C-43 West Basin Storage Reservoir (WBSR) Water Quality Component (WQC) Siting Evaluation Public Meeting Minutes

April 15, 2021 10:00 AM – 11:30 AM
Webinar

Meeting Welcome

- Kim Fikoski, South Florida Water Management District (SFWMD), stated that she is the Project Manager for the C-43 WBSR WQC. The meeting purpose is to present the Siting Evaluation Update.
- Jennifer Reynolds, SFWMD Director of Ecosystem Restoration and Capital Projects, thanked everyone for joining the meeting today. She thanked the Working Group, sister state agencies, consultants who have been critical in this process, and members of the public who have diligently participated in this process. All are very critical in getting us to where we are today to restore the Everglades, reduce estuary discharges, and ensure that water delivered to the estuaries is clean, which is what this project is about. This is the next step in the process to achieve that goal. She stated that she looks forward to the presentation and your comments.
- Georgia Vince, J-Tech, welcomed everyone to the project update meeting for the C-43 WBSR WQC. She provided information on how to ask questions throughout the presentation using Zoom. She noted that the team is looking forward to the questions and feedback during the meeting.
- Georgia reviewed the meeting agenda and then introduced the Working Group members from SFWMD, Florida Department of Environmental Protection (DEP), Hendry County, Lee County, City of Cape Coral, City of Sanibel, and Lehigh Acres Municipal Services Improvement District. Georgia also introduced the J-Tech consultant team members from Jacobs Engineering, Tetra Tech, and Wetland Solutions.

Project Background

- Georgia stated that in January of 2019, Governor DeSantis signed an executive order to greater the protection of Florida's environment and water quality. It included efforts to reduce harmful algae blooms and a directive to study additional water quality treatment opportunities for water leaving the C-43 WBSR.
- Georgia showed a map of the basin and noted that the C-43 WBSR is located in western Hendry County. The reservoir is currently under construction and has two cells (Cell 1 on the left and Cell 2 on the right) and is 10,000 acres in size. The reservoir will intake and discharge water to and from the Townsend Canal. Generally, the reservoir will be filled and emptied one time a year, storing water

during the wet season and discharging water during the dry season to maintain prescribed flows for the downstream estuary. The reservoir is downstream of the S-78 Ortona Lock structure and upstream of the S-79 Franklin Lock structure. These are also water quality monitoring locations that will be discussed later in the presentation.

- The primary objective of the Phase I Feasibility Study was to identify opportunities to provide additional treatment and improve water quality leaving the C-43 WBSR using alternative technologies with an emphasis on total nitrogen (TN) removal. It is understood that the Caloosahatchee River and Estuary are more at risk from high nitrogen concentrations, rather than phosphorus. During the Study, treatment technologies were evaluated that may be implemented with the reservoir project with the ultimate goal of identifying three alternatives that are compatible with the objectives of the C-43 WBSR project.
- The Feasibility Study evaluated pre-treatment (prior to entering the reservoir), in-reservoir treatment, and post-storage treatment to identify technologies that are cost-effective and technically feasible. Conventional and innovative treatment methods were considered including biological, chemical, and physical water quality treatment technologies. The technologies had to be scalable and available for long-term operation.
- There were some constraints that the Working Group and J-Tech identified at the beginning of the Study. These included that the identified alternatives could not affect the congressionally approved C-43 WBSR project purposes, benefits, infrastructure, construction schedule, or operation, which includes the minimum flow and level (MFL) and water reservations that apply to the operation of the reservoir. Project lands were not specifically identified for the Feasibility Study alternatives. The C-43 WBSR and the selected treatment component(s) are not intended to achieve compliance with the Caloosahatchee River and Estuary Total Maximum Daily Loads (TMDLs)
- The team evaluated 38 water quality treatment technologies that have been commonly used for water quality treatment. Of those 38 technologies, 25 were included in the literature review, which were further reduced to 10 technologies based on performance, compatibility, general land area requirements, residuals, and scalability since the flows leaving the reservoir will generally be 457 cubic feet per second (cfs). Rough order of magnitude costs were developed for the alternatives, which included capital construction costs and operation and maintenance (O&M).
- The final results of the water quality feasibility study, which were presented to the public in December 2020, identified the offline alum treatment system as the most cost-effective, followed by Bold and Gold® media (which is tire crumbs, sand, and clay combination) with a constructed wetland, hybrid wetland treatment technology HWTT (combination of alum and constructed wetland cells), sand filter and Bold and Gold® combination (clean sand is used to filter the water along with

the media), and least cost-effective was the 5,000 acre stormwater treatment area (STA).

- Georgia noted that all Study documents are available at the SFWMD website https://www.sfwmd.gov/content/c43waterqualitystudy.

WQC Siting Evaluation Constraints and Opportunities

- Georgia stated that to further evaluate the top ranked alternatives, Phase II of the Study is the Siting Evaluation of the WQC and it kicked off in December 2020. This evaluation included SFWMD-owned lands as well as lands within the general vicinity of the C-43 WBSR. A detailed routing and siting evaluation was conducted for the four alternatives and full-scale STA. Siting workshops were held with the SFWMD Review Team and Working Group.
- Phase II also includes further water quality analysis, water quality modeling to determine nutrient outflow concentrations leaving the reservoir, and evaluation of an in-reservoir alum application.
- Georgia stated that the first step was a desktop resource characterization that was conducted to determine the compatibility with the proposed WQC. This analysis was completed on March 25, 2021. The siting study evaluated ownership, rights-of-way (ROW), and easements in the area, as well as wetlands, protected species, cultural resources, contaminated sites, soils, land use, and existing water conveyance features. For this evaluation, opportunities are areas that are compatible with the proposed project and are shown on the map in green. Avoidance areas are those conflicts that could be mitigated using certain measures and are shown in yellow. Exclusion areas represent the greatest potential for environmental, social, or economic impacts and are shown in red.
- Georgia presented the opportunities and constraints map. The large red area to the south of the reservoir is the Rodina Planned Development, and the hatched yellow area to the north of the reservoir is a planned unit development. The map also includes the cultural resources and protected species constraints in yellow. Based on the desktop analysis and some site reconnaissance, the areas to the north and northeast of the reservoir are the best opportunities for siting the WQC.
- Around the reservoir, there are some easements and ROW that were considered in the siting. These include the C-43 Canal, State Road 80, North Rim Canal, south agricultural ditch, single family homes between the two SFWMD-owned parcels with about 50 individual homeowners, Banana Branch Canal with a Florida Department of Transportation (FDOT) maintenance ROW and a bridge, Hendry Canal and Murphy Groves, and new Florida Power & Light (FPL) substation and transmission line.
- In summary, it was identified there are limited lands to the north and south of the reservoir due to planned developments. The lands to the east and west of the reservoir are privately-owned agricultural lands. There are conveyance restrictions to the west of the reservoir due to the Townsend Canal and concerns for water loss

during conveyance, which could affect the MFL requirements if water is not sent directly back to the C-43 Canal. For all locations, consultation for protected species will be required. Ultimately, the SFWMD-owned lands provide the best opportunity for siting the WQC.

WQC Water Conveyance for Alternatives

- Shawn Waldeck, J-Tech, stated that that he will be focusing on the WQC alternatives that are located on the SFWMD-owned parcels directly north of the reservoir. The Townsend Canal is the main inflow and outflow from the Caloosahatchee River to the reservoir. Water is pumped from the Townsend Canal into Cell 1 of the reservoir and then into Cell 2. Water is stored within the reservoir before it is released into the perimeter canal system that is controlled by a series of water control structures that cascade water around the reservoir back to the Townsend Canal. Opportunities to connect to the perimeter canal for each alternative for inflow and outflow were evaluated.
- Shawn presented Option 1 that sites the offline alum system on the western-most property that is directly adjacent to the Townsend Canal. This alternative ranked first as most cost-effective. The treatment facility would be located on about 50 acres of the western parcel, and would be adjacent to the FPL substation that is under construction. A direct connection to the perimeter canal can be made to pump water to the WQC and then treated water would be sent through an upgraded canal to the Townsend Canal. There are no additional flow easements needed for construction of this alternative, and it could use the existing discharge point on the North Rim Canal back to the Townsend Canal. In addition, because of the location, flows could be sent for treatment from Cell 1 through the S-470 pump station, as well as from Cell 2.
- Option 2 is for the sand filter and Bold and Gold®, which uses the center parcel that is generally located east of Option 1 and north of Cell 1. The Cell 2 discharges would be connected to this feature but the Cell 1 discharges are too far west. In general, this is acceptable as most of flow will go from Cell 1 to Cell 2 and out of the S-473 pump station. In the event that Cell 2 is empty and there is some water in Cell 1, that water would flow to the perimeter canal and then to the Townsend Canal. This option would pump water from the reservoir perimeter canal into the eastern portion of the parcel for treatment. Flows from the WQC would be discharged via gravity to either the perimeter canal, which would require minimum flow easements, or into the existing North Rim Canal.
- Option 3 would be the HWTT, which uses both the center and western parcels. Water would be pumped from the perimeter canal to the WQC. The WQC would discharge by gravity to the western parcel or there could be an additional intake to the western parcel to use flow from the S-471 pump station to minimize flow easements. Either option would use existing flow conveyances for discharges.
- Option 4a would be the STA and Bold and Gold® WQC and would use the two parcels to the east, which are north of Cell 2. Water would be pumped into both

the STA, which would be the larger parcel to the right, and the Bold and Gold®, which would be on the smaller parcel on the left. Water would need to be pumped over the Banana Branch Canal into the North Rim Canal from the STA, which would have more flow easement requirements. Water would gravity discharge out of the Bold and Gold® component.

- Option 4b is same as Option 4a except that flows from the WQC would discharge by gravity into the existing Banana Branch Canal. The Banana Branch Canal is much lower than the WQC so it could discharge by gravity. Water would be pumped into each component like in Option 4a. This options requires more easements including more conveyance in Banana Branch Canal and upgrades to the bridge at Fort Denaud Road. There may also be a need for improvements to the properties to the north.

First Round of Questions

- Comment: The City of Sanibel Vice Mayor stated that he wanted to go on the record that he appreciates being involved in this process both from a scientific and council standpoint. He understands the importance of the C-43 project, specifically the WQC, and this is shown in the city's legislative priorities. He also supports the Governor's Executive Order 19-12 that gave SFWMD clear direction to add water quality treatment to the reservoir. The city recognizes that this storage component will be part of the answer to water quality issues on the west coast. He appreciates the efforts from SFWMD and looks forward to providing input as the project moves to the conceptual design phase. He noted that SFWMD Governing Board Chairman Chauncey Goss refers to Sanibel/Captiva as the "catcher's mitt" for what is coming out of the river so the city appreciates the work that is going into the reservoir and WQC. The "catcher's mitt" is getting worn and tattered from use and he looks froward to working with the SFWMD on this project. Please continue the good work.

- Q: How will discharge from the WQC go into the Caloosahatchee River. I am struggling with how you are preventing agricultural water supply from pulling treated water. In the report, it looks like you used a pro and con matrix to evaluate separating water. In the final plan, I am still struggling if water is discharged into Townsend Canal, how timing and periods of drought will be addressed.
- A: The conceptual designs are still being developed so we are not sure where the WQC will be discharging. If the discharge is into the Townsend Canal, the WQC will be operated to avoid peak hours when water will be pumped for irrigation. The irrigation pumping will typically be during off-peak hours for FPL rates. The operational plan will be evaluated to address this issue. The focus is on selecting a WQC for treatment to improve water quality leaving the reservoir to the extent possible while still meeting the reservoir purposes, benefits, infrastructure, schedule, and operation. The WQC must have de minimus water loss. This will have to be evaluated in more detail.

- Q: Was there any effort to identify additional lands/willing sellers through the siting evaluation?
- A: We are focusing on SFWMD-owned lands at this time as they are suitable for the sizing of the WQC alternatives. The 5,000-acre STA was not sited for this effort; we only updated the costs.

- Q: In the alum configuration(s), where will the used alum floc be disposed?
- A: The 50-acre alum facility includes disposal areas for a certain duration of operation.

- Q: For Option #1, is there any benefit to expanding the alum pond to take full advantage of the available right-of-way?
- A: 50 acres is what we have proposed to meet the targets. If needed, this area could be expanded.

- Q: For Options 4a and 4b, did the original Feasibility Study contemplate the Bold and Gold® and STA technologies being in series (acting as a treatment train) or as two separate parallel treatment systems? And were the Options 4a and 4b configurations presented here today shown in series or parallel?
- A: They are currently evaluated as parallel treatment trains. More details will be determined during conceptual design.

- Q: Is there a table which shows the estimated costs versus the anticipated nutrient load reduction? Is that in the report or are you still refining those details?
- A: Yes, that table is in the Water Quality Feasibility Study, which is available on the SFWMD website.

WBSR Inflow and Outflow Water Quality

- Marcy Frick, J-Tech, stated that, for the WQC evaluation, J-Tech made a clean pull from DBHYDRO, taking TN, total phosphorus (TP), and total suspended solids (TSS) data from January 1, 2010 through November 16, 2020, which were the most recent data uploaded at the time. The data were cleaned up and organized in Excel workbooks. Statistical evaluations were conducted in Excel, and the Shapiro-Wilk test was used to determine whether the data were normally distributed, based on a recommendation from SFWMD staff.
- Based on the water quality data evaluation, J-Tech recommended using the S-78 monthly median time series as the inflow to the reservoir. S-78 is located upstream of the reservoir and is more representative of the water quality that will be coming into the reservoir. There are several tributaries that contribute to the river between S-78 and Townsend Canal but these are the best data available. The monthly dataset was selected because it best represents the seasonal trends in water

quality. The median was selected because the data are not all normally distributed. In addition, J-Tech recommended using the S-79 monthly median time series as the target for WQC treatment to ensure that the quality of water leaving the WQC will be the same or better than the quality of water in the river.

- Marcy presented the plots showing the TN and TP monthly time series for S-78 and S-79. The gray line is the median values, which are similar to the arithmetic means.
- As part of the Siting Evaluation, the updated monthly median time series for S-79 was used to revise the water quality treatment targets from the Feasibility Study. The targets were updated to help with refining the size of each treatment alternative. The targets were determined using the S-79 median dry season data. The dry season is from November through April. This period had the most conservative values since the TN, TP, and TSS concentrations are low in the river during this time. The dry season is also the time of year when the reservoir will most likely be discharging. The updated targets are 1.23 mg/L for TN, 0.088 mg/L for TP, and 1.5 mg/L for TSS.
- Chris Keller, WSI, stated that he used the water quality time series to create the spreadsheet model. The purpose of creating the spreadsheet model was to help estimate the water quality conditions that the inline alum system and downstream WQC will need to treat. The spreadsheet uses the inflows and outflows from the reservoir 2007 Project Implementation Report (PIR) model with the water quality time series to manage the storage effects of inflows and outflows on water quality. The spreadsheet also includes an option to modify the water quality to represent the inline alum system. The spreadsheet is limited because it is not a mechanistic model and it relies on the 2007 PIR hydrology, including rainfall and evapotranspiration (ET), and reservoir operational rules. It is a mixing type model to evaluate how to achieve the targets using the S-79 data.
- Chris showed a diagram that summarizes the spreadsheet model. The inflows to the spreadsheet are the 2007 PIR flows, which are 41 years of simulated inflows that were coupled with the S-78 median concentration data. For instance, every January day from the 41-year flow period is combined with the median January value for TN, TP, and TSS. Another input is rainfall, and on a 10,000-acre footprint, there is a lot of input which has nutrient loads. The rainfall was estimated using information from the PIR model that was paired with the wet deposition data from S-7. Seepage is zero in the spreadsheet model due to the cutoff wall for the reservoir and the clay layer underneath. There are also ET outflows from the PIR model, which remove water from the reservoir but not any mass of nutrients. The spreadsheet outflows are the 2007 PIR model outflows plus the resulting water quality from mixing and blending within the reservoir.
- Chris showed sample spreadsheet results for TN, TP, and TSS outflow loads and frequency distributions. The blue line shows the spreadsheet model discharge load from the reservoir. The red line shows the load that would be required to meet the dry season median concentrations at S-79. The difference between the two lines, which is the work that needs to be done by the WQC, is the green line. For

example, for TN, 50% of the time the WQC needs to achieve a reduction of 366 pounds per day.

WQC Sizing Analysis

- Chris stated that J-Tech reevaluated the sizing of the alternatives using new data. There were four alternatives from the WQFS: 50-acre offline alum treatment, 600-acre HWTT, 1,000-acre STA with 104-acre parallel Bold and Gold®, and 200-acre sand filter with 104-acre parallel Bold and Gold ®. He noted that they retained the full-scale STA, based on stakeholder input. Chris presented a table from the WQFS with the capital, O&M, and net present value costs for the alternatives. The lowest cost was for the offline alum system.
- As part of the Siting Evaluation, J-Tech updated the sizing of each alternative from the Feasibility Study. For the offline alum treatment, there is no change in size but the amount of alum needed is lower, which reduces costs. The HWTT footprint was reduced from 660 acres to 525 acres. For the STA and Bold and Gold® alternative, the STA size was adjusted from 1,000 acres to 925 acres and the Bold and Gold® size was increased by one-acre to 105 acres. For the sand filter and Bold and Gold® alternative, the sand filter area was reduced from 200 acres to 193 acres to fit on the S-4 parcel and the Bold and Gold® area was increased to 105 acres. The full-scale STA was not modified and would meet the targets.

Second Round of Questions

- Q: Was any water quality sampling done from the runoff coming from the agricultural areas to the south draining to the Townsend Canal and compared to the Caloosahatchee flows to see which one has higher nutrient concentrations and might be better to specifically treat?
- A: There is a sampling station at the Townsend Canal. This station had not been sampled for most of the data period used in this study and was recently restarted in June 2020. Therefore, the S-78 data were the best available for this analysis.

- Q: A recent paper by Rumbold and Doering (2020) found the C-43 basin to be equal or greater source of various constituents to the river. Has any consideration been given to including in the operational schedule a priority of filling the water quality component and reservoir from drainage from the basin rather than the lake? Possibly catching the first flush after heavy rainfall events?
- A: The WQC will take water from the reservoir and the reservoir will receive inflow from the Townsend Canal. During heavy rainfall events, the Townsend Canal does flow with a large discharge. Under those types of conditions, the reservoir pump station would pump as much water as possible prior to those discharges entering the river. The reservoir would take flows from both runoff and lake. If you can share the paper, we will review it and see what can do with it. In addition, as SFWMD works on the watershed protection plan for the Caloosahatchee River and Estuary,

these are some of the things being evaluated. This is not the only project in the basin being considered to improve water quality. SFWMD, with DEP and the Florida Department of Agriculture and Consumer Services, is looking at ways to address the nutrient contribution from the runoff in the basin before it reaches the river with other types of projects.

- Q: There will be large quantities of alum floc generated over the lifetime of the project that cannot be stored in that space. Has consideration been given to where this will be disposed and has that cost been included in the overall model?
- A: The disposal of residuals is an issue with the alum application. There is space onsite, not only within 50 acres for the treatment system, but on other parts of the western parcel to accumulate the solids. The plan is to reuse the solids in the process so that we are not continuing to generate solids. The cost do include the transport and disposal of the solids. Although this is a large quantity and long-term consideration, this system is still very cost-effective.

- Q: TSS was nearly double for alum treatment than the STA. Does that indicate a holding cell is needed after alum treatment, prior to discharge to the canal?
- A: TSS is about 3 mg/L coming out of the alum system instead of about 1.5 mg/L for the STA. This concentration is still within the normal range of TSS values in the river during these time periods. Additional work can be done to evaluate the settling basin size as part of conceptual design.

- Q: With the STA component, is there a capacity limit in respect to TN and TP uptake?
- A: The 5,000-acre STA size was determined based on flow rates, concentrations, and outflow targets. The targets could be achieved in a 5,000-acre STA. The STA can be sized for specific water quality targets and there is not a saturation effect that degrades over time, so the STA does not get filled and result in reduced performance. There is no capacity limit and the wetland can be sized for inflow ranges and targets that would be met over the long-term.

- Q: Will the water quality spreadsheet model be made available to the public.
- A: All documents for this Study will be located on the project webpage.

- Q: Will this presentation be recorded and available for review later? Can you give us the site to look for it?
- A: Yes, the presentation will be made available on the project webpage.

Updated Full-scale STA Cost Estimate

- Georgia stated that J-Tech performed a cost-benefit analysis for the alternatives including a full scale 5,000 acre STA. The updated cost estimate for the 5,000-acre

STA included additional design features as well as land acquisition costs. A full-scale STA would require a 450 cfs pump station to lift water out of the discharge canal and convey the water to the treatment wetland. Conveyance to available lands may cover longer distance than the other technologies, and discharges similar to the other alternatives, would need significant conveyance improvements. Additionally, land acquisition estimated at $10,000 per acre would substantially increase the cost of this alternative.

- In addition to land costs, STA efficiency is limited for treating dissolved organic nitrogen, the target nutrient in this region. If the STA was sited within the vicinity of the reservoir significant regrading of the land to create uniform and level cells would be needed. The updated cost estimate with contingency and 50 years of O&M is approximately $300 million, making it the highest cost alternative. There are also socioeconomic concerns related to encumbering large areas of land. Therefore, the full-scale STA will not move forward to conceptual design.
- The remaining four alternatives will be moved to conceptual design and a detailed cost-benefit analysis will be performed.

Inline Alum Treatment Update

- Jim Bays, J-Tech, stated that during the Feasibility Study, there was interest in including an inline alum treatment system to help control algal blooms within the reservoir but not to achieve the targets for the WQC.
- J-Tech conducted a literature review that covers a range of experience in Florida, including interviews with St. Johns River Water Management District staff who have used alum in their projects for 20 years. The studies all show the effectiveness of alum in controlling algae. The range of nutrient reductions are 20–40% for TN and 60–90% for TP. None of the studies identified a toxic response or concern, and the studies have documented a change in the benthic communities over time due to sediment quality changes. The literature did not document any impacts on the reservoir materials and components from the alum. In comparison studies that SFWMD performed, which will be discussed later, had similar removal efficiencies for different types of alum. The conclusion is that alum should be a reasonable approach to controlling algae in the reservoir.
- The inline alum system was modeled to determine the alum dosing and nutrient removal. Jim presented plots summarizing the TN reductions from about 1.6 mg/L to about 1.2 mg/L, and TP reductions from about 0.15 mg/L to less than 0.08 mg/L. All of the inorganic nitrogen would be removed and there would be some reduction in organic nitrogen. The dose would be small compared to other applications because we can rely on the storage time in the reservoir to complete the reactions. An alum dose of 0.6 mg/L would be needed at a flow rate of 6.8 gpm.
- The application of alum would result in residuals that would settle in the reservoir. When you apply the mass to the overall surface area of the reservoir, the accumulation is estimated to be about 1/8 inch per year in Cell 1 and about half that in Cell 2. These accumulation rates are similar to what has been seen in natural

lakes in Florida so this is within a natural range. The time for settling is about 30 days and to stabilize is about 60–90 days. Over the course of 100 years, that accumulation is about one foot. Long-term fate of alum is crystallization in the sediments. Jim noted that J-Tech is now looking at a more detailed design of the alum system, which will include modeling to get more detailed information on the settling in the reservoir.

- Jim showed a map of the reservoir pump station and the conceptual placement of the alum system and storage. The alum storage tank farm would include five alum tanks with total storage of about 70,000 gallons. The tanks would be kept in a containment wall. Alum would be sent through a metering system, where it would be diluted and then injected into the reservoir intake bay. Mixing that will occur through the pump station and pipeline will be sufficient to adequately mix the alum. Alum would then discharge into Cell 1 and would continue to react and settle. The location of the alum system is intended to provide accessibly and maintenance of the site since it would be located adjacent to the existing operations for the pump station.
- The construction cost for the inline alum system is $3.5–$6.5 million. O&M costs are estimated between $400,000 and $700,000/year. This range depends on the amount of alum used and the current cost, operational maintenance, mechanical replacement, as well as monitoring costs for water quality coming into the reservoir and within the reservoir. The net present value over 50 years is estimated between $30 million and $46 million, which would include significant and periodic replacement of mechanical components. The inline alum system is entering a final detailed design phase to expand this concept.

Next Steps

- Georgia stated the SFWMD initiated a pilot study to further evaluate two technologies that were included in the Feasibility Study final recommendations: Bold and Gold® and alum. The purpose is to look at the performance of these technologies for nutrient removal specific to the water quality in the C-43 Canal. The Bold and Gold® study is evaluating both low flow and high flow rates, and the results are comparable at about 30% removal for TN.
- Alum was tested as a rate of 12–14 mg/L, which is higher than our proposed rate of 0.6 mg/L. The results showed 43%–51% TN removal. The pilot study evaluated changes in pH from the alum application, which was determined to have a manageable effect. The alum used in the pilot study is the same type of alum being proposed for the WQC alternatives and the inline system. This type of alum is more effective for nutrient removal than other forms of alum.
- Georgia provided a summary of what was discussed during the meeting. The Siting Evaluation report has been completed and is available on the SFWMD website. The results show that the SFWMD-owned lands are the best location for siting the WQC, once it is selected. So far, the study has evaluated the water conveyance opportunities, updated water quality targets for the WQC, and adjusted the sizing

of some of the alternatives to meet the target. The full-scale STA will not proceed to conceptual design due to cost implications. In addition, an in-line alum project to control nutrients within the reservoir during storage is moving forward to design.

- Georgia reviewed the next steps in the project. The in-line alum design kick-off is scheduled for April 19. The draft conceptual design submittal is due April 30 for SFWMD comment and review. The final conceptual design submittal is due July 1. The WQC selection memo is due August 20, which will be followed by a final public meeting in September to provide an update on the WQC selection. The selected WQC Plan, if funded, will move forward to detailed design under a separate contract. The goal is for project construction to be completed and operating concurrently with full operation of the reservoir.

Third Round of Questions

- Q: Has anyone raised concerns about using alum sulfate over alum chlorohydrate? Such as accumulation in sludge (e.g., if bottom waters go hypoxic), generating hydrogen sulfide. What is sulfate's role in methylation of mercury?
- A: The addition of sulfate to the system has been discussed, and the sulfate does not stay with the alum and does not accumulate in the sediments where it can be reduced. It is just washed out with the water column. Alum is only adding very small amounts of sulfate to the overall water volume. Specifically, alum, when added to water, converts to aluminum hydroxide, and that is what is settling in the sediments. We have not seen issues in other lake-scale applications.

- Q: Have issues with the potential for aluminum and sulfate export been evaluated? Aluminum becomes toxic in low pH conditions, which I do not think we have here. In the report, there was discussion of the Sumo model. My understanding of alum application is that efficiency relies on alkalinity and pH. The alkalinity at S-78 is relatively high/normal although there is a fluctuation. Is there any additional analysis to test sensitivity to alkalinity for both TN and TP in that model?
- A: We have considered the pH issue and it is known that alum will lower the pH if the water is not buffered naturally. The benefit here is that there is sufficient alkalinity to balance the alum. The pH drop looks to be very nominal, if it occurs at all, based on the model results. The results from the SFWMD jar tests from the pilot study showed a drop of a couple of tenths in pH. The Sumo model looks at all the pertinent cations and anions to evaluate multiple reactions in the model. As we approach the detailed design, we will confirm the model and dosing and that information will be conveyed in the final report.

- Q: I was wondering if you could site the alum technology to reduce nitrogen other sources. We have a big problem in the North IRL with the wastewater treatment plants (WWTPs), which are not taking TN out of the effluent. Can alum be used at the WWTPs? Are there other places where this technology has been used?

- A: TN reduction for the C-43 WBSR is being expected to occur through coagulation and settling of soluble phosphorus particles, which are the main driver of algae production. Coagulation of TN occurs from larger particles or organic forms. If this is the case for your example, alum could result in some TN reductions although they would be less than the TP reductions. There probably is some potential but it would require a pilot study.
- Q: The reason for my question is that TN drives red tide on the west coast and brown tide in the IRL. I hope we are paying attention to TN, which is causing the problems.
- A: In the WQC analysis, TN removal is the key factor. Our target is for nutrients to be the same or better than what is occurring in the river.

- Q: Can you put the project webpage up so we can write it down, please?
- A: The project webpage is https://www.sfwmd.gov/content/c43waterqualitystudy.

Wrap Up

- Kim thanked J-Tech for their work on evaluating conventional and innovative technologies to add to our toolbox for this area. She thanked the Working Group members for their dedication and collaboration. She also thanked the public for their feedback and engagement. She noted that she looks forward to presenting the WQC conceptual design at the next public meeting. The project webpage includes all the Feasibility Study and Siting Evaluation information. If anyone needs additional information, they can contact Kim at kfikoski@sfwmd.gov.