June 15, 2021

P.O. Box 292
Ruby, NY 12475

New York State Department of Environmental Conservation
Attn: Kristen Cady-Poulin, Environmental Analyst,
625 Broadway
Albany, NY 12233-1011

Re: Catalum SPDES No. NY026-4652 (NYSDEC Case No. D007-001-11.01)

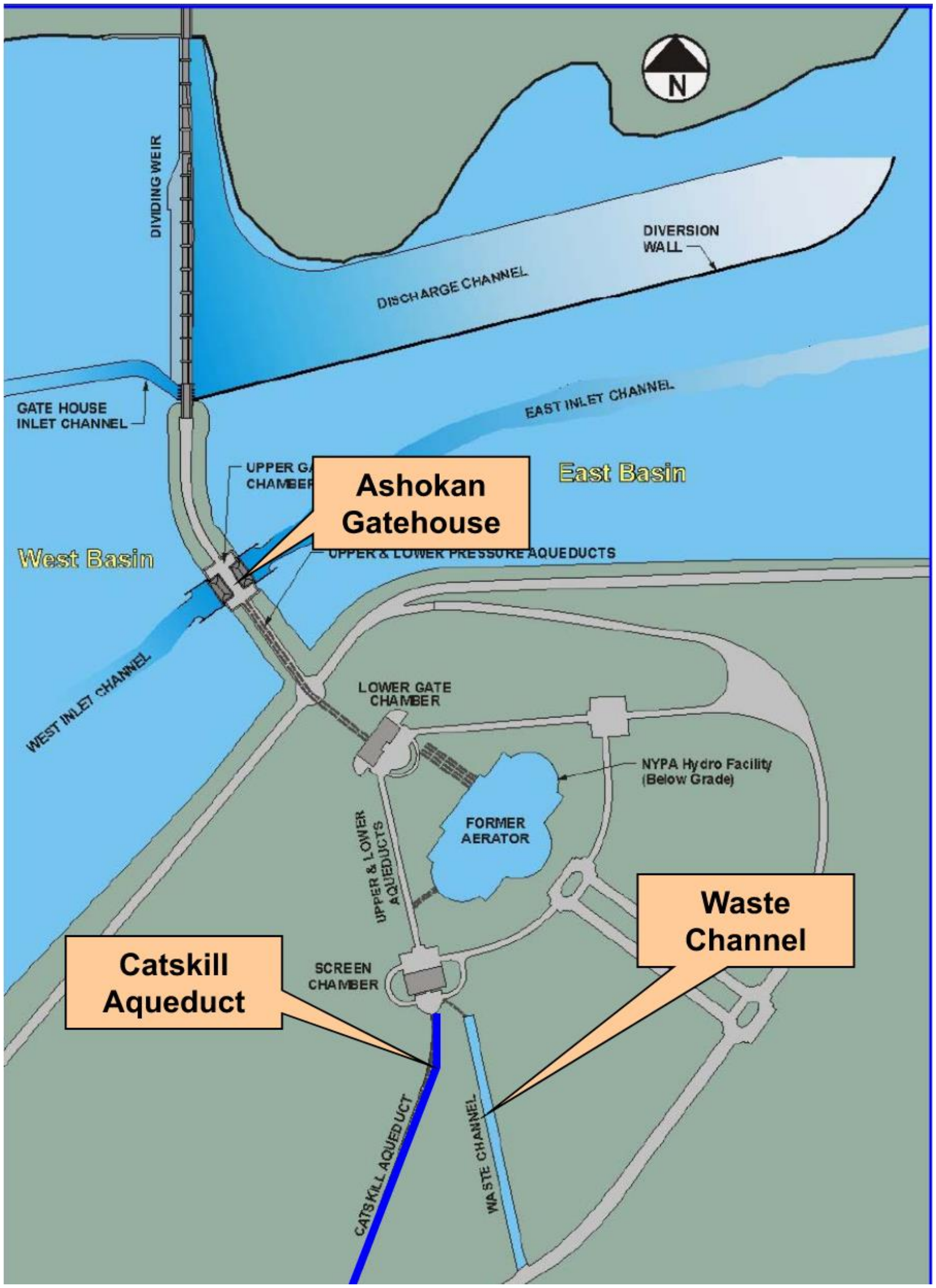
Dear Ms. Cady-Poulin:

As a professional engineer in the State of New York, I have serious concerns about the Draft Environmental Impact Statement (DEIS) evaluating modifications of the New York City Department of Environmental Protection's (DEP) Catskill Aqueduct Influent Chamber State Pollutant Discharge System Permit (SPDES No. NY026-4652) (Catalum SPDES Permit). These concerns became more apparent after the releases of millions of gallons of water and thousands of tons of solids from the Ashokan Reservoir between 12/28/2020 and 2/12/2020 and 3/10/2021 and 4/17/2021. DEIS has many unanswered questions, the evaluation of alternatives is inadequate, the implementation of a reasonable solution has been delayed because of DEP's mismanagement of one of the greatest water systems in the world, and interim solutions were not presented in DEIS to stop the muddy discharges immediately. While the New York State Department of Environmental Conservation (DEC) considers modifications to the Catalum SPDES Permit, I am requesting that you consider requiring modifications to the DEIS, Catalum SPDES Permit, and the Order on Consent (NYSDEC Case No, Doo7-001-11.01), immediate interim actions to correct the situation and a specific schedule to implement permanent solutions.

First, I want to introduce myself. I recently retired after a 48-year career. I have predominately worked on projects involving water treatment plants (WTPs) and handling residuals from these plants. I have been involved in the design of 17 WTPs, including the design of the first UV disinfection facilities for the Poughkeepsies' water treatment facility. I have worked for large cities, including Philadelphia, New Haven, Cleveland, Minneapolis, Jersey City, Norfolk, Davenport, Chicago, and New York. For Chicago, I served as the Planning & Design Manager for the Department of Water Management. The system included three intakes, a 1.45 BGD treatment plant, a 720 MGD water treatment plant, finished water tunnels and storage tanks, 12 pump stations, and 4,230 miles of water distribution mains. For New York, I worked on the pilot plant and preliminary design for the Croton WTP, Water Supply Dependability Facility Plan, and the Contamination Warning System Demonstration Pilot Project Study. I am the Past Chairperson of the AWWA Residuals Management Research Committee and co-author of Chapter 18, Process Residuals, in the Fifth Edition of the AWWA/ASCE Water Treatment Plant Design. In the Hudson Valley, I have worked with operators of all five plants that withdraw water from the Hudson River and am a technical advisor for the Hudson 7.

I also have some personal reasons for my concerns. My wife's grandfather lived in Brown Station, which is now beneath the waters of the Ashokan Reservoir. His family and neighbors were forced from their homes by New York City, and even their cemeteries were moved to Mount Tremper. Every time I visit the family cemetery, I think about all the suffering the people of Ulster County experienced. And now again, NYC is asking 40% of the county population that lives around the Lower Esopus Creek to live with the muddy releases. These releases are destroying the environment, reducing property values, limiting recreation activities, and hurting business. Ulster County's economy is based on tourism and outdoor recreation, and a muddy creek is detriment.

The Ashokan Reservoir figure below is from DEP, and I will be referring to it during the remainder of this letter because it is larger than the figure in the DEIS. Also provided is a more detailed map of the area around the dividing weir and Ashokan Gatehouse. These drawings should have been included in the DEIS. The basin on the left is the West Basin, and the Esopus Creek enters the West Basin at the upper left corner of the map. The East Basin is on the right side of the map. The Dividing Weir Bridge separates the two Basins. Water usually flows over the Dividing Weir from the West Basin to the East Basin. As shown on the insert, the water exits the East Basin through the East Intake and Screen Chamber or leaves the West Basin through West Intake and Screen Chamber to Catskill Aqueduct. The water from either Chamber can discharge to the Waste Channel, now called the Release Channel. During a period of high turbidity, nearly all of the water enters the West Basin, which becomes very turbid, and overflows into the East Basin. The cleaner water exits only through the East Chamber to the Catskill Aqueduct, while the turbid water exits through the West Chamber to the release channel. To minimize the overflow of turbid water into the East Basin, DEP tries to lower the West Basin by discharging the turbid water to the Release Channel.



In the following sections, I will discuss the following and present some alternatives, which I believe will benefit both Ulster County and New York City:

- Evaluation of Section 14, Alternatives presented in the DEIS
- The need for muddy releases was the result of DEP's lack of system maintenance, inadequate planning, and excessive delays
- Immediate and long-term solutions to minimize muddy releases

Alternative Presented in the DEIS

Alternatives that DEP presented in Section 14 of the DEIS for the Modifications to Catalum SPDES Permit, shown below, are evaluated in this section.

Before evaluating these alternatives, I want to discuss the DEP's overall approach. This section is not a typical alternative analysis that is presented in most engineering reports. This is only a presentation of alternatives to the alternative already selected by DEP. Alternative analyses should start with an open mind to all possible alternatives. Then, the benefits of these alternatives should be established by all stakeholders, not just the benefits to DEP. The capital and operations costs should be determined for each alternative. The DEIS does not present any costs for consideration except to say an alternative is too expensive. Once the cost and benefits are determined, a cost-benefit analysis should determine the alternative that provides the most benefits for money spent. In addition, alternative analyses should include detailed explanations and sketches of the alternatives. None of these steps were taken, and therefore, the alternative analysis is worthless.

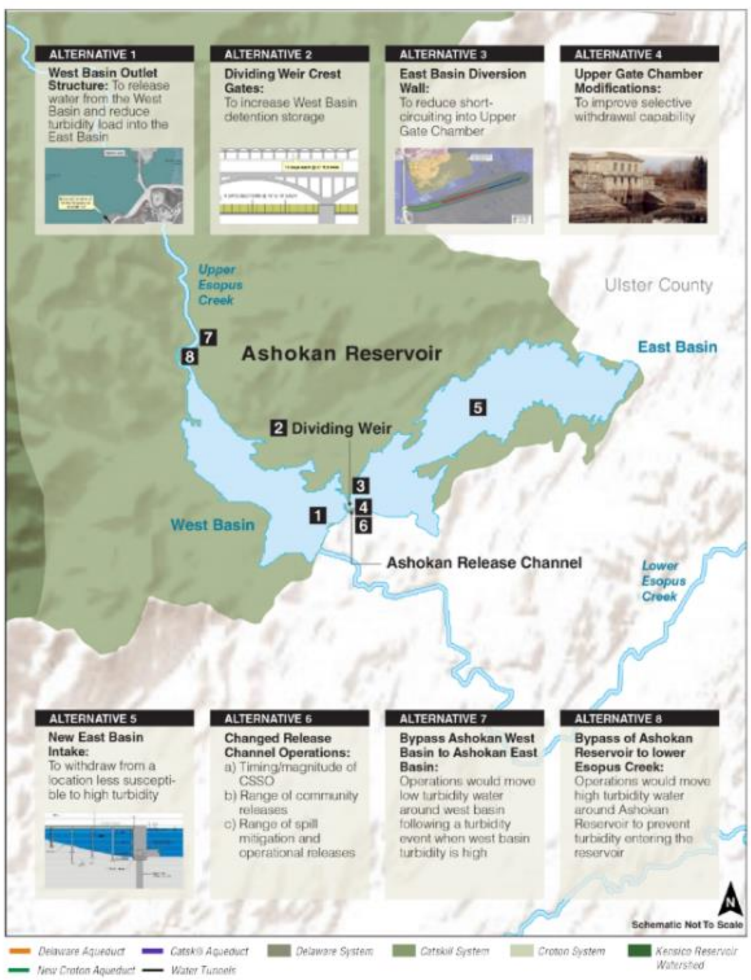


Figure 14.2-1
Ashokan Reservoir Alternatives

In addition, the alternatives are not clearly explained for laypersons, and these explanations should be provided so that the public understands them. I prepared a detailed description of these alternatives with drawings in a memorandum to the concerned environmental groups. I spent many hours answering their questions and explaining the engineering aspects of each alternative. I found members of these groups to be very knowable and included scientists and biologists. However, there were no engineers in the groups to explain these alternatives. I learned that many engineers are unwilling to challenge DEP because of the engineering work that DEP can provide them. I hope this is not true, but my firm and I believe that it is our duty as professional engineers to assist all persons in developing a plan that satisfies all stakeholders. I also think that DEC's responsibility to work with these groups to provide engineering support not to harass DEP but to challenge them to develop the best plan.

No Action Alternative

This alternative of continuing operation of the Ashokan Waste Channel in accordance with the Interim Ashokan Release Protocol (IRP) and delaying of dredging alum sludge at the Kensico Reservoir is what DEP is doing now and basically what they propose in the future. Since the environmental groups will address the problems with this alternative, there is no need for me to discuss it. However, in 2010, Ulster County issue a notice of intent to sue NYC because the City was violating the Clean Water Act of 1972 (CWA). When DEP stopped releasing turbid water in 2011 and promised to study the issue, the County dropped the case. I agree that this alternative would be in direct violation of the CWA if DEC had not issued a permit. The goal of CWA is to make our rivers and streams fishable and swimmable, and this alternative does neither. The CWA also requires that no discharge have solids that exceed 30 mg/L, and DEP violates this regulation in discharges through the waste channel.

Most water utilities in the country are not allowed to discharge untreated water to surface water, and no water utility is permitted to discharge alum sludge to surface water. In a study for Washington Sanitary Suburban Commission in Maryland, I suggested that WSSC install a pre-sedimentation basin to settle out most of the solids from the Potamic River before any chemicals were added and return a slurry to the river. Both MD Department of the Environment and EPA Region 3 prohibited returning the slurry to Potomac River, whose turbidity at times can be greater than 1,000 NTU. Discharge of alum sludge to surface waters has been prohibited since the enactment of CWA. Poughkeepsie Water Treatment Facility had to stop discharging spent backwash water and alum sludge to the Hudson River in the early 1980s and construct facilities to recycle the spent backwash water and thicken, dewater and truck the dewatered sludge to a recycle center. Poughkeepsie faces fine if there is any discharge to the Hudson River. The discharge of alum sludge to the Kenisco Reservoir would violate the CWA for any other water utility in NY or any other state in the US. DEP is misleading the public and DEC by calling it alum floc. Alum floc are small coagulated particles that form in a flocculation basin. Once it settles in a basin, river, or reservoir, it is called alum sludge. The DEIS indicated that the alum sludge has no toxic effect on fish. However, the Final Fact Sheet on Aluminum in Freshwater dated December 2018 states, " Elevated levels of aluminum can affect some species' ability to regulate ions, like salts, and inhibit respiratory functions, like breathing, aluminum can accumulate on the surface of a fish's gills, leading to respiratory dysfunction, and possible death." Therefore, DEP must stop releasing muddy water to an impaired stream, which is impaired due to sediments, and stop discharging alum sludge to the Kenisco Reservoir.

Ashokan Reservoir Alternative 1 – West Basin Outlet Structure

For Alternative 1, DEP is proposing an intake tower in the West Basin, which would be like the structure below:

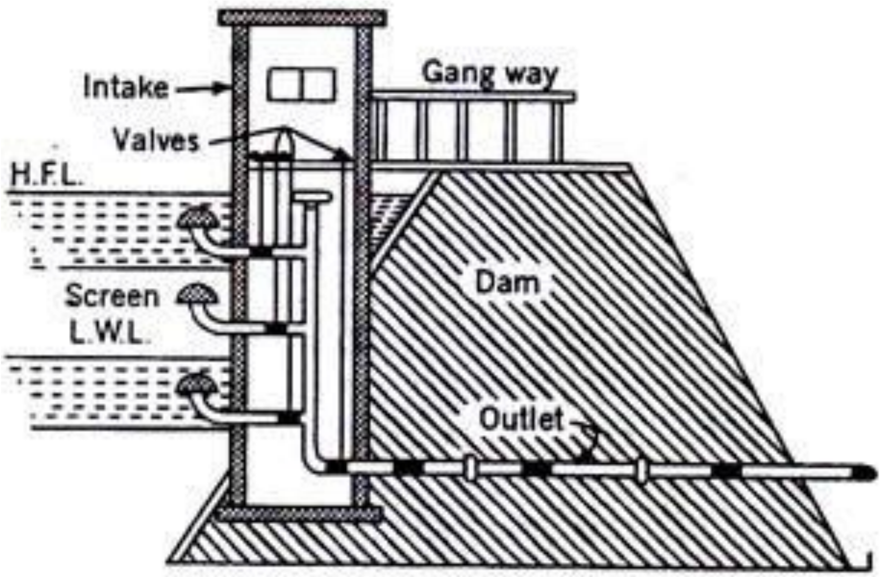


Fig. 7.7. Reservoir intake.

The water from the outlet pipe would be discharged to the Lower Esopus Creek. DEP proposes to design the structure to handle up to 6,000 MGD, which would flood the Lower Esopus. It should be designed for no more than 600 MGD, which is the current limit. This alternative will make the discharge even worse since the intake structure will be closer to the Upper Esopus discharge, lessening the retention time, increasing the turbidity, and possibly creating short-circuiting. In addition, the conduit to carry 6,000 MGD would be tremendous and cost-prohibitive. To carry only 600 MGD, the conduit would have to be approximately two 12' x 12' culverts, as shown below. DEP decided not to pursue this alternative, and I agree.

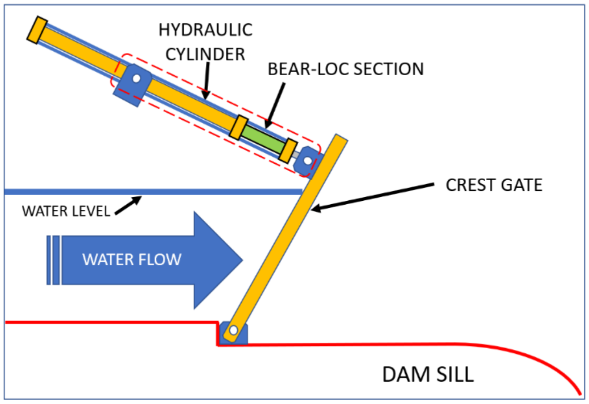
Ashokan Reservoir Alternative 2 – Dividing Weir Crest Gates

It is interesting to note that in Table 14.1-1, DEP proposes inflatable gates on the Dividing Weir, and on page 14-6, it proposes crest gates on the Dividing Weir. An inflatable dam, which was not presented, inflatable crest gate, and hydraulic crest gate are shown below:

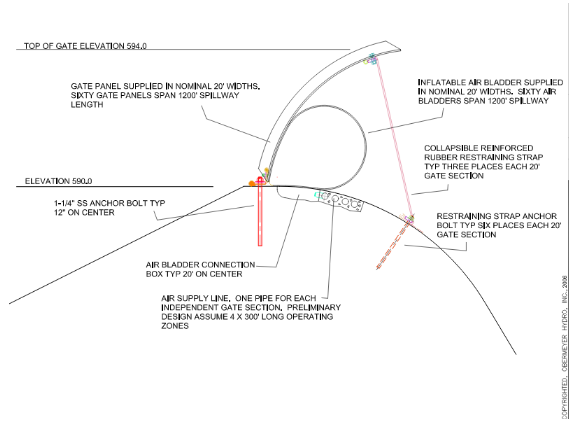
Inflatable Dam

Inflatable Gate

Hydraulic Crest Gate



Hydraulic Operated Crest Gate



Inflatable Crest Gate

Obviously, the inflatable dam will be less expensive than the inflatable crest gate and crest gates, but the crest gate would make it easier to change the elevation of the West Basin. The crest gate can raise and lower the reservoir by rotating the crest gate. The inflatable dam may be an excellent temporary solution since it can be installed quickly but will deteriorate in the sunlight.

All these options will raise the West Basin by four feet but could flood the West Basin's surrounding area. By lowering the West Basin to the existing weir height to remove water and then raising the dam or gate, four feet will allow a storage volume of 3-4 billion gallons during a storm event. According to historical flow records for Coldbrook, the peak flows are approximately 10 billion gallons. For the Christmas Storm of 2020, the flow over four days was 17.9 billion gallons. Although the dam or crest gate would have only captured 17-22 percent of a Christmas Storm event and only capture 30-40% of a peak historical storm, it will probably catch most of the turbidity, which occurs mainly at the start of the storm. To capture the additional flow, DEP should start to release a maximum flow without flooding the downstream communities as soon as the flow at Coldbrook Station reaches 2,000 MGD or before a predicted significant storm. DEP could also maintain the level in the West Basin below the weir wall. During the Christmas Storm of 2020, the flow peaked on the 25th, but DEP did not release water to the waste channel until the 29th. This delay was probably because the stop shutters could not be removed manually fast enough or the flows from Sawkill and Plattekill were too high to release water from the Ashokan. I would suggest that modeling be performed to determine the flow amount for releases during a significant storm event to prevent flooding and minimize turbidity.

Another issue is that DEP proposes reconstructing the Dividing Weir and roadway as part of the Ashokan Improvement Project. This project could further delay a temporary or permeate method to increase the water level in the West Basin. The crest gates should be included in the Ashokan Improvement Project, but the work to be included is unclear because DEP indicated that it would not share the details of the improvements until the design is completed.

I contacted Obermeyer Hydro, Inc to obtain prices for the inflatable dam and inflatable crest gate. The firm's vice president informed me that he gave a proposal and the above drawing of the inflatable Crest Gate to DEP in 2007. He also gave me the cost of $3,887,000 for an inflatable dam and $5,398,000 for inflatable crest gates. I compared these costs with the costs in the Value Engineering Study dated January 2008. Inflating the VE cost to 2021, the estimated cost is $161,744,000, which is nearly 30 times the estimated cost for inflatable crest gates. It may be that DEP's estimate is based on hydraulic-operated crest gates. I believe that inflatable gates should be adequate, at least for a temporary measure.

Ashokan Reservoir Alternative 3 – East Basin Diversion Wall and Channel improvements

There is an existing diversion wall in the East Basin, probably constructed in 1915, and is shown in the picture below:

When the reservoir is full, the Diversion Wall is 20 feet below the water surface. The submergence allows short-circuiting to the East Basin Intake Chamber, as shown on the picture and drawing below with red lines indicating the short-circuiting:

Weir Dividing Wall

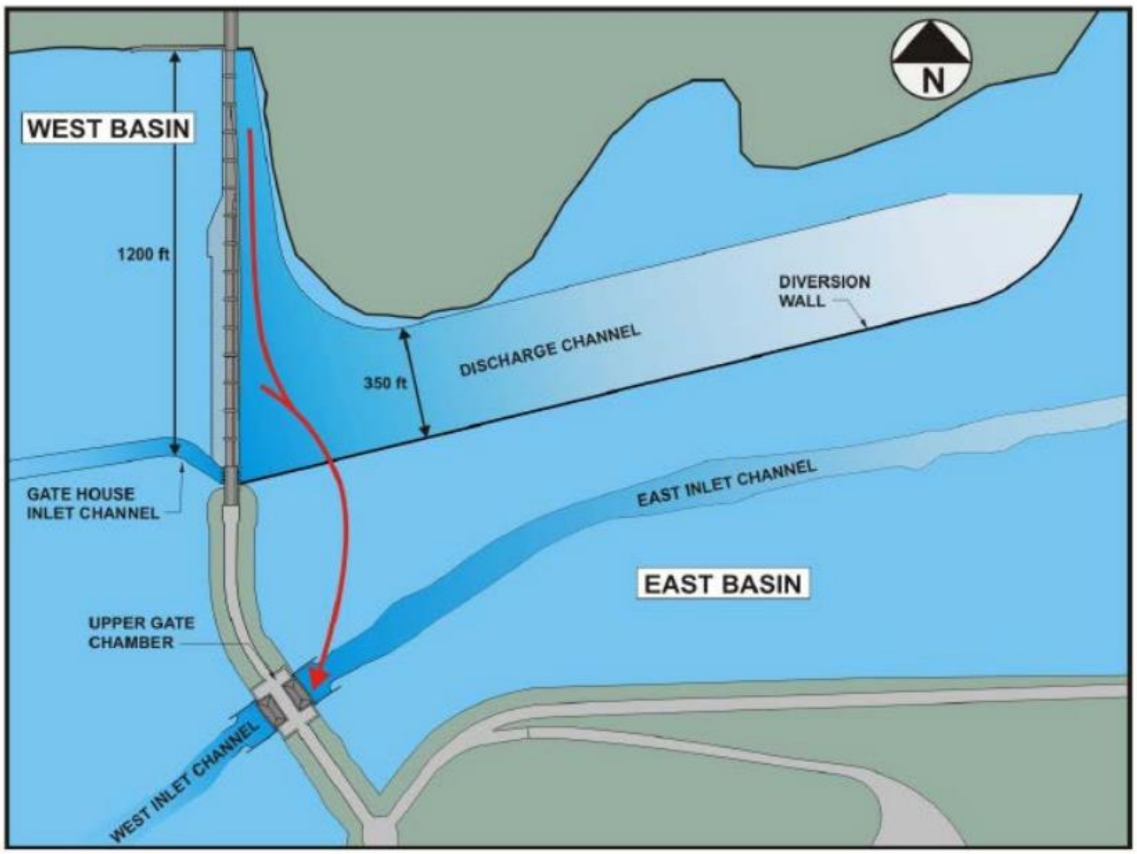


Figure 14.2-2
Existing East Basin Dividing Weir and Diversion Wall
(Red lines show short-circuiting of flows over existing diversion wall)

In April 2021, I visited the Dividing Weir and witnessed the short-circuiting, as shown below. At the west end of the East Basin, the water was turbid, but the water was clear at the east portion of the East Basin.

West End of East Basin

East Portion of East Basin

DEP is proposing to extend this wall to the surface to prevent short-circuiting to the East Basin Intake Chamber using a jetty wall or closed-cell cofferdam construction method as shown below:

Per the modeling done for DEIS, the modifications to the diversion wall would reduce the turbidity in proportion to the wall's length but would have limited benefits for extended periods of high turbidity.

I like this alternative, but I suggest using a turbidity curtain above the wall and extending the turbidity curtain to a length that would reduce turbidities even during extended periods of high turbidity. According to manufacturers, these curtains could be installed quickly before next spring at the cost of approximately $400,000 for the curtain that would extend 3,000 ft into the East Basin. In contrast, a 2,400-ft jetty wall or cofferdam cost about $998,378,000 or $351,175,000, respectively, based on the 2008 Value Engineering Study, inflated to 2021. The curtain could be extended to the Glenford Dike at the far east end of the East Basin at a cost lower than 2,400 feet of a cofferdam. One manufacturer to whom I spoke is working with DEP to supply a barrier in the Kensico Reservoir. A picture of a turbidity curtain is shown below:

I would suggest a turbidity curtain be installed in the East Basin immediately as an interim solution. I also would suggest that DEP consider baffling the West Basin with turbidity curtains to prevent short-circuiting from the Upper Esopus to the Dividing Weir, as shown in the figure below:

These baffles would allow the entire West Basin to provide more detention time to enhance settling.

Ashokan Reservoir Alternative 4 – Upper Gate Chamber Modifications

DEP uses stop shutters (stop logs) to withdraw water at multiple levels from both the East and West Basins and are in the Intake Chambers, as shown in the pictures below. By adding and removing the stop shutters, the elevation of the water in the basins can be raised and lowered to allow water to flow through the intake valve. The use of wooden stop shutters is an ancient technology used in 1915, and stop shutters are now called stop logs. Based on the picture below, it appears that the wooden stop shutters have not been replaced for a long time. These shutters are operated manually, which is time-consuming and dangerous for the operators.

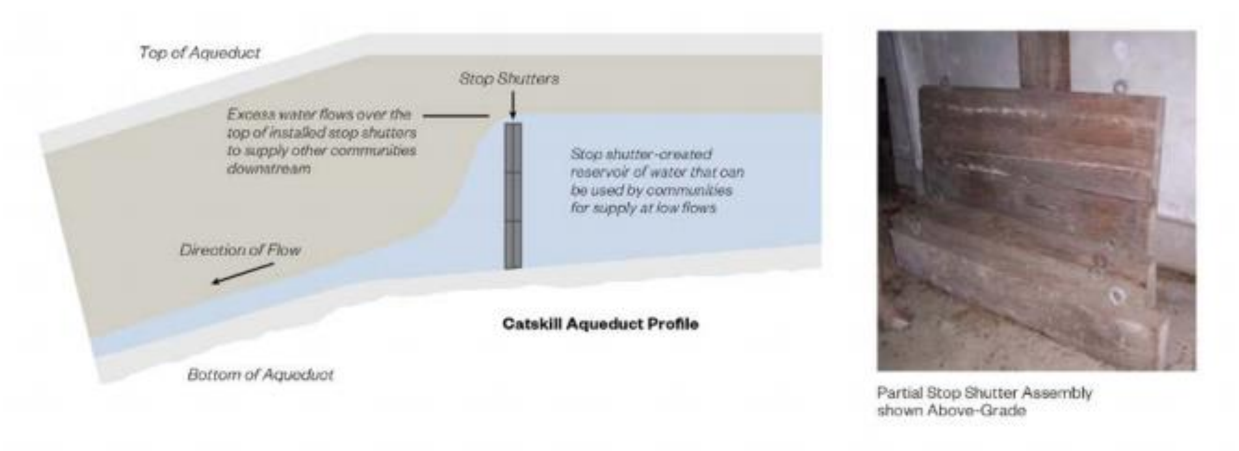


Figure 1-9. Stop Shutter Schematic

The operation of the stop shutter is challenging to change water levels since each stop shutter must be lifted out or in to change levels. Today, water systems use stop logs constructed of steel and can be lifted in and out with a crane, as shown in the pictures below.

DEP is proposing an improved multi-level intake and may include these intakes in the Ashokan Improvement Project. However, in the DEIS, it is indicated proposed intakes would only provide a limited turbidity reduction. I would recommend replacing the labor-intensive and dangerous stop shutters with steel stop logs and motor-operated hoist and moveable frame so that the DEP can respond quickly to change water levels and releases from the East and West Basins.

Ashokan Reservoir Alternative 5 – East Basin Intake

This alternative is similar to Alternative 1, except it is in the East Basin and could minimize the short-circuiting. However, DEC is proposing to install it in the center of the East Basin, which would not maximize the retention time. I would suggest placing it at the farthest eastern, low point of the East Basin to maximize the retention and utilize the entire volume of both basins. However, it will be costly to connect this intake with Catskill Aqueduct, which is on the other side of the spillway, since it would probably require a six to eight-mile tunnel at the cost of approximately $1,621,000,000 based on the 2008 Value Engineering Study. The conduit size would have to be two 12' x 12' culverts, as shown in Alternative 1.

Ashokan Reservoir Alternative 6 – Change Release Operation

Any turbid release is unacceptable but releases of low turbidity is required for flood protection, to maintain minimum flows and to allow flows over the spillway. I have assumed that this alternative will use the Croton System and Delaware System when the turbidities are high and will use the Catskill System during high turbidity events for only those water systems north of NYC. This assumption is based on the description of Alternative 6A in the AWWA article published in AWWA Journal dated April 2013 and co-authored by Paul Rush, Deputy Commissioner for the Bureau of Water Supply at DEP. The systems north of the City should be able to handle the high turbidities because they have water filtration plants. However, the DEIS description is very vague and only says that Alternative 6 would balance the water supply needs for DEP. I am concerned that DEP is backing away from this alternative because DEP may believe this alternative may be too risky because its recent evaluation using its Operations Support Tool (OST) may have indicated that the Delaware and Croton System may not be able to meet the City's water demands. DEP also may not want to use the Croton System at its maximum capacity because the water is more expensive due to the treatment plant. Further clarification about this alternative is needed from DEP.

Alternative 6A, as described in the AWWA article, would be an excellent long-term solution. However, it cannot be implemented until the Delaware Aqueduct Rehabilitation is completed, and this project will not be started until 2022 and probably will not be completed until 2027. This alternative would still require releases to prevent flooding. However, turbid releases could be avoided by keeping the West Basin as low as possible and releasing water from the West Basin when the water is not turbid. When the releases from West Basin becomes turbid, water should be released from the East Basin. With these control releases, Alternative 6A is the best of all the other alternatives proposed. It will not require any permanent structural solutions. However, temporary solutions will be needed until at least 2027, until the rehabilitation of the Delaware Aqueduct is completed.

Ashokan Reservoir Alternative 7 – Bypass of the Lower Turbidity Upper Esopus Creek Water directly to the Ashokan East Basin

This alternative would be valuable when the incoming is cleaner than settled water in the west basin. I agree with DEP that since the tunnel or similar structure would have to pass 15,000 to 45,000 MGD around the West Basin, the bypass structure would be tremendous in size and an approximate length of nine miles. The project would be a significant undertaking, the environmental impacts from construction would be substantial, and the project costs would be in the billions of dollars.

Since this is one of the preferred alternatives for the environmental groups, I discussed this alternative with them. They agreed that the bypass could be designed only to bypass the maximum flow needed from the Catskill System of 400-600 MGD. By diverting smaller flows, the costs and impacts could be reduced significantly. However, the conduit would have to be at least two 12' x 12' conduits, or a concrete wall could be constructed along the south shoreline of the West Basin to form a bypass channel.

Ashokan Reservoir Alternative 8 – Bypass the Upper Esopus Directly to the Lower Esopus

This is another alternative that the environmental groups would prefer, but it would result in higher turbidity water being discharged to the Lower Esopus since the Upper Esopus would have higher turbidity than the release channel turbidity because the water would lose the benefit of the settling of solids in the West Basin. Also, the Lower Esopus Creek basin residents would lose the flood control that the Ashokan Reservoir provides. Finally, as DEP points out, providing a tunnel or similar structure that would have to pass 15,000 to 45,000 MGD around the West Basin would be tremendous in size and approximately 11 miles in length. The project would be a significant undertaking, and the environmental impacts from construction would be considerable.

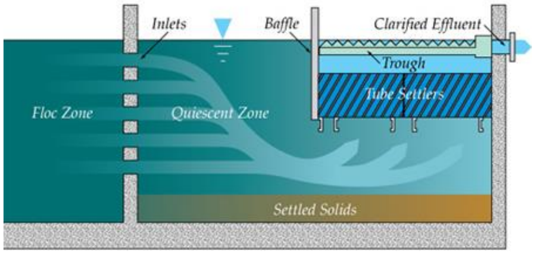
As with Alternative 7, by diverting smaller flows of 400-600 MGD, the costs and impacts could be reduced significantly. However, the conduit would have to be at least two 12' x 12' conduits, or a concrete wall could be constructed along the south shoreline of the West Basin to form a bypass channel.

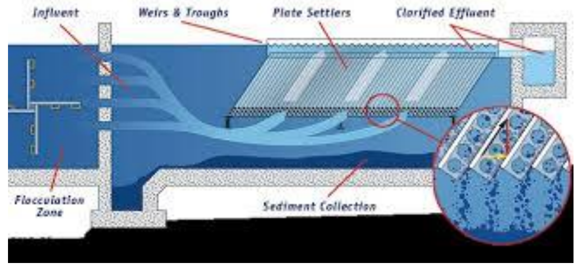
Catskill Aqueduct Alternatives

These alternatives include discharging high turbidity water to Hudson River, the new Croton Reservoir, Rondout Creek, or Wallkill Creek through existing pipes and siphons. These alternatives only transfer the problem to other surface waters. The only one that may be feasible is discharging to the Hudson River since the location is well downstream of the drinking water intakes.

Tube Settlers and Plate Settlers

Tube Settlers and Plate Settlers, shown below, enhance settling and the removal of solids and have been used at water treatment plants for over 45 years. They are usually used in settling tanks and can achieve turbidities of less than 5 NTU. As an out-of-box alternative, I am suggesting that they be investigated at the weir dividing wall.





Tube Settlers *Plate Settlers*

Tube settlers use multiple tubular channels sloped at an angle of 60° and adjacent to each other, which combine to form an increased effective settling area. This provides for a particle settling depth significantly less than the settling depth of a conventional clarifier, reducing settling times.

Plate Settlers work in a similar way to tube settlers. Flow passes through multiple, variably sized inlet orifices to the settling zone and proceeds upward through the plates at an angle of 55° from horizontal. Careful attention has to be paid to the design flow velocity between the plates to maximize settling capabilities

Because of a peak flow of 12,900 MGD (Peak flow during the 2020 Christmas Storm), the tube settler area would be 3,600,000 square feet. The installed tubes would cost about $1,000,000,000 and would require a massive structure to hold them in place. The support structure may double the price. If effluent turbidity requirements could be increased at the peak flow and the tubes sized for the average flow of 575 MGD (Average flow from December 1, 2020, to April 30, 2021), 160,000 sq. ft. would be required, and the installed cost would be $4,480,000. However, the support system may double the price. Life expectancy for tubes installed outdoors is about 10 years; 15 years maximum outdoors when considering UV degradation.

The plate settlers would have a longer life of 50 years and require less area than the tube settlers. However, they would cost more. To size for peak flow, the cost would be $1,550 million. If sized for the average flow, the cost would be $34.5 million. As with the tube settlers, the price could double because of the support structure needed.

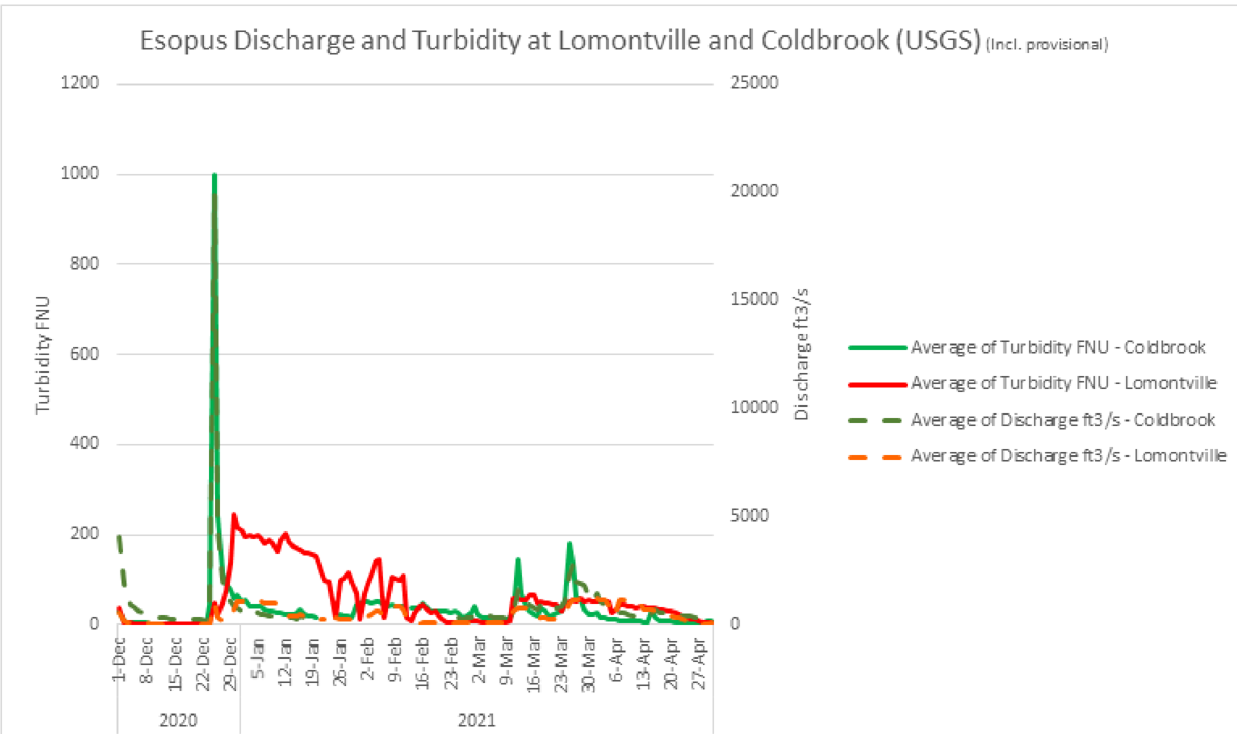
To proceed with this alternative, DEP would have to answer the following questions:

1. What is the cross-section of the dividing wall?
2. What is the water depth in the proposed area 1,000' out from the 1,200' long dividing weir? Is bedrock available in this area?
3. Is it cost-effective to build concrete structures west of the dividing wall to support plate beams and cross-collection flumes?
4. Is there any jar testing data or water characterization on the fine clay high turbidity events to determine the most cost-effective loading rate to achieve target effluent turbidities?

This alternative would require that the West Basin be operated as a settling tank with solids accumulating in the basin, and the basin would have to be operated at its full depth. This alternative is only one of the possible alternatives that DEP should consider to adequately evaluate all possible alternatives. I challenge the DEP engineers to be as innovative as Waldo Smith in removing turbidity.

Interim Release Protocol

Environmental groups desire to have the releases more mimic the natural flow of the Upper Esopus Creek without the Lower Esopus Creek flooding the homes and businesses along its banks. Below are the flows and turbidities between December 1, 2020, and April 27, 2021, for the upstream monitoring station at Coldbrook and the downstream station at Lomontville. This period covers the 2020 Christmas storm and rain and snow melts in April 2021.



As shown, the patterns for flows and turbidities are nearly the same for each station. Therefore, the operations could be based on the flows at the Coldbrook Station. However, the high flows and turbidities only last for about two days at Coldbrook. The high flows and turbidities for Lomontville were not as high but lasted a more extended time created by releases from the Ashokan for 85 days, as shown on the graph. The most prolonged duration was 47 days. The releases ranged from 86 MGD to 601 MGD. The lengths of these durations are harmful to the Lower Esopus since they block light from reaching aquatic plants and lower the oxygen for fish. A suggested protocol would be to keep the West Basin as low as possible but without reducing the reservoir capacity below DEP's target Conditional Seasonal Storage Objective (CSSO). Then, DEP should release as much as possible from the West Basin when a large storm is predicated until the turbidity reaches 25 NTU without flooding the Lower

Esopus. Once the turbidity of 25 NTU, release as much water as possible from East Basin until the solids settle in the West Basin. DEP should investigate this protocol with their Operations Support Tool (OST).

Stream Restoration

This program should continue because the best way to improve raw water quality is a robust watershed protection plan. In my discussions with the environmental groups and reviewing information from USGS and National Academy Science, I have concluded that the program is excellent, but not enough stream restorations are being completed. DEC should ensure that all currently designated creek and stream banks are restored before the Spring of 2023 in the Upper Esopus Watershed. Any additional creek banks should be restored within two years of being designated.

The Ultimate Alternative

The ultimate alternative is the elephant in the room - the construction and operation of a Catskill/Delaware Water Filtration Plant. Environmentalists oppose this plan because they believe that DEP will stop its watershed protection if a plant is constructed as DEP did in the Croton System when its plant was completed in 2015. I hope that is not the case because watershed protection is the best way to ensure quality drinking water and reduce treatment costs.

The plant would treat the high turbidities, and no releases would be required except for releases for flood protection, releases over the spillway and releases necessary to keep the Lower Esopus Creek fishable and swimmable in accordance with the CWA. All the water systems that use the Catskill Aqueduct must filter. Why not DEP? Is favoritism be given to DEP? DEP will say that once they dilute the Catskill Water with the Delaware Water, the water turbidity is usually less than 5 NTU but not always as indicated by NYC Water Quality Report. As most regulators have told me, "Dilution is not the solution to pollution." Every source must meet the water quality standards. For example, if I had ten wells and one well has PFAS above the limit, dilution would not be acceptable to the Department of Health (DOH), which would require that the well be shut down or treatment be provided for the well. This requirement should also hold for NYC. Therefore, DEP should construct a plant, at least for the Catskill System.

Data in the Table below from DEP’s Evaluation of Turbidity Reduction Potential through Watershed Management in the Ashokan Basin dated November 2008 has proven that the FAD should be discontinued. The Table shows the number of days alum had to be used because the turbidity exceeded 5 NTU, which is the limit DEP must meet to continue its FAD. As shown in the Table, alum was required nine times over the 10-year period, for six times over a month, and for almost half a year in 1996. Also, NYCDEP's study on climate change present 2019 Annual FAD Report indicates that the number of days that turbidities will be high from the Catskill System will increase.

Table 2.1. Listing of alum treatment periods from 1987-2007.

Dates of Alum Treatment	Duration of Alum Treatment (days)	Avg. Daily Flow(s) at Coldbrook Causing Alum Treatment (cfs)	Date(s) of Daily Flow (mm/dd/yyyy)	Rank of Daily Flow for WY87-WY07
Apr. 6, 1987-May 19, 1987	43	17,400 10,000 9,460	04/04/1987 04/05/1987 03/31/1987	2 (tie) 8 11
Jan. 22, 1996-June 21, 1996	151	21,800 10,400	01/19/1996 01/27/1996	1 6
Jan. 14, 1997-Jan. 29, 1997	15	9,570	12/02/1996	10
Jan. 10, 2001-Feb. 2 2001	76	9,740	12/17/2000	9
Apr. 5, 2005-June 20, 2005	23	17,400 13,400	04/03/2005 04/02/2005	2 (tie) 4
Oct. 13, 2005-Nov. 23, 2005	41	6,520	10/13/2005	25
Dec. 1, 2005-Apr. 10, 2006	129	9,050	11/30/2005	12
May 15, 2006-May 24, 2006	10	5,950	05/12/2006	29
June 28, 2006-Aug. 2, 2006	36	11,400 10,300	06/28/2006 06/26/2006	5 7

Also, DEP has found Giardia at several sites in the Catskill Watershed, as indicated in the 2019 FAD Annual Report. Giardia are protozoan parasites that occur in a trophozoite and an oval-shaped cyst form. Giardia infection may be acquired without producing any symptoms, and this is often the case for children. In symptomatic patients, acute diarrhea is the predominant feature. In some instances, diarrhea may be transient and mild, passing without notice; in others, diarrhea can be chronic. When operated under appropriate conditions, commonly used filtration technologies can effectively remove Giardia cysts from water. Giardia is one reason the EPA issued the Surface Water Treatment Rule (SWTR) that requires public water systems to filter and disinfect surface water; 99.9% of Giardia must be removed or killed. The presence of Giardia is another reason that DOH should require DEP to provide filtration. DEP would probably respond to this comment that its UV disinfection kills Giardia, but UV is not effective if the water is turbid.

The main issue with this alternative is that it probably could not be implemented for 15-25 years, and we must STOP THE MUD NOW. I proposed short-term solutions in the last section to minimize the releases before Spring 2022.

The Reasons for the Problem of Muddy Water Releases

The reasons for the muddy water releases are DEP's lack of planning, lack of maintenance, and excessive delays in implementing projects for one of the greatest water systems in the world. For example, if the Catskill Aqueduct and Delaware Aqueduct had been maintained and the shaft connecting the Catskill and Delaware Aqueducts had been completed, Alternative 6A could have been implemented, and the Ashokan Reservoir would not have to be used during high turbidity periods, and there would be no need to release muddy water to the lower

Esopus Creek. The persons of Ulster County, DOH, and DEC, should not be penalized for DEP's negligence.

Waldo Smith, the Catskill System designer, and the Board of Water Supply Engineers in the early 20th century would be upset that the Catskill Aqueduct and Ashokan had not been repaired for over 100 years and the Delaware Aqueduct had not been restored in more than 75 years and has been leaking 20 MGD since 1993. (That is more water than all the Hudson 7's plants filter.) These engineers design the world's greatest water system without aerial photography, GPS, GIS, modern survey equipment, CAD, and other engineering tools we have today in less time than DEP is rehabilitating the systems they design.

DEP's lack of planning to meet current regulations is also negligent. Waldo Smith knew that the Esopus Creek had turbidity problems. That is why he designed two basins for the Ashokan Reservoir. The West Basin was mainly designed to settle out solids, and East Basin was designed to store the clarified water. However, in 1915 turbidity could only be measured by a Jackson Turbidity Meter, which consisted of a candle beneath a column of water and was only accurate to 25 JTU. With the Safe Drinking Water Act, which was enacted in 1974 with amendments in 1986 and 1996, DEP was required to reduce turbidities to 5 NTU. DEC should ask why DEP did not develop plans to minimize turbidities 25 to 47 years ago and why DEP did not release water for over 100 years until they could not meet the turbidity standards set many years ago? It also should be noted that other water utilities at no time can turbidity go higher than 1 NTU, and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month.

The excessive delays should have been prevented by DEP and should have been stopped by DEC. I have personal experience with these delays. I started working in 1973 for Metcalf & Eddy, which was conducting pilot tests for the Croton Water Treatment Plant, and the Plant was not completed until 2015. It took 42 years to design and construct the plant. Any other water utility would have been fined for such an outrageous delay. Repairs on the Delaware Aqueduct were scheduled to start in 2013, and now it is expected to begin in 2022. The Ashokan Century Project was announced in 2017 and is not likely to be completed until 2027, 12 years after the 100th anniversary of the completion of the Ashokan Reservoir. Finally, Ulster County requested an EIS be performed in 2011, and now, 10 years later, DEP has produced only an insufficient DEIS.

This negligence on the part of DEP has forced DEC to allow the release of turbid water from the Ashokan and discharge of alum sludge into the Kenisco Reservoir, which would not be permitted for any other water utility, in order to provide drinking water to 9.5 million people. The DEC made the right decision which I also would have made. However, now is the time to stop these discharges, which would have been violations of the Clean Water Act if DEC had not granted DEP a discharge permit. The time for studies and a Supplemental DEIS is over. DEP must take immediate actions to stop these discharges.

Immediate Solutions and Long-Term Solutions to Minimizes Muddy Releases

It is essential to complete interim plans to STOP THE MUD NOW. I and environmental groups are also recommending additional studies and long-term structural solutions in a Supplemental DEIS. However, a Supplemental DEIS will not happen for 10-20 years based on DEP's history, and the Lower Esopus will not survive with the current release protocol. Therefore, we need DEP to put into place a new release protocol and temporary structural solutions. Once they are in place, all stakeholders should meet with DEC, DOH, and DEP, determine what studies are required, what long-term alternatives should be evaluated by a cost/benefit analysis, and revise the DEIS to address everyone's concerns. Ulster County, DEC, and DOH cannot allow another delay for additional studies since the Lower Esopus cannot survive any more delays.

Interim Release Protocols

Based on the Bathymetry of Ashokan Reservoir, dated November 2018 by USGS in cooperation with DEP, the usable capacities of the East and West Basin at various water elevation is shown below:

Ashokan Reservoir Usable Capacity at Specified Elevations, East and West Basins

East Basin		West Basin	
Elevation (feet above BWS) reservoir datum)	Useable Capacity (billion gallons)	Elevation (feet above BWS) reservoir datum)	Useable Capacity (billion gallons)
587.00	74.339	590.00	41.475
577.00	58.402	580.00	32.012
567.00	44.158	570.00	23.663
557.00	31.603	560.00	16.565
547.00	20.706	550.00	10.700
537.00	11.415	540.00	6.073
527.00	3.874	530.00	2.518
517.00	0.000	520.00	0.000

The usable capacities of the East and West Basins are 74.339 Billion Gallons (BG) and 41.475 BG, respectively. As previously mentioned, the 2020 Christmas Storm produced 17.925 BG, which is approximately 15% of the usable capacity of 115.814 BG of the Ashokan Reservoir. Or, the reservoir would be running at 85% capacity, which is DEP's target Conditional Seasonal Storage Objective (CSSO) from October 14 through March 15. At 85% capacity, the West would be operating at 20 ft below the spillway elevation of 590 ft, and the East Basin would be at 100% capacity. If the crest gates are installed, the West Basin would be operated at approximately 15 feet below 590 ft elevation. This operation protocol will capture nearly all of the flow and turbidity of storms and snow melts to improve the settling of solids and the water quality as the water goes over the weirs. At other times of the year, rainfall and runoff are usually less except during tropical storms, as happen in 2011. DEP will have to release as much water as possible from the West Basin before the significant storms in summer and fall storms without flooding the area around the lower Esopus Creek until the turbidity reaches 25 NTU. At that point, the releases should be from the East Basin until the overflow from the West Basin drops to below 25 NTU. During summer and fall storms, the water is also warmer, which makes it easier to settle out solids. These protocols should be implemented immediately.

Interim Structural and Long-term Improvements

I would suggest the following interim structural improvements:

1. Restoration of all currently designated creek and stream banks before the Spring of 2023 in the Upper Esopus Watershed. Restoration of additional creek banks within two years of being designated.
2. Installation of a minimum 3,000-foot turbidity curtain in the East Basin before the Spring of 2022 to prevent short-circuiting. DEP should determine the exact length to reduce turbidities with its model
3. Operation of the West Basins at 20 feet below its spillway between October 14 and March 15. At this low elevation, the reservoir capacity would be 85%. This protocol should start on October 14, 2021. When a significant storm or tropical storm is predicted, DEP should release as much water as possible from the West Basin without flooding the Lower Esopus Creek. When the turbidity exceeds 25 NTU, water should be released from the East Basin until the turbidity of the overflow from the West Basin drops below 25 NTU.
4. Installation of inflatable crest gates on the weir wall before the spring of 2023.
5. Replacement of the labor-intensive and dangerous stop shutters with steel stop logs and motor-operated hoist with a moveable frame before the Spring of 2024.
6. Installation of submersible pumps at the spillway to continuously provide 15 -25 MGD over the spillway to the Lower Esopus Creek before the summer of 2022. This pumping will provide the community flow, enhance the beauty of the spillway and restore the Lower Esopus Creek.

I would recommend the following long-term improvements be considered and should be completed by 2027:

1. Utilization of the Croton System and Delaware System during high turbidity events in Catskill System. If these systems cannot provide adequate water, implement water conservation measures in the City.
2. Operation of the West Basins at 20 feet below its spillway between October 14 and March 15. At this low elevation, the reservoir capacity would be 85%. When a significant storm or tropical storm is predicted, DEP should release as much water as possible from the West Basin without flooding the Lower Esopus Creek. When the turbidity exceeds 25 NTU, water should be released from the East Basin until the turbidity of the overflow from the West Basin drops below 25 NTU.

3. Installation of submersible pumps at the spillway to continuously provide 50 MGD over the spillway to the Lower Esopus Creek. Environmental studies should determine the actual flow to make the Lower Esopus Creek swimmable and fishable and not impaired.
4. Continue pilot testing and preliminary design for Catskill/Delaware Water Filtration Plant. Consider constructing a plant only for the Catskill System.

I stand ready to work collaboratively with DEC, DOH, and DEP to develop short-term and long-term solutions and address my critical concerns. Please feel free to contact me directly about my concerns and other environmental and engineering issues at 860-895-7211 or PEMalmrose@tighebond.com.

Sincerely,

Paul E Malmrose

Paul Malmrose, PE

cc:
Basil Seggos, Commissioner, Department of Environmental Conservation
Roger Sokol, Director, Bureau of Public Water Supply, NYS Department of Health
Marc Molinaro, Dutchess County Executive
Pat Ryan, Ulster County Executive
NYS Senator Sue Serino (NY-41)
NYS Senator- Michelle Hinchey (NY-46)
NYS Assembly Member Kevin Cahill (NY-103)
NYS Assembly Member Jonathan Jacobson (NY-104)
NYS Assembly Member Kieran Lawlor (NY-105)
NYS Assembly Member Didi Barrett (NY-106)
US Senator Charles Schumer
US Senator Kirsten Gillibrand
US Rep. Sean Patrick Maloney (NY-18)
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