



Audit of Water System Operations

Production

The City of Denton has established effective processes to monitor and identify needed water production infrastructure improvements and to report on drinking water quality.

Additional controls over water treatment chemical deliveries would further ensure that the City is receiving what is ordered. Similarly, additional guidance over water plant maintenance work orders could further streamline the work order completion process.

Audit Team

City Auditor

Madison Rorschach, CIA, CGAP

Audit Staff

Neeraj Sama, MBA, MS

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Audit at a Glance

Why we did this Audit:

Annually, the City produces about seven billion gallons of drinking water for its customers. Adequate planning and maintenance of production infrastructure is critical to ensure drinking water is available and meets quality regulations. This audit project was included on the City's fiscal year 2020-21 Audit Plan as approved by the City Council. This report details findings and recommendations from phase three of the project.

What we Recommend:

Recommendation 1

Consider altering the Daily Sheet recording process to more closely align with the Surface Water Monthly Operating Report.

Recommendation 2 & 3

Provide staff written guidelines on work order completion and prioritization.

Recommendation 4

Implement a process to ensure the quantity of chemicals ordered is delivered.

Recommendation 5

Maintain an electronic central repository for retaining chemical delivery bills of lading.

Recommendation 6

Develop a water treatment plant safety manual.

What we Found:

This audit generally evaluated the City's water production processes including production infrastructure planning & monitoring, water quality reporting, treatment chemical controls, and plant maintenance. Findings about each of these areas are summarized below:

Production Infrastructure Planning & Monitoring. Water production infrastructure must be planned to ensure adequate water supply is available to meet peak water demands. The Water Department appears to have developed effective processes to forecast water supply needs and identify associated water production infrastructure improvements. In addition, the City currently has water production capacity to meet forecasted water demands and is planning to expand this capacity in the next five years.

Water Quality Reporting. In order to comply with State regulations, the City must submit monthly water quality reports. The Water Department's process to measure, verify, and report water quality minimizes the chance for human error. Similarly, the City has adequately licensed staff to meet State requirements. Finally, the City's water system has continuously meet water quality regulations since at least the beginning of 2018 and has often met water quality optimization goals.

Treatment Chemical Controls. Furthermore, in order to treat raw water, each plant must have an adequate supply of treatment chemicals. While Water Production has established an effective process to identify when chemicals need to be ordered, there is currently no process to ensure the quantity of chemicals ordered are actually delivered.

Plant Maintenance. Water Production has established a preventative maintenance program for treatment plant equipment. While this program appears to be generally effective at identifying and correcting maintenance issues, some improvements could be made to how work orders are prioritized and monitored to improve timeliness.

Introduction

The Internal Audit Department is responsible for providing: (a) an independent appraisal¹ of City operations to ensure policies and procedures are in place and complied with, inclusive of purchasing and contracting; (b) information that is accurate and reliable; (c) assurance that assets are properly recorded and safeguarded; (d) assurance that risks are identified and minimized; and (e) assurance that resources are used economically and efficiently and that the City's objectives are being achieved.

The Internal Audit Department has completed a performance audit of the City's water utility system's production processes. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Management Responsibility

City management is responsible for ensuring that resources are managed properly and used in compliance with laws and regulations; programs are achieving their objectives; and services are being provided efficiently, effectively, and economically.

Audit Objectives, Scope, and Methodology

The Internal Audit Department has completed an audit of the City's water system production processes. This report is intended to provide assurance the City has adequate controls over water production processes including water production infrastructure monitoring and planning, water quality reporting, treatment chemical controls and plant maintenance.

This report is the third phase in an audit project series covering water system operations. [Phase One Rate Structure](#) was published in June 2021 and [Phase Two Distribution](#) was published in July 2021.

Audit fieldwork was conducted during April, July, and August 2021. The scope of review varied depending on the procedure being performed. The following list summarizes major procedures performed during this time:

¹ The City of Denton's Internal Audit Department is considered structurally independent as defined by generally accepted government auditing standard 3.56.

- Reviewed documentation to develop criteria including industry standards, best practices, policies, and procedures;
- Developed process narratives to identify current control activities in water quality reporting, water production equipment maintenance, and water treatment chemical delivery processes that was certified by Water Department staff;
- Toured the Lake Lewisville and Ray Roberts Water Treatment Plants;
- Evaluated annual water demand forecasting methodology to ensure assumptions seemed reasonable;
- Compared planned production infrastructure needs from the 2008 and 2018 Water Master Plans to actual infrastructure improvements and upgrades and discussed project initiation process with Water Department staff;
- Reviewed Texas Optimization Program Monthly Optimization Reports from March 2018 through December 2020, the water system's Monitoring Plan, and the water system's Emergency Response Plan;
- Compared water quality data from the February 2020 Surface Water Monthly Operating Report to Daily Sheets for the same period;
- Verified Water Production Operators' licensing aligned with state regulations and City job description requirements;
- Compared bills of lading for 30 water treatment chemical deliveries to SCADA system data and Daily Sheet entries;
- Examined a statistical sample of 352 unscheduled maintenance work orders² and a statistical sample of 95 preventative maintenance work orders³ to determine if maintenance was completed effectively and timely; and
- Interviewed Safety and Water Department staff about safety assurance activities and examined safety trainings attended by Water Production staff.

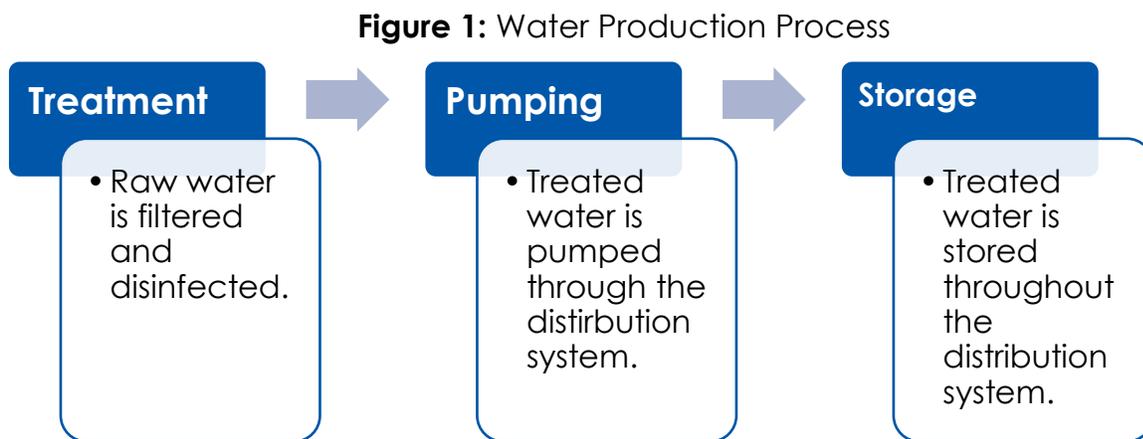
² This sample size provides with 95 percent confidence that the true population mean is within ± 5 percent of the sample estimate.

³ This sample size provides with 95 percent confidence that the true population mean is within ± 10 percent of the sample estimate.

Findings & Analysis

The City of Denton’s water system currently consists of two water treatment plants – the Lake Lewisville Water Treatment Plant and the Lake Ray Roberts Water Treatment Plant – which can treat 30 and 20 million gallons of water a day respectively. This treated water is then stored in clearwells⁴ at each plant before being pumped into the City’s distribution system.

Treated water must be adequately pumped to maintain positive pressure, which prevents contaminants from entering the distribution system. In addition, storage tanks placed throughout the distribution system help maintain positive pressure through elevation and help ensure peak water usage demands can be met. The water production process generally consists of three steps as illustrated in Figure 1:



This audit generally evaluated the City’s water production processes including water production infrastructure⁵ monitoring and planning, water quality reporting, treatment chemical controls and plant maintenance.

⁴ Clearwells are storage tanks where filtered water is held as the last stage of treatment to allow disinfectants to inactivate any remaining pathogens.

⁵ Based on the City of Denton’s 2018 Water Master Plan, water production infrastructure refers to the City’s water treatment plants, clearwell storage, and high service pump stations. Storage tanks in the distribution system were also included in this definition for the purposes of this audit.

Water Production Infrastructure Planning Process is Adequate

In order to provide effective water service to its customers, a water system must ensure it has adequate water supply and production infrastructure capacity to meet daily peak water demands and maintain positive water pressure throughout the system.

What We Found

- Annually, the Water Department forecasts water production needs as part of the budgeting process in order to project revenues and inform the capital planning process. This forecasting methodology appears to be based on reasonable assumptions and is an effective planning tool.
 - This process annually forecasts the City’s peak day water usage⁶ using the formula shown in Equation 1, whereby GPCD means gallons per capital per day and the peaking factor is the ratio of the maximum day flow to the average day flow.

Equation 1: Peak Day Forecast Equation

$$\frac{GPCD * Population}{Days in the Year * 1,000,000} * Peaking Factor = Peak Day$$

- Based on review of the Department’s forecast, GPCD estimates appear to be reasonable based on historical water usage as shown in Table 1.

Table 1: Produced Water GPCD Forecast Evaluation (2000-2019)

| Year Rain | Forecast Historical Estimate | Average Historical Actual |
|-------------------------------|------------------------------|---------------------------|
| Normal Year (32-42 inches) | 158.00 | 155.41 |
| Drought Year (<32 inches) | 170.64 | 165.79 |
| Wet Year (>42 inches) | 145.36 | 146.65 |
| | All: | 156.59 |

- Similarly, population is generally estimated to grow about two percent, which appears to be consistent with the City’s growth rate for the last ten years. In addition, the forecast increased this population estimate to account for the Hunter and Cole Ranch Development in future years.
- Finally, the peaking factor used in the forecast is slightly higher than the actual average peaking factor from 2000-2019.

⁶ Peak day water usage is the maximum volume of water used in a 24-hour period within a given year.

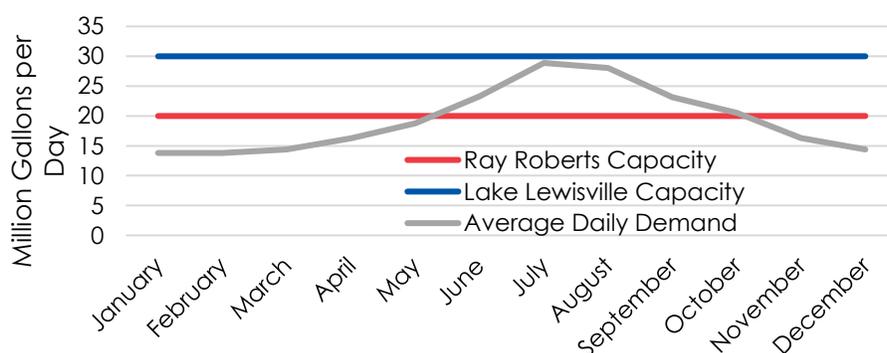
- In order to identify water production capacity improvements needed in the near-term, the Water Department periodically contracts with a consultant to develop a Water Master Plan. As part of this process, the consultant updates a hydraulic model of the City's water system, which the City uses to evaluate the impact of smaller developments on the water system.
 - The most recent Water Master Plan was completed in 2018 and recommended several production infrastructure projects be completed between 2019 and 2043. The current status of each of these projects is shown in Table 2.

Table 2: Water Production Infrastructure Recommendations

| Project | Complete By | Status |
|---|-------------|------------------|
| Riney Road Booster Pump Station | 2023 | In Design |
| 30.0 MGD RR Water Treatment Plant Expansion | 2028 | Planned |
| 2.0 MG State School Elevated Storage Tank | 2043 | Under Evaluation |
| Southwest Pump Station Improvements | 2043 | Planned |

- In order to ensure that recommended improvements are still required, the Water Department contracts with an engineering consultant to perform a hydraulic analysis before initiating a project to ensure the improvement is actually needed at the forecasted size.
- Similarly, the Water Department intends to update the Water Master Plan and associated water system model every five years.
- The City currently has the combined water production capacity to meet projected drought year peak day demands until 2024.
 - That being said, the Ray Roberts Water Treatment Plant does not always have the ability to meet average day water demand alone as shown in Figure 2. While it is unlikely Ray Roberts will be the City's only operational treatment plant, the impacts of being unable to meet water demands can be substantial.

Figure 2: Daily Water Demand & Treatment Plant Capacity



- Water Production is in the process of preparing the Ray Roberts plant to be rerated by the Texas Commission on Environmental Quality. Rerating this facility should help mitigate the risk of not meeting the average day demand alone as the plant's production capacity will increase.
- In addition, the 2018 Water Master Plan recommended expanding the Lake Ray Roberts Plant's capacity by 30 million gallons a day. This expansion is currently included in the Water Department's five-year capital improvement plan which would further mitigate this risk.

Why It Matters

Providing adequate water supply to its customers is critical for the City to ensure public health. The Water Department appears to have developed effective processes to forecast water supply needs and identify associated water production infrastructure improvements. In addition, the City generally has water production capacity to meet forecasted water demands and is planning to expand production capacity in the next five years.

Recommendation: None.

Water Quality Reporting Practices are Generally Effective

The City of Denton's water system is required to meet water quality regulations set forward in the Texas Administrative Code Chapter 290. Under this chapter, all public water systems in Texas must submit monthly water treatment data to the Texas Commission on Environmental Quality. This chapter also requires public water systems to employ a minimum number of licensed water system operators.

What We Found

- Based on a review of the Lake Lewisville and Ray Roberts plants' water quality reports from January 2018 through December 2020, the City has continuously met the Environmental Protection Agency's water quality regulations.
 - In addition, Water Production began participating in the Texas Optimization Program in March 2018. This program recognizes water systems that meet optimization goals set by the United States Environmental Protection Agency and is run by the Texas Commission on Environmental Quality. Table 3 summarizes each plants performance as it relates to these [optimization goals](#).

Table 3: Plant Optimization Goal Performance

| | Percent of Months Meeting Goal | |
|-----------------------|--------------------------------|-------------|
| | Lake Lewisville | Ray Roberts |
| Filter Goals | 100% | 94% |
| Backwash Goals | 100% | 100% |
| Settled Water Goals | 85% | 97% |
| Months Participating: | 34 | 33 |

- Water Production has developed a semi-automated process to measure and report on water quality, which minimizes the chance for human error.
 - Water quality readings are automatically taken periodically by the Water Department’s supervisory control and data acquisition – or SCADA – system using instrumentation⁷ within the water treatment plants. These readings are then imported from the SCADA system into the required Surface Water Monthly Operating Report.
 - In addition, water quality metrics are recorded throughout each day by Water Production Operators in Daily Sheets. These Sheets are then used at the end of each month to identify any discrepancies in the Surface Water Monthly Operating Report.
 - Based on a comparison of the Surface Water Monthly Operating Report and Daily Sheets from February 2020, there was not a significant difference for about 93 percent and 91 percent of the active plant days for the Lake Lewisville and Ray Roberts plants respectively.⁸
 - While these Sheets generally provide enough information to identify discrepancies, recording Daily Sheet turbidity⁹ readings on even hours could increase comparability between the Daily Sheets and the Surface Water Monthly Operating Report.

- As required by the Texas Administrative Code, the Water Department has developed and submitted a Monitoring Plan to the Texas Commission on Environmental Quality that demonstrates that the water quality monitoring performed by the system is consistent with regulatory requirements.

- The City annually publishes a Consumer Confidence Report to all its customers as required by the Environmental Protection Agency, which provides information on any regulated contaminants found in the local

⁷ Means flow meters, pH meters, pressure meters, turbidity meters, and more.

⁸ Whereby a significant difference in the daily average was a difference ± 0.005 nephelometric turbidity units.

⁹ Turbidity is the measure of relative clarity of a liquid and is the primary measurement used in water quality since particles in water provide attachment places for metals, bacteria, and other pollutants.

drinking water. The information produced in this report is based on tests run by the Texas Commission on Environmental Quality. This report is also known as the annual drinking water quality report.

- Based on a review of the City’s Water Production Operator licenses, the Water Department has adequate water system operator licenses as required by state regulations to operate its water treatment plants.
 - In addition, the City of Denton has established different levels of Water Production Operators which are distinguished by the minimum required level of water system operator licensing. Water Production staff licensing is tracked by Water Production management, which is required to report on staff licensing to the Texas Commission on Environmental Quality periodically.
 - Based on a comparison of each Water Production Operators’ associated job descriptions and current licensing, all 18 Water Production Operation staff meet minimum job description licensing expectations as shown in Table 3; however, five have not obtained licenses in accordance with the Department’s progression plan.

Table 4: Water Production Operator Licensing Summary

| Operator Level | Staff | Minimum Requirement | Career Progression Step | Licenses | | | |
|----------------|-------|---------------------|-------------------------|----------|---|---|---|
| | | | | A | B | C | D |
| I | 6 | None | C in Three Years | 0 | 0 | 2 | 4 |
| II | 8 | C Upon Hire | B in Three Years | 0 | 0 | 8 | 0 |
| III | 2 | B Upon Hire | NA | 1 | 1 | 0 | 0 |
| Foreman | 2 | A Upon Hire | NA | 2 | 0 | 0 | 0 |

Why It Matters

The production and distribution of drinking water in the United States is highly regulated by the Federal and state governments. Non-compliance with licensing and reporting requirements could lead to significant penalties and public health impacts. Based on this review, Water Production appears to have established effective processes to report on water quality and track operator licensing. Slight adjustments to the Daily Sheet process might further improve their effectiveness as a control.

In addition, Water Production’s participation in the Texas Optimization Program is considered a best practice. While the City’s water treatment plants are not always meeting these optimization goals, they have continuously met water quality regulations established by the United States’ Environmental Protection Agency.

Recommendation:

1. Consider taking Daily Sheet turbidity readings each even hour instead of each odd hour to more closely align with turbidity readings reported in the Surface Water Monthly Operating Report.

Water Department Comments: *It is believed that this recommendation may not result in all numbers matching from the manual readings to the SCADA readings as the SCADA system records many more points than our staff reports manually. However, Water production has implemented even hour recording at LLWTP. The RRWTP was already recording the readings on the even hours.*

Water Treatment Chemicals Secure; Deliveries Not Adequately Reconciled

The City has contracted with ten vendors to supply chemicals needed for water treatment at its plants. In general, these chemicals are used to reduced turbidity and disinfect water. Best practices suggest that the following controls should be in place to ensure chemical inventories are properly safeguarded:

- Physically secure inventory so only authorized personnel have access;
- Record inventory usage; and
- Count all incoming inventory to ensure what is received is what was ordered.

What We Found

- Chemicals used in the water treatment process are safeguarded on site at each water treatment plant, which are fenced in and require appropriate authorization to enter. In addition, each storage tank is locked and keyholders are tracked.
- Water Production staff have developed an effective process to monitor chemical levels and order new inventory when needed.
 - Bulk chemical levels are automatically recorded by the Department's supervisory control and data acquisition – or SCADA – system regularly. Twice each day, Water Production Operators record chemical tank levels in their Daily Sheet. These levels



Picture 1: Chemical Storage Tank

- are reviewed by the Water Production Operations Supervisor to determine if additional chemicals need to be ordered.
- Based on review of a judgment sample of Daily Sheets recorded on five chemical deliveries days,¹⁰ chemical deliveries captured by the SCADA system were reflected in chemicals levels recorded in the Daily Sheets.
 - Water Production staff do not have a process to ensure that the quantity of chemicals ordered is delivered appropriately.
 - As chemicals are being delivered, water production staff ensure that the chemical is the correct type based on color and specific gravity before allowing the offloading process to begin. In addition, chemical storage tanks must be unlocked by authorized Water Production staff and all deliveries are observed during the offloading process.
 - Based on a review of thirty chemical deliveries, chemical levels on five days recorded by SCADA were significantly different from what would be expected based on the ordered quantity. In addition, SCADA readings could not be obtained for 19 of the delivery days due to a SCADA system crash that happened in the past. It should be noted that SCADA readings must be converted from feet to pounds or gallons to compare ordered and delivered quantities.
 - According to Water Production staff, they physically retain all bills of lading; however, of a sample of 30 orders the Department could not provide bills of lading for nine sampled orders.
 - Based on discussion with Water Department management, this issue may be due to a staffing vacancy caused by the COVID-19 Pandemic.

Why It Matters

Chemical inventory is critical to water production operations to ensure that raw water is adequately treated. For this reason, chemical inventory levels must be adequately maintained and safeguarded. While chemicals appear to be adequately safeguarded by each water plant's physical security, there is currently no process to reconcile delivered chemicals to those ordered.

Implementing a reconciliation process will provide assurance that not only is the City appropriately spending its money, but also that chemicals will be available

¹⁰ Due to a process change, only five of 30 reviewed Daily Sheets had chemical inventory levels recorded.

when needed. In addition, bills of lading should be retained in order to provide support for the chemicals received.

Recommendations:

2. Implement a process to ensure the quantity of chemicals delivered matches the quantity ordered. It may be necessary to create and adopt formulas with acceptable margins of error to convert delivery amounts to those reflected in the SCADA system.

Water Department Comments: *The Department has started to use Infor EAM's work priority field. The field allows the selection of high, medium, medium low, medium high, and low. Their priority level will be designated by the manager or supervisor responsible for the work request. Any items related to safety, compliance or environmental impact will receive high priority while items related to building maintenance or aesthetics will receive a medium to low priority. Written guidance will be provided as part of Recommendation #3.*

3. Maintain a central repository for keeping electronic copies of bills of lading to aid the chemical delivery reconciliation process. In addition, determine how long bills of lading should be retained per the appropriate Texas State Records Retention Schedule.

Water Department Comments: *Will develop written guidance on how to complete work orders. This guidance will also include Recommendation #2.*

Additional Maintenance Work Order Guidance Could Improve Efficiency

Over time, the performance of water production equipment eventually degrades. In order to ensure each water treatment plant continues to be capable of producing drinking water, this equipment must be adequately maintained and repaired.

Timely and appropriate maintenance of water production equipment also helps ensure this equipment meets its useful life and water production is not impacted. In general, there are three types of maintenance programs as defined below:

- Reactive Maintenance – no actions or efforts are taken to maintain equipment to ensure expected life is reached;
- Preventative Maintenance – actions performed on a time- or machine-run-based schedule that detect, preclude, or mitigate degradation with the aim to extend the useful life of equipment; and

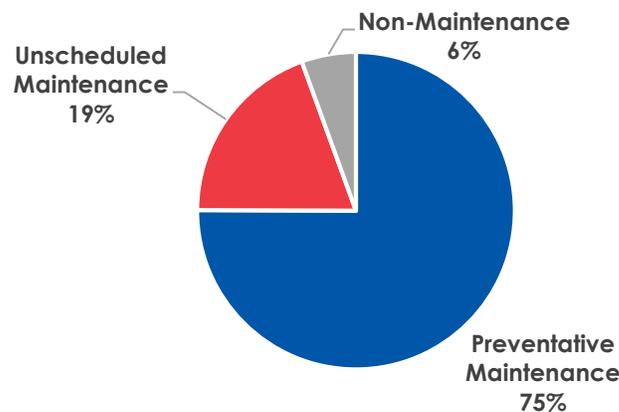
- Predictive Maintenance – measurements that detect the onset of system degradation, thereby allowing casual stressors to be eliminated prior to deterioration.

Each of these program types has its own advantages and disadvantages, though it should be noted preventative and predictive maintenance programs still include reactive maintenance activities – these activities just make up a smaller percentage of work performed.¹¹

What We Found

- Water Production has generally established an effective preventative maintenance program, where about 20 percent of maintenance activities are reactive – or unscheduled maintenance – as shown in Figure 3.
 - While additional cost savings could be observed in the long run from increasing predictive maintenance activities, this type of program requires large, short-term investment in technologies to monitor equipment condition. Due to the size of the City, this type of large, technological investment may not be necessary at this time.

Figure 3: Plant Work Orders by Type



- Water Production utilizes a work order management system to assign maintenance work to staff. This process appears to effectively ensure work orders are assigned to appropriate staff.
 - Most work orders are automatically generated as part of the preventative maintenance program. In addition, unscheduled maintenance activities can be reported by all Water Production staff.

¹¹ Typically, a maintenance program is considered reactive if more than 55 percent of maintenance activities are reactive.

These work orders are then reviewed by Water Production management to ensure they are necessary before being assigned.

- Based on review of a statistical sample of 95 preventative maintenance work orders, about 17 percent were not completed in a timely manner.¹²
 - This issue appears to be due to delays in the assignment of preventative maintenance work orders rather than how quickly staff are completing them.
- Based on review of a statistical sample of 352 unscheduled maintenance work orders, it was unclear if the maintenance issue had been resolved based on the comments entered for about 10 percent. For an additional three percent of work orders, the comments indicated that the maintenance issue was not resolved.
- According to Water Production staff, work orders are generally prioritized informally as part of the daily staff meeting. That being said, there is no clear, written guidance around how work orders should be prioritized based on the work needing to be performed.
- Similarly, the timeliness of unscheduled work orders could not be determined as there is no written guidance around how quickly these work orders should be completed.
 - According to staff, Water Production management meets every two weeks to discuss work needing to be completed and writes comments on outstanding work orders to check up on their status.

Why It Matters

An effective work order system is critical to ensure that maintenance work for water treatment plants is completed effectively and timely. Water Production staff appear to have established a preventative maintenance program, which generally appears to be effective at ensuring critical plant equipment is monitored for maintenance needs. That being said, a significant portion of preventative maintenance work orders are not completed in a timely manner.

Furthermore, while unscheduled maintenance generally appears to be completed effectively, some documentation limitations make it difficult to determine if the issue was corrected. Moreover, it is unclear if unscheduled

¹² For preventative maintenance purposes, a work order was timely if it was completed before the next preventative maintenance work order in that schedule was issued.

maintenance is being completed in a timely manner as there are no guidelines around how quickly these should be completed.

While having periodic management meetings to check on the status of outstanding work orders is appropriate, without documentation of this follow-up and staff's response, it is unclear if maintenance delays are reasonable. Similarly, developing guidelines for staff on how to prioritize work orders could further improve timeliness as staff would have a clear reference for which work should be completed first.

Recommendations:

4. Develop guidelines for Production staff on how to prioritize work orders by type.

Water Department Comments: *Staff implemented chemical delivery tracking on operations paperwork. In addition, all vendors will be contacted to ensure they provide certified weight tickets as required by our contract specification.*

5. Provide staff written guidance on how to complete work orders to ensure all needed information is included. Ensure that management follow-up on outstanding work orders are included in the comments.

Water Department Comments: *This was the procedure until we lost our administrative assistant to the voluntary separation program. The department was told we did not need to keep these documents. The department has reinstated the practice of keeping these documents electronically,*

Safety Assurance Activities Generally Seem Effective

The American Water Works Association's best practices recommend that water utilities establish a health, safety, and environment program. In general, this kind of a safety program includes the policies, procedures, training, personal protective equipment, and lifesaving equipment needed to perform the work safely.

What We Found

- Water Production staff regularly attends safety training organized by the Safety Department including the Federal Emergency Management Agency's required Incident Command System courses, defensive driving, heavy equipment awareness and confined space training.

- As part of the Safety Department's initiatives a safety committee consisting of Water and Safety Department staff has been formed that meets monthly to discuss safety concerns, procedures, and initiatives.
- Safety Department staff also meet regularly with Water Department staff to discuss any safety concerns and get feedback. In addition, the Safety Department is planning to begin periodic inspections of the City's water treatment plants.
- Water Production management also supplements this training with the Occupational Safety and Health Administration's hazardous waste operations and emergency response training and hazard communication training. These trainings are specifically focused on responding to hazardous materials, including those that are kept on site at the City's water treatment plants.
 - According to Water Production's records, all 31 staff have received the hazard communication training, and nine have undergone the hazardous waste operations training. Based on discussion with Water Department staff, the hazardous waste operations training must be performed in person and so roll out has been delayed due to the COVID-19 Pandemic.
 - In addition, Water Production staff meet periodically to have "tailgate" meetings, during which they discuss the day's activities and go over certain safety procedures.
- Water Production has developed some written safety guidance to aid staff in the event of an emergency and as they complete their work.
 - As required by the 2018 America's Water Infrastructure Act, the Water Department has developed an Emergency Response Plan that details emergency response procedures for several emergency situations including extreme weather events, source water contamination, cyberattacks, active shooters or other physical security threats, and power loss.
 - In addition, Water Production has formalized a Hazard Communication Program, which is intended to ensure that employees have adequate information to identify hazardous substances and prevent illness if exposed, and to clarify who is responsible for maintaining the Program.
 - That being said, Water Production does not have a comprehensive safety manual that details safety practices and standards needed throughout the plant.

Why It Matters

Education and specialized safety training are important tools for making Water Production staff aware of the hazards and safety procedures involved in their jobs. If any safety incident happens on a water plant, it may result in injury to City staff, financial losses, and potential drinking water hazards.

The Water and Safety Departments are providing knowledge and education to Water Production staff through training. Development of a comprehensive safety manual describing the safety standards and procedures needed on a water treatment plant would help provide clear, written guidance to Water staff on how to adhere to safety measures that will eventually be used by the Safety Department to perform safety inspections.

Recommendation:

6. Incorporate water treatment plant safety standards and practices into a Water Department safety manual in consultation with the Safety Department for staff guidance.

Water Department Comments: *Water Production will work with Safety to develop the manual. The outline is currently under development.*

Safety Department Comments: *The Safety Department concurs with Recommendation #6.*

Appendix A: Management Response Summary

The following summarizes the recommendations issued throughout this report. The auditors found that staff and the Department were receptive and willing to make improvements where needed. Management has provided their response to each recommendation.

| | | |
|--|--------------------------------|--|
| <p>1 <i>Consider taking Daily Sheet turbidity readings each even hour instead of each odd hour to more closely align with turbidity readings reported in the Surface Water Monthly Operating Report.</i></p> | <p>Partially Concur</p> | <p>Expected Completion: Completed</p> |
| <p>Water Department Comments: It is believed that this recommendation may not result in all numbers matching from the manual readings to the SCADA readings as the SCADA system records many more points than our staff reports manually. However, Water production has implemented even hour recording at LLWTP. The RRWTP was already recording the readings on the even hours.</p> | | <p>Responsibility: Plant Managers</p> |
| <p>2 <i>Develop guidelines for Production staff on how to prioritize work orders by type.</i></p> | <p>Concur</p> | <p>Expected Completion: 10/30/2021</p> |
| <p>Water Department Comments: The Department has started to use Infor EAM's work priority field. The field allows the selection of high, medium, medium low, medium high, and low. Their priority level will be designated by the manager or supervisor responsible for the work request. Any items related to safety, compliance or environmental impact will receive high priority while items related to building maintenance or aesthetics will receive a medium to low priority. Written guidance will be provided as part of Recommendation #3.</p> | | <p>Responsibility: Plant Managers</p> |
| <p>3 <i>Provide staff written guidance on how to complete work orders to ensure all needed information is included.</i></p> | <p>Concur</p> | <p>Expected Completion: 10/30/2021</p> |
| <p>Water Department Comments: Will develop written guidance on how to complete work orders. This guidance will also include Recommendation #2.</p> | | <p>Responsibility: Plant Managers</p> |
| <p>4 <i>Implement a process to ensure the quantity of chemicals delivered matches the quantity ordered.</i></p> | <p>Concur</p> | <p>Expected Completion: Completed</p> |
| <p>Water Department Comments: Staff implemented chemical delivery tracking on operations paperwork. In addition, all</p> | | <p>Responsibility:</p> |

vendors will be contacted to ensure they provide certified weight tickets as required by our contract specification.

Plant Managers

5 *Maintain a central repository for keeping electronic copies of bills of lading to aid the chemical delivery reconciliation process.*

Concur

Expected Completion: Completed

Water Department Comments: This was the procedure until we lost our administrative assistant to the voluntary separation program. The department was told we did not need to keep these documents. The department has reinstated the practice of keeping these documents electronically,

Responsibility: Plant Managers

6 *Incorporate water treatment plant safety standards and practices into a Water Department safety manual in consultation with the Safety Department for staff guidance.*

Concur

Expected Completion: 7/31/2022

Water Department Comments: Water Production will work with Safety to develop the manual. The outline is currently under development.

Responsibility: Water Production Superintendent & Director of Safety

Safety Department Comments: The Safety Department concurs with Recommendation #6.