
**CITY OF NEW BRUNSWICK
COMPREHENSIVE TECHNICAL ASSISTANCE (CTA)
MONTHLY PROGRESS REPORT**

TO: FRANK J. MARASCIA
FROM: HOWARD J. WOODS, JR., P.E.
SUBJECT: MONTHLY REPORT FOR APRIL 2014
FINAL CTA PROGRESS REPORT
DATE: MAY 15, 2014

I. PERFORMANCE LIMITING FACTORS DEFINED IN THE COMPREHENSIVE PERFORMANCE EVALUATION

A. ADMINISTRATION – POLICIES ADMINISTRATION (A)

1. Adopt Plant Performance Goals

During the month of April, gravity filters No.1 through No. 4 remained in service and performance for the month was strong and within the newly determined operating goals for the plant. As a result of heavy rains at the end of the month, the plant operators shifted load to the membranes as settled water turbidity began to increase. As a result of a failure of the New Jersey Water Supply Authority's D&R Canal, raw water pumping was shifted entirely to Weston's Mill. The plant is continuing to use Weston's Mill, allowing an opportunity for the City to make repairs to the raw water main leading from the Canal Pump Station. Temporary repairs to the Canal have been made by the Authority and the City can return to this supply after the City completes its raw water main repairs.

At the conclusion of the Comprehensive Performance Evaluation, the plant adopted a settled water turbidity goal of 1.0 NTU. While this goal can be met most of the time, operations through the winter months and following severe storm events demonstrate that occasional changes in raw water quality can result in higher settled water turbidity. Plant operating guidelines have been developed to shift production from the gravity filters to the membrane filters under such abnormal conditions. While this results in increase treatment expense, it provides greater assurance that plant output water quality can be maintained at the highest levels. When raw water quality improves to normal conditions, the operating guideline allows gravity filtration to increase to normal output levels. This reduced wear and tear on the membranes, which extends the life of the membranes and reduces ongoing operating expense.

As a result of the City's recent experience treating water solely from Weston's Mill, new procedures have been developed to supplement SCM readings with more aggressive pH monitoring and jar testing. Water from both Weston's Mill and the D&R Canal contains color and this increases following storm events. The City has determined that this can be addressed by increasing the coagulant dose, which lowers the pH of the water in the coagulation and sedimentation process. This enhances the removal of fine colloidal material and improves filtration in poor raw water quality

conditions. When this form of enhanced coagulation is practiced, the settled water turbidity goal can be met even under more challenging raw water quality conditions.

The adoption of plant performance goals that are more stringent than the water quality requirements of the Safe Drinking Water Act Regulations resolves the issue raised in the CPE report. This provides a sufficient factor of safety between day-to-day performance and the maximum compliance limits specified in the regulations. Senior plant operations staff have also demonstrated the ability to properly diagnose changing treatment conditions – including the loss of the City’s primary source of supply – and develop operating procedures needed to ensure water quality. The development of written operating procedures will continue to be an ongoing activity following the conclusion of the CTA.

2. *Outdated or Inadequate Continuous Monitoring Equipment*

Since the issues with plant performance were first identified in 2013, the City has installed new turbidimeters on all eight gravity filters, installed a streaming current monitor to provide improved control of the coagulation process, installed a new continuous chlorine residual analyzer near the high service pumps, and installed an additional chlorine residual analyzer and a redundant chlorine feed line at the head of the chlorine contact basin.

Poor weather conditions in March caused the installation of new loss-of-head gages to be rescheduled for April. Additional issues with the materials supplied to the City for this installation have caused further delays.

A new SCADA system is being installed and parallel operations of the old and new SCADA system will begin. Parallel operations will be maintained until the new SCADA system is fully commissioned and at that point, the old SCADA system will be retired.

3. *Delayed Maintenance*

The City has restructured the water treatment plant staff and designated an employee to be responsible for all maintenance planning. “Maintenance Connection” has been acquired and is being used to develop a programmed and preventative maintenance system. The “Maintenance Connection” database of equipment and systems at the plant is being populated. Once sufficient data has been input, work order requirement data will be added to the system. This is necessary to allow the system to schedule and track both programmed and reactive maintenance activities. The plant staff have established a target for programmed and reactive work orders. They are targeting the completion of 80% of all work orders on a programmed basis and 20% on a reactive basis. After some experience is gained at this level, the targets will be reviewed and modified as needed to optimize the work management system. The development and use of programmed and preventative maintenance procedures addresses the concern raised in the CPE report. The implementation of “Maintenance Connection” will be an ongoing activity.

4. *Lack of Safety Equipment*

The City requested a survey of the plant by P-OSHA. An inspection was completed and the recommendations have been implemented. Appropriate personal safety equipment has been acquired and the operators have been trained in the use of the equipment when conducting maintenance and operating activities.

B. SUPERVISION – ADMINISTRATION (A)

These organizational changes put in place through early December resolve the organizational issues identified in the CPE report.

C. WATER TREATMENT UNDERSTANDING – OPERATIONS (A)

In-service training of the plant operations and maintenance staff is now being performed by the newly installed operations staff management team. This will be an ongoing activity.

D. DATA INTEGRITY – OPERATIONS (B)

The installation of a new SCADA system is in progress. The grab sampling routine in the plant has been completely reviewed and revised. In addition, the operator log sheets have been reviewed and updated. The use of the new log sheets will be coordinated with the commissioning of the new SCADA system.

E. OPERATING GUIDELINES – OPERATIONS (B)

A template for the plant operating guidelines has been developed. Since the start of the CTA, the plant operations staff has been developing operating criteria and objectives for various elements of the plant. For example, guidelines for the duration of filter runs and IFE turbidity breakthrough have been established. As the guidelines are proven by several months of operating experience, they will be committed to paper in the form of a written series of Standard Operating Procedures. The operations staff recognizes that the development and use of operating procedures will be an ongoing activity designed to continuously improve plant performance.

F. MAINTENANCE – MAINTENANCE (B)

The City purchased and installed replacement membranes as needed to address membranes that could not meet appropriate pressure criteria. This work is complete.

All filtered water effluent valves have now been replaced. The old and unused surface wash sweeps have been removed from the filter boxes. A plan is being developed to replace the filter-to-waste, influent, backwash and drain line valves and the older valve actuators that remain in service. The replacement of additional valves and actuators and the replacement of media in all eight filters will be prioritized and addressed in the City's next update to its water system Master Plan.

The gravity filters were completely renovated in 2002. Detailed filter inspections demonstrate that the existing filter media is adequate and close to the original installation specification. Prioritization of the media replacement will be addressed in the Master Plan update and scheduled when needed.

G. REPRESENTATIVE SAMPLING – OPERATIONS (B)

A new CFE turbidity monitoring location will be created to provide a more representative CFE result for the plant that does not rely on a clearwell level sample pump. The potential locations for a relocated gravity-filter-only CFE monitoring point are impacted by turbulent flow containing entrained air. As a result, reliable turbidity measurements from these locations would not be possible. A plant level CFE monitoring point near the high service pumps may be possible and this will be evaluated. Because of issues related to the loss of prime of the sampling pump at the existing

combined CFE monitoring point, this sampling location will be eliminated once a suitable alternative is identified.

ATI probe-type turbidimeters will be installed at the outlets to the two sedimentation basins. The devices have been received on site. The purpose of these two monitoring points is to give the operators real-time knowledge of the quality of the effluent leaving each individual sedimentation basin prior to the addition of lime. This will provide better operational control of the sedimentation process. The current monitoring point will continue to provide data that reflects the turbidity of the combined settled water after lime addition and prior to filtration.

A sample pump and pH probe will be installed to link pH to the operation of the streaming current monitor to provide better control of the coagulation process. The pH probe has been received on site.

H. COMPENSATION – ADMINISTRATION (B)

The Utility Director has developed a modified compensation plan and submitted this plan to the City Business Administrator. Once the plan is finalized, it will be incorporated into the City's annual operating budget. A pilot proposal for training and licensing incentives is currently being developed by the Utility Director.

II. ADDITIONAL ISSUES DEFINED DURING THE CTA

A. LIME ADDITION RELIABILITY

During the CTA, reliability issues associated with the lime feeders have been identified. Lime addition will be continued for the foreseeable future. Programmed and preventative maintenance will address the reliability issues normally found with lime addition. The Master Plan update will provide a detailed evaluation of potential alternatives to lime addition. No further attention to this issue is needed in the CTA.

B. POTASSIUM PERMANGANATE FEED

Inspections of various elements of the plant show some evidence of manganese staining. The gravity filter inspections show that manganese has deposited on the media. The presence of a manganese coating on the media is likely helping to remove manganese in the treatment process and this would serve to reduce the potential for customer complaints. The potassium permanganate feed at the intake is being restored.

III. CLOSING SUMMARY & RECOMMENDATIONS

Each of the issues raised in the CPE have been addressed in the CTA. With the exception of the completion of the installation of new loss-of-head gages, there are no elements of the CTA scope of work remaining to be addressed. Normal operations of a surface water treatment plant require ongoing attention to the issues raised in the CPE and addressed in the CTA. The City is positioned to address these matters in a way that will result in continuous improvement to the systems, staffing and procedures used at the Comstock Street Water Treatment Plant.

During the course of the CTA, some issues were identified that were beyond the scope of either the CPE or the CTA. For example, some process elements in the plant are reaching the end of their normal, expected useful life. The gravity filter media is now roughly 12 years old and should be replaced in the next few years. The sedimentation basins and flocculators will require normal

structural repairs to remain in safe operation; however, these elements of the plant are based on old technologies. A complete replacement with more modern systems that are both more effective treatment units and more easily maintained should be considered as an alternate to major capital repairs. These normal capital repairs and replacements need to be prioritized and scheduled.

The City has directed its engineer to develop an updated Master Plan focusing first on source of supply and water treatment needs. This is an important undertaking and will provide a solid foundation for future decisions that will need to be made by the City. The Master Plan update should define an overarching treatment strategy for this facility that addresses both current and anticipated water quality regulations. The Safe Drinking Water Act regulations adopted by the US Environmental Protection Agency and the New Jersey Department of Environmental Protection continue to grow in complexity, as they have over the last decade, and these changing requirements can best be evaluated in the context of the Master Plan update. In addition, the Master Plan update is an opportunity to identify the least costly means of producing high quality drinking water in a safe and reliable way. The Master Plan update is a way to make sure that residents of New Brunswick continue to pay a fair and reasonable rate for water service. This update is a top priority.

Additional studies concerning the chemical treatment of water at the Comstock Water Treatment Plant should be undertaken and incorporated into the Master Plan update. Issues identified in the CTA that will require further evaluation are pH control through the coagulation and sedimentation processes, manganese control and removal, the use of alternative coagulants, and the potential use of compounds to improve gravity filtration while avoiding fouling of the membrane filters.

Regardless of the recommendations of the Master Plan update, the City should consider a further modification to its organizational structure to include a qualified laboratory technician at the water treatment plant. While the current operations staff are qualified to run basic water quality tests, additional support for the operators is warranted. Throughout the CTA, evidence of sometimes rapidly changing raw water quality conditions was apparent. Some of these changes are weather driven, some are man-made and result from complex and highly developed watersheds, but none of these changes can be controlled by the City or its staff. In short, the sources of water available to the City are technically challenging sources to treat. As a result, the City must be prepared to evaluate source conditions on the spot and make appropriate treatment decisions based on what is known at any given point in time. While members of the existing staff are capable of doing this, these are the same people charged with the task of implementing, monitoring and modifying treatment and operations from minute to minute and hour to hour at the plant. Additional support from a qualified individual who could be tasked with sampling and analytical work is justified.