JACOBS

Memorandum

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Subject	**Operations Study/Recommendations – Rev. 2**
Project Name	Wastewater Treatment Plant Operation and Facility Study, City of Northfield, MN
Attention	Dave Bennett, Public Works Director
From	John Borghesi, Jim Borton, and Steve Waters
Date	April 22, 2020
Copies to	Justin Wagner, Utilities Manager

1. Background/Scope

The City of Northfield requested that Jacobs conduct an operations and maintenance (O&M) evaluation to review the following categories within the wastewater treatment plant (WWTP):

- Management/Staffing
- Process Control and Regulatory Compliance
- Maintenance Practices/Computerized Maintenance Management System (CMMS)/Condition Assessments

The City requested this report in response to several incidents that have taken place at the WWTP so that similar issues are not repeated and to identify other operational risks may be detected within the facility. Recent staff turnover further prompted City managers to be concerned about the possibility that the incidents could have been prevented with more staff on hand or staff with higher levels of experience. This has created a desire to determine if the WWTP is staffed according to industry standards.

Incidents in question prompting the review included a fire in the biosolids handling facility, flooding of the pump room because of pipe failure, flooding of the scum/solids wet well because of an inadvertent repositioning of the scum trough during normal operations, and flooding of the Biological Aerated Filter (BAF) building basement due to a pipe plug failure.

The ultimate purpose of the evaluation was to determine the overall status of the utility as it relates to industry standards and to provide insight for potential improvements to the WWTP's O&M. This included a review of management practices, staffing levels, process control methods, plant design, maintenance practices, current operating conditions, and compliance with applicable standards. This report serves as an interim update that will allow the City to proceed with implementation of new procedures and practices immediately. A review of asset conditions was completed in December and a draft report on this is pending. This will be completed prior to the end of January, at which time a draft report will be issued with recommendations for improvements in managing the City's wastewater assets.

The observations and recommendations in this technical memorandum are the result of onsite interviews and a review of plant information from October 15 to 17, 2019. The evaluation team consisted of John Borghesi, Project Manager; Jim Borton, Director of Operations Consulting; and Steve Waters, Principal Wastewater Engineer.

2. Operations Review

2.1 Facility

The Northfield WWTP is a 5.2-million-gallon-per-day (mgd) design facility employing an influent pump station consisting of three variable frequency drive (VFD) 86.25-horsepower (hp) dry pit submersible pumps (two older Fairbanks Morse, one new Flygt; see Figure 1) that pump from the wet well to the influent screening process. Influent screening is accomplished by one of two Lakeside rotating drum screen systems and followed by a Pista-Grit grit removal system. Grit and screenings are sent to a dumpster for disposal in a sanitary landfill. Following preliminary treatment, wastewater is dosed with ferric chloride and polymer, and mixed to enhance settling in one of two primary clarifiers (one is normally online). Scum and sludge produced from the primary clarifiers is removed to the solids treatment process.

Figure 1. Left: Two Fairbanks Morse (Tan), New Flygt (Gray) Pumps. Right: Rotary Screens.

The preliminary/primary treatment building is maintained under negative pressure to capture odors and remove corrosive gases (i.e., hydrogen sulfide). The foul air is sent to a wet odor scrubber system where sodium hypochlorite is used to oxidize odors before the air is vented to the atmosphere. Blowdown wastewater is dechlorinated with sodium bisulfate before being recycled into the treatment plant. Mixers and clarifiers are shown on Figure 2.

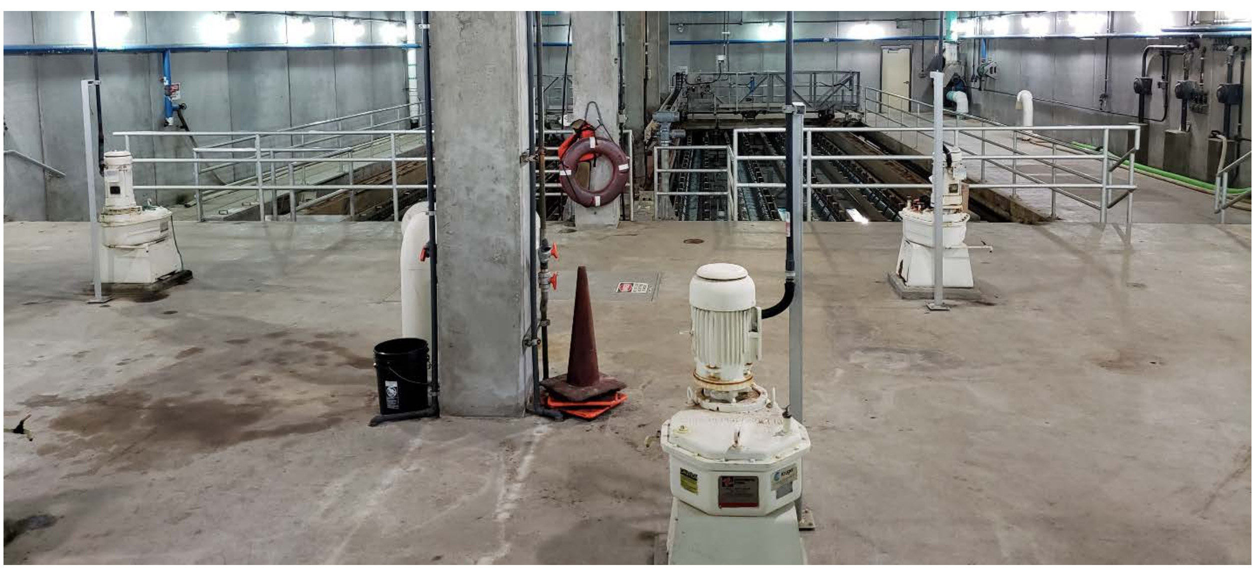

Figure 2. Foreground, flash mix and flocculator mixers. Background, primary clarifiers.

After primary settling, wastewater is pumped to 1 of 10 BIOSTYR treatment system cells arranged in five cells per side grouping. BIOSTYR is a process that uses a proprietary styrene based media, air, and bacteria to treat organic constituents (i.e., biochemical oxygen demand or BOD) in the wastewater. The styrene media provide a place for bacteria to grow and affix itself, allowing for the BOD removal. The styrene serves as a filtration media to capture any solids in the waste stream. Cells are rotated online and offline to facilitate reaction time with wastewater and allow the backwash cycle to remove excess solids captured during treatment. Backwash solids are returned to the primary clarifier influent. The process also removes ammonia as Northfield's NPDES permit includes ammonia discharge limits from April through November and monitoring requirements from December through March. The blower room and a BIOSTYR cell is shown on Figure 3.

Figure 3. Left: Blower Room. Right: Top of BIOSTYR Cells with Treated Wastewater on Surface.

Air supplied to the BIOSTYR process comes from eleven 50-hp positive displacement blowers. Blowers are either on or off; no VFD control is provided for these units. Each blower is valved to a BIOSTYR cell with one backup blower unit for all blowers. Blowers were recently replaced as part of the ongoing capital improvements program discussed in Section 2.4.

Treated water then flows to the ultraviolet (UV) disinfection process prior to discharge to the Cannon River. This process allows the facility to meet its fecal coliform limit to comply with the NPDES permit. The UV system, shown on Figure 4, was recently updated as part of the capital improvements program.

Figure 4. Left: UV Controls. Right: UV Light in Water.

Solids removed from the primary clarifier are sent to the solids treatment process (see Figure 5). Currently, a temporary Schwing Bioset unit is in place for solids handling. Solids are pumped to an existing decommissioned clarifier. The clarifier is used for solids flow equalization before solids undergo the Bioset process.

Figure 5. Left: Solids Storage in Decommissioned Clarifier. Right: Temporary Dewatering, Lime Addition, and Reactor.

Solids from the clarifier flow are pumped to the Bioset dewatering process where excess water is removed. Solids then move to the lime addition and mixing portion of the process. Solids are stabilized within a reactor vessel and then conveyed to a truck for transport to a location for land application or to an onsite storage facility prior to future land application (weather dependent). The dewatering process and lime addition/reactor process are not operated in a fully automatic mode and are not connected to the plant supervisory control and data acquisition (SCADA) system; therefore, these processes require constant operator attention.

Once the new permanent unit is brought online, solids will go to an aerated holding tank and will then be pumped to a larger capacity Bioset unit. At current loadings, the temporary unit needs to be operated 60 hours per week to keep up with solids production, while the permanent unit, expected in spring 2020, will only need to be operated 18 hours per week. Figure 6 shows a newly installed screw press and the solids dewatering room.

Figure 6. Left: Newly Installed Screw Press for Solids Dewatering. Right: Newly Renovated (Still in Process) Solids Dewatering Room.

Most of the plant (except the temporary Bioset process) is connected to the plantwide SCADA system, which allows the monitoring and, in most cases, control of the processes remotely. The SCADA system has a dial-out capability, so that alarms can be reported to programmed phone numbers to inform operations personnel of any alarm or out-of-specification condition. Not all conditions within the plant are covered by SCADA; however, important, critical alarms are included and are typical of a WWTP this size. As SCADA is updated, increased capabilities are inherent to new systems that would allow monitoring of additional conditions and parameters, even remote operation of the system. Monitoring of 100 percent of all plant parameters is not cost effective and can be balanced out with determining critical failure paths and monitoring conditions along that pathway.

The facility is covered by a standby diesel generator capable of full load operation of the facility within a few seconds of power loss. The generator contains automatic switch gear that allows the plant to go onto and off generator power in the event of an outage and an automatic paralleled transfer back to utility once external power is restored.

The plant has an onsite laboratory, which is used only for two NPDES reportable parameters: pH and dissolved oxygen. The remainder of the required compliance sampling is contracted out to a certified laboratory. The plant laboratory has the capability to test all process control parameters necessary to optimize the facility, including a Hach 3900 Spectrophotometer that can test many parameters. In addition, a jar testing unit is onsite and can be used to optimize polymer and coagulant dosing. Unfortunately, due to staffing limitations Northfield staff admit that there is insufficient time to utilize the on-site equipment for optimization testing and only absolutely required NPDES testing is completed on-site. Test equipment is shown on Figure 7.

Figure 7. Left: Hach DR3900 Spectrophotometer. Right: Lab Bench with Jar Testing Apparatus under Cover.

2.2 Staffing

The Northfield Utilities Department is split into two primary divisions: Utilities, which includes 5 drinking water wells with chemical feed, 96 miles of water distribution mains, 80 miles of wastewater collection lines, and 56 miles of stormwater lines; and Wastewater, which is responsible for the O&M of the WWTP. The current, basic organization showing headcounts is provided on Figure 8.

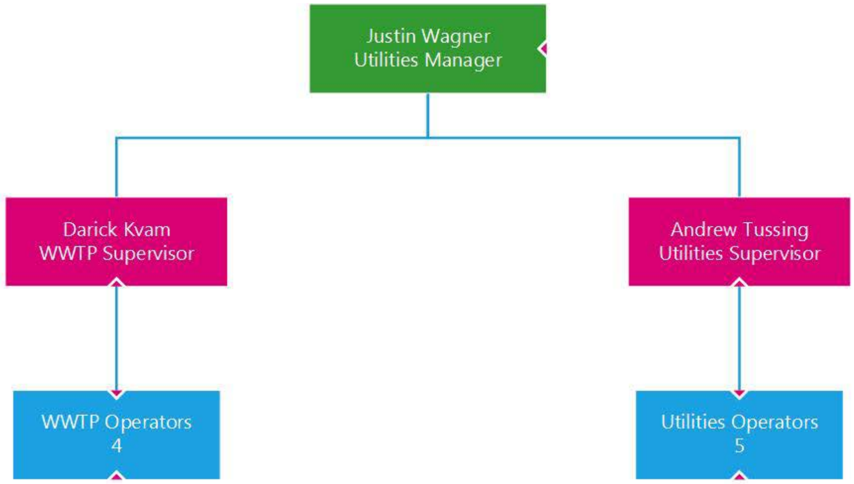

Figure 8. Organizational Chart

While the WWTP treats wastewater 24 hours per day/7 days a week, it is currently staffed Monday through Friday, 5:00 a.m. to 5:00 p.m. to man the temporary biosolids process. However, upon the completion of the biosolids upgrades the City can revisit this situation. Depending on the season, needs of the facility and/or management preference, several options are available. Industry standards vary on what is the most appropriate methodology for staffing a plant that can operate in an unstaffed condition. One option is to continue Monday through Friday, 5:00 a.m. to 5:00 p.m. with 8 hours per day/employee coverage (i.e. some staff are 5:00 a.m. to 1:30 p.m. and others are 8:30 a.m.-5:00 p.m.). This spreads out the available staff to provide 12 hours of on-site coverage with approximately 3-4 hours of overlap to accomplish tasks that require additional staffing.

A second option is to maximize staffing on-site during shifts by reducing hours that staff are on site for coverage (i.e. all staff are Monday through Friday, 8:00 a.m. to 4:30 p.m. - times are provided for illustration only) and relying more on SCADA systems. In both options, coverage is provided by an on-call team member who is required to visit the plant Saturdays, Sundays, and holidays to check in on the process and do a set of operational rounds. Operational rounds involve a review of all settings and gauge/meter readings. Rounds require a look at mechanical equipment to ensure proper operating temperatures and lack of vibration, and to note abnormal behavior, etc. These readings are captured on a paper form and then later entered into the plant data management system for tracking purposes. The on-call staff member is also responsible for accepting alarm calls from the plant dialer system.

Both options provide for 40 hours per week per employee plus any hours earned for coverage work on weekends and holidays. Both options have advantages and disadvantages with the preferred schedule being dictated by the community's needs, collective bargaining agreements and management preference. If considerable call ins are noticed, for example, from excessive alarms requiring operator intervention, extended on-site coverage may be needed until the condition(s) causing the alarms can be corrected.

Plants of Northfield's size are generally not staffed more than 12 hours per day, and most are between 8 to 10 hours per day with operational checks on weekends and holidays. In general, the work load is created by the system components such as the processes utilized, age of equipment, permit limitations, regulatory requirements (i.e. some regulators require x hours of staffing/day) and utility resources.

Currently, one supervisor and four operators are onsite and all O&M duties are divided among the four staff. The plant supervisor typically handles process decision-making, data management activities, including filling out permit-required reports and coordinating contract laboratory data. Operators conduct rounds, take care of preventative and reactive maintenance, and monitor and adjust process parameters, especially the current temporary biosolids process.

Staff members, by industry standards, are inexperienced. Except for one staff member with approximately 30 years of experience, the most experienced staff member at the plant has only 2 years of experience. The utility industry has been in an industry-wide changeover of employees of late because many treatment facilities expanded or were built for the first time in the late 1980s; employees from that era are retiring nationwide, taking significant institutional knowledge with them. Their retirement has created a “brain drain” in industry circles. Northfield also lost two staff members who pursued an opportunity in another town. With a smaller number of staff, the staffing gap is more apparent. Loss of two staff members in Northfield equates to approximately 50 percent of the workforce.

Table 1 presents a comparison of Northfield’s staff levels to both nearby and nationwide comparably sized wastewater treatment plant staffing levels.

Table 1. Staffing Comparisons

Municipality	Design Flow (mgd)	Average Flow (mgd)	Total No. Staff Onsite, Full Time	Manager/ Supervisors on-site Full Time	Comments
Northfield, MN	5.2	2.5	4	1.5	BAF process, solids dewatering and stabilization, UV disinfection, three significant industrial users
Faribault, MN	7	4.5	4	2	Roughing filters/activated sludge process, five significant industrial users
New Prague, MN	1.83	0.75	3	1	BAF process, use part-time help from Street Department for biosolids hauling
Red Wing, MN	4.0	2.5	5	1	City manages two WWTPs with staff listed; Trickling filter municipal plant, physical/chemical and solids dewatering industrial plant pretreatment by another department
Delphos, OH	3.83	1.5	4	1.5	Membrane treatment WWTP with ATAD solids digestion, solids dewatering
Duncan, OK	4.5	N/P	5	1	Trickling Filters/Activated sludge, solids drying beds. Staff includes Lab, IPP and Manager
Pampa, TX	3.0	N/P	3.5	1	Oxidation ditch, solids dewatering.
Stephenville, TX	3.0	N/P	3	1	Oxidation ditch, solids dewatering, chlorination/dechlorination
Mercedes, TX	5.0	N/P	4.5	1	Oxidation ditch, dewatering and drying beds, UV disinfection
Berryville, AR	2.4	N/P	3.5	1	Activated sludge, solids dewatering, UV disinfection
Westerly, RI	3.3	N/P	5	1	IFAS, solids thickening/dewatering, chlorination/dichlorination. Staff include one FTE for Lab/IPP
Carol Stream, IL	6.0	N/P	5	2	Activated sludge, solids thickening/dewatering, chlorination/dichlorination. Staff includes one FTE for Lab/IPP

Note:

BAF = biological aerated filter

ATAD = Autothermal Thermophilic Aerobic Digestion

N/P = Not Provided

IPP = Industrial Pretreatment Program

IFAS = Integrated Fixed Film Activated Sludge

As can be seen in Table 1, staffing at the facility is within an expected range for the size and type of facility operated, but clearly on the lower end. Other considerations for staffing should include the potential to develop bench strength within the utility, the maturity of various programs (such as predictive/preventative maintenance or the newly delegated industrial pre-treatment programs), and the effort required to establish and maintain such programs in their infancy. Not considered in Table 1 is the complexity of the processes, current loads, age and condition of equipment, regulatory requirements beyond basic permit compliance, and functionality of plant automation.

From a facility and Utility-wide management structure, the City's current set up is an effective arrangement that can be enhanced via staff sharing and cross training. Cities that are similar in size to Northfield continue to struggle with staffing and keeping enough experienced staff available. By maintaining a common Utility Manager over both wastewater treatment and water/distribution/collection utilities, with an Assistant (or Supervisor) for each utility, Northfield can reduce the amount of management staff as compared to a Manager/Assistant Manager arrangement for each utility. This provides budget savings that can be allocated to front line operations staff or a reduction in operating costs. Other advantages in letting Supervisors assist the opposite side of the utility when appropriate include 1) developing bench strength to help fill temporary supervision vacancies due to injury, illness or retirement, and 2) providing for a succession plan for the Utility Manager role.

For the current management structure to be most effective, consistent and regular communication between the Manager and Supervisors, as well as the sharing of occasional duties, is necessary. Sharing of duties can come from providing coverage for on-call rotations, assisting at the counterpart's facility when extra hands are needed for a task or during an absence. Ideally, cross training would include not only experience at the counterpart's location, as required by the state for certification, but also training opportunities in the opposite field. Training may consist of operations related classes, professional conferences or specialty courses.

Cities the size of Northfield where effective operation is maintained with smaller staffing must be innovative with use of team members to ensure enough coverage is available when needed. Hiring excess staff members for "just in case" is not always fiscally practical or possible. As such, the above cross training structure can be applied to front line operations staff as well. This would further bolster the experience level of staff and provide for a larger pool of staff members to draw upon should it be necessary to provide coverage due to unexpected resignations, retirements, illness and so on. Staff members that desire to gain the additional experience in their counterpart's operation should be encouraged to do so when appropriate. Similar for supervision above, staff can be utilized whenever projects dictate the need for additional help or when they can assist with plant coverage working with an experienced operator.

2.3 Operations Practices

Overall, the facility appears to be well operated by the existing staff. During the evaluation, the plant's onsite process control methods were discussed. Generally, the facility operates well with limited adjustments, which are evaluated from time to time except for the temporary solids process, which requires significant adjustments and operator attention. The fact that the plant does not require significant and frequent adjustments is good news and suggests the processes and facilities can handle the wastewater flows and loads without excessive operator attention. However, it may also suggest there is an opportunity to improve process optimization and reduce costs. Additional attention to process control testing and optimization would require more operator attention and take time away from regular responsibilities.

In a facility such as the Northfield WWTP, jar testing should be done weekly, unless significant flow changes are observed, in which case the adjustment of coagulant and polymer doses may need more frequent attention. With facility performance in compliance (with minimal exception), it is acknowledged that the process is operating well and the recommendation is purely for cost optimization. Additionally, as seasons change and permit requirements for ammonia become more relaxed or more stringent, additional nitrogen testing (ammonia, nitrate, TKN) can point toward additional optimization (i.e. take units off line) or to prepare for upcoming lower limits (i.e. get additional unit(s) ready to come on line as well as to monitor trends for potential performance issues).

Current operation dictates one blower per BIOSTYR cell. The blowers are set to maximum output because there are no VFD controls on the blowers, resulting in the following: 1) excessive aeration and the general underloading of the plant allow nitrification to occur, and 2) the blower settings increase energy consumption.

One pound of oxygen is needed to treat 1 pound of BOD, and amounts more than these are a waste of aeration energy. Likewise, nitrification requires 4.6 pounds of oxygen per pound of ammonia nitrified. However, because the treatment facility is required by permit to remove ammonia, albeit at varying levels seasonally, operations could investigate installing VFD control on the blowers. Currently, the primary clarifier effluent ammonia is not tracked, so it is difficult to determine how much excess air is being applied as indicated above. Utilizing influent ammonia as tested for NPDES reporting may not give the full picture of the loads placed on the BIOSTYR cells. Using average domestic concentrations of approximately 20 milligrams per liter (mg/L) of influent ammonia and an average flow of 2.4 mgd (as compared to average influent carbonaceous biochemical oxygen demand of 250 mg/L), it is likely that the facility is over-aerating by at least 35 percent.

Another observation is that the corrosion of the sluice gates in the effluent of the BIOSTYR process could be related to the unintended nitrification. This concept was not investigated, but experience suggests it may be occurring. Nitrification reduces alkalinity to the point that water becomes aggressive and speeds corrosion of metals and concrete within the process. Simple testing in the lab by monitoring alkalinity values can rule out this possibility and serve to prolong equipment life. A minimum recommended residual alkalinity level to prevent corrosion is 50 mg/L.

2.4 Capital Planning

The City is in the middle of a 10-year capital improvements plan. The plan, developed in January 2016, was intended to identify equipment items at or near the end of their respective useful life and to replace or upgrade the equipment to ensure plant functionality. To date, several of the items on the list in Table 2 have been or are currently in the process of being upgraded or repaired, even if in an incremental phase of work (i.e., one unit at a time).

It appears that the City has taken the appropriate steps to plan for future work at the treatment facility. The condition assessment portion of this project will help determine the following: whether additional work is necessary, if the listed priorities need further review, or if additional work efforts are required. As for the upgrades, if all projects were combined into one larger project, there may be cost savings and more consistent technology used. Combining the projects also has the advantage of operations being disrupted one time for a year rather than continuously for the next 5 years. Cost savings are typically seen in the mobilization and demobilization costs for general contractors and economy of scale for a larger project.

Table 2. Capital Plan Improvements

Item	Proposed Completion per Capital Plan	Actual Completion	Comments
UV Disinfection	3/2017	3/2017	In service April to October, per permit
BAF Gate Replacement	11/2019	In process	Shop drawings in review
Biosolids Treatment Upgrades	12/2021	3/2020 anticipated startup date	Treatment process under construction; originally to be completed with storage project
Biosolids Storage	12/2021	-	Separated from biosolids treatment project due to fire mishap
SCADA Upgrade	12/2022	-	
Influent Lift Pumps	12/2023	In process	One pump replaced
Blower Replacement	12/2024	In process	Some units already replaced
Water Reuse System	12/2025	-	

3. Maintenance Review

3.1 Maintenance Program Overview

The plant staff consists of a Plant Supervisor and 4 operators who cover 60 hours of plant operations via an overlapping 12-hour-shift schedule 5 days a week. Staff is responsible for the maintenance of the plant and the day-to-day operations. The operators perform limited routine maintenance tasks (lubrication, calibration, and minor maintenance on equipment). Larger, more complicated maintenance tasks are handled by local contractors (i.e., mechanical and electrical). The Utilities Department has implemented and is using the OpWorks CMMS platform to manage preventative maintenance (PM) tasks at the facilities. OpWorks is a cloud-based solution with the data hosted on OpWorks servers. The CMMS platform is discussed in more detail in Section 3.2.

Currently, most of the equipment maintenance is corrective and reactive in nature, and very little preventive maintenance is carried out. This inefficient way of using the limited resources available to maintain the facility is a common problem in the industry for facilities of this size. In addition, it is difficult for a limited staff to get ahead of the planning curve. This frequently leads to maintenance programs devolving into a reactionary mode, which creates additional costs because of inefficient deployment of resources and unexpected equipment costs.

There are no documented maintenance procedures, except for the PM tasks set up in the CMMS, but these do not provide much detail other than a short description of the required task (i.e., CHECK OR GREASE & CHECK AND ADJUST BELTS). The lack of maintenance procedures can create problems, especially with an inexperienced staff. A good set of maintenance procedures based on the equipment manufacturer's recommendations and industry standard practices is essential. Well-documented procedures are an excellent asset for training purposes, ensuring that the required maintenance is completed properly, increasing the efficiency of the staff, and minimizing re-work.

Although spare parts are stocked onsite, the plant does not have an organized or documented spare parts inventory; as a result, parts usage and inventory costs are not tracked. The plant relies on historical knowledge rather than documentation to determine the parts inventory, which is inefficient and problematic. Without documented usage, it is difficult to determine critical spares and the appropriate stocking levels. It can also lead to situations where critical spares are not immediately available, thus forcing an unintended shutdown.

Maintenance costs for the facility are only tracked at a high level in a limited number of cost accounts, making it difficult to determine the effectiveness of the maintenance program and determine critical tasks. Additionally, costs or labor hours are not tracked on Work Orders, so it is difficult to compare the amount of preventative versus corrective maintenance performed or to identify the amount of effort expended on individual equipment assets. That said, the staff and plant management have a good sense of the equipment "bad actors" and the areas of the plant that present greater maintenance challenges. Maintenance tracking is a common challenge in the industry, but the robust documentation of maintenance costs is essential to effective maintenance planning in both the short term (daily, weekly, and monthly) and long term (capital replacement). This will be discussed further in Section 3.2.

There appears to be minimal coordination with contractors performing capital and maintenance work onsite. During the evaluation team's visit, contractors were onsite installing the new biosolids stabilization system, and a heating, ventilation, and air conditioning contractor performed work in the primary building. Work performed by contractors is not captured in the CMMS, and there does not appear to be a permit (hot work or other) system in place to control the work. Coordination with contractors performing maintenance is critically important in preventing operational excursions. Contractor actions that can lead to operational problems include an incorrect breaker thrown or an incorrect valve isolation, among others. Understandably, coordination of contractors is difficult with minimal resources; however, a good control program is important in preventing operational excursions.

3.2 Computerized Maintenance Management System

The Utilities Department is using OpWorks, a cloud-based CMMS with the data hosted on remote servers. Jacobs was provided access to the CMMS through a user account so that the system and data could be reviewed. The following observations were made while navigating the CMMS platform and data:

- The interface is user-friendly, and navigation through the program is easy and intuitive.
- The system is used for both the water and wastewater assets of the City.
- The system uses the equipment run-time taken from the WWTP's SCADA system to generate PM Work Orders as required.
- There are 365 assets set up in the system for the WWTP; the following were observed about those assets:
  - There are 32 asset types set up from blowers to VFDs.
  - There does not appear to be a uniform approach to categorizing assets.
  - There is limited asset data captured in the system (mostly just equipment identifiers).
- There are 291 PM tasks established in the system, and there are currently 102 PM Work Orders in the backlog.
- The platform can track labor hours on a work order but not the cost associated with those labor hours. Tracking of labor hours is not used currently.
- The platform does not have the ability to control a spare parts inventory or track the cost of parts used on work orders

Overall, management has done a decent job in implementing the OpWorks CMMS platform for use in the plant; however, the CMMS platform requires additional work (asset data, PM procedures, man-hour tracking, planning) to realize its full potential to increase efficiency. CMMS is a good program for scheduling and planning, but as it is currently used, it does not have capabilities in cost capture/reporting and inventory control. As compared to industry standards, Northfield is on the entry level, along with many other facilities that are starting to implement CMMS into their daily routines. To reach the next level additional efforts are required.

The Plant Supervisor performs most of the maintenance planning with feedback from the operations staff. The bulk of the maintenance, however, is reactive in nature because the planning is minimal. The CMMS is used in a limited manner for planning and documenting corrective maintenance work; however, there is a real opportunity to significantly improve maintenance efficiencies with minor modifications to the existing CMMS or implementation of a CMMS with cost and inventory management capabilities.

4. Recommendations (Pending Asset Condition Analysis Report)

The following recommendations are presented for the City's consideration:

1) Hire one additional full-time staff member and bring the total number of operations personnel under the Supervisor to five. This position should focus on:
   a) Maintenance activities,
      i) planning,
      ii) scheduling,
      iii) CMMS input, and
      iv) work order execution.
   b) Additionally, this staff member should be trained in operations and encouraged to gain licensing to fill in for employees on sick leave and vacations. A typical job description for this position is included in the attachment.

2) Restructure operator duties:
   a) Place Supervisor in position to coordinate work efforts and rely on sufficient staffing levels to complete the tasks under normal circumstances. Allows more focus on process decisions, compliance issues, contractor coordination (see work permits) and related duties.
   b) Ensure that operators rotate through all facets of plant operation to gain experience on current systems and to enhance knowledge for state certification exams.
   c) Train operators in laboratory work so that they can complete testing and generate data for process control decision-making.
   d) Allow operators to assist the new staff member with maintenance activities
3) Evaluate VFDs to reduce blower output and achieve better control of the system for energy conservation.
4) Investigate installing valves that would allow half of the BIOSTYR process to be offline. The plant is currently underloaded, which would provide the ability to isolate portions of the plant to conserve energy and to facilitate future maintenance.
5) Investigate the potential for consolidating all capital projects into one large project. Typically, cost of construction is lower as one project due to mobilization and administration costs. Likewise, when looking at system integration it yields a more functional control system to design and install systems at the same time.
6) Initiate new and increase the frequency of existing process control testing, including monitoring of primary clarifier influent/effluent parameters, BIOSTYR effluent quality including alkalinity, and jar testing of primary clarifier influent (prior to chemical dosing).
7) Develop and implement standardized maintenance procedures to cover both preventative and corrective maintenance work.
8) Implement an industry-standard work order system to track maintenance costs at a more detailed level. This can be accomplished in a few different ways
   a) At a minimum, the City should modify or update the existing OpWorks CMMS platform to standardize the asset listings and equipment data and include standard maintenance procedures and supporting data. Additionally, a procedure should be established to track and record labor hours expended on work orders. Note that OpWorks is only capable of recording labor hours and cannot track the cost of parts used.
   b) For a more accurate accounting of maintenance costs, the City should consider implementing a more robust CMMS that allows the recording and tracking of labor costs and a spare parts inventory. This is the industry norm as it allows for superior planning and budgeting of maintenance costs.
9) Establish a database and control system to manage the City's existing spare parts inventory. This will allow the staff to track inventory levels and costs, and record usage data. The data gathered will allow for better inventory control and reduced costs.
10) Establish a permit system to control the maintenance work performed in the plant by plant personnel and contractors. This system would establish procedures for obtaining permission to start work and notifying staff management when work has been completed. This would apply to any cold or hot work (welding, cutting) carried out in the plant. In order to implement an effective permit system, the City will need to develop written procedures, train the staff to carry out the procedures, and establish a records management system for storage of the permit records. It is essential that a permit system has the full support of senior management so that the staff using the system daily take it seriously and implement it to its full effect.
11) Review and update the safety program with, at a minimum, documented requirements for minimum personal protective equipment (safety shoes, hard hats, safety glasses, reflective vests) in the plant and a safety orientation for contractors and visitors.

Attachment

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Attachment. Scheduler/Planner Job Description

POSITION SUMMARY
Under direction of the Plant Supervisor, supports a department or area in maintaining all equipment and facilities as assigned in a safe and efficient working condition for the Utilities Department. This position will be accountable for ensuring the timeliest and cost-effective maintenance of wastewater conveyance and treatment equipment, electrical power, instrumentation, mechanical systems, and auxiliary equipment in the safest manner possible, or as mandated to ensure regulatory compliance and achievable metrics. The Maintenance Scheduler/Planner's responsibility is to improve maintenance workforce productivity and work quality by anticipating and eliminating potential delays through planning and coordination of manpower, parts and material and equipment access, while maintaining compliance with all regulatory permits. Direct Reports 0   Budget Responsibility 0

PRIMARY RESPONSIBILITIES/JOB DUTIES

- Assists with development, administering, and management of departmental budgets.
- Interacts with front line supervisors, managers, operators, and shift supervisors to guarantee the efficient, safe, and permit-compliant operation of the system.
- Interacts with Plant Supervisor for reporting on, maintaining, or operating the system in an efficient, safe, and permit-compliant manner.
- Supports capital projects.
- Required to be administratively proficient and detail-oriented to manage key performance indicators along with project management.
- Participates in development and coordination of planned assignments for staff and contractors, and/or work efforts of weekly, monthly, quarterly, and annual work schedule for designated areas focusing on department goals.
- Plans and evaluates the quality and quantity of work needed to accomplish work group goals within set limits of time, cost, and permits.
- Maintains effectiveness in changing environment.
- Is comfortable dealing with the competing priorities and missions within the Department.
- Prepares clear and concise records, reports, and other written materials; reads and understands blueprints, drawings, specifications, and sketches pertaining to the work.
- Reviews documentation to ensure concise and accurate equipment data descriptions, work procedures, and limited development of standard maintenance procedures.
- Assists in initial identification of plant improvements, including development of criteria for job scope and engineering review.
- Exercises purchasing knowledge to find obsolete parts; finds new vendors and establishes reliable contacts for industry, ensuring support of critical equipment and process.

PRIMARY RESPONSIBILITIES/JOB DUTIES
• Performs warehouse identification of spare parts; oversees stocking notifications matching equipment/parts descriptions in system; checks levels, criticality, and pricing. • Manages service contract.

KNOWLEDGE, SKILLS, and EXPERIENCE	
Minimum Required	• A working knowledge in chemical, process, or mechanical engineering; or related fieldwork experience; or a Bachelor's Degree in related field • 5+ years in a maintenance, engineering, or process environment • 3+ years formal maintenance planning experience • Ability to operate in a team environment and lead projects as necessary • Ability to shift priorities frequently and to effectively perform under pressure • Ability to operate a personal computer and other office equipment as needed • Ability to function in both a plant and office environment • Ability to write logical work packages • Ability to organize and communicate work assignments • Strong mathematics and analytical abilities, including statistical analysis • Computer skills to include Microsoft Office Suite, Microsoft Access, computerized maintenance management system (CMMS) and other software applications • Strong technical knowledge of mechanical and electrical systems associated with industrial processes • Knowledge of occupational hazards and safety precautions needed in an industrial environment for the performance of mechanical, electrical, and control system maintenance work • Thorough knowledge of the repair and maintenance of turbines, gasoline and diesel engines, mechanical equipment and/or electrical equipment, and transmission systems • Minimum of 5 years of relevant experience in maintenance planning, with preferred experience in heavy manufacturing, chemical, or utilities industry • Superior interpersonal and communication skills; ability to develop and maintain good working relationships with client, public, purchasing, operations, employees, etc. • Excellent management and organizational skills
Preferred	• Knowledge and experience in the operation and maintenance of a water and wastewater reclamation facility • Maintenance planning certification • 3 to 5 years progressive supervisory experience in an industrial environment • Experience in process/operations management; quality assurance/quality control procedures; safety, environmental, and facilities management • Knowledge of purchasing, procurement, ordering of equipment also a plus • Knowledge and experience in reliability-centered maintenance

KNOWLEDGE, SKILLS, and EXPERIENCE	
	• Experience supervising in a union environment • Experience in developing and managing a budget greater than $500,000 • Leadership skills for leading and facilitating work efforts and projects

WORK ENVIRONMENT

Physical effort required: bending, standing, lifting and carrying up to 50 pounds, climbing ladders, walking, climbing and balancing, stooping, crouching, crawling, and smelling

Working conditions (50 percent of time in operations environment and 50 percent of time in office environment): Worker in this position will be exposed to temperature extremes, noise, fumes, odors, confined spaces, elevated heights, and dust. Working conditions include sitting for prolonged times in front of computer. May need to work outside in inclement weather conditions.

Travel: Occasional travel for training or meetings. This function is largely in an industrial environment, so the job includes frequent visits to maintenance and repair locations.

Potential for on-call work: This position requires on-call time.