

**City of St. Joseph, Missouri**  
**Facilities Plan**

**Technical Memorandum No. TM-WW-10**  
**Staffing Analysis**



**By**



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## Staffing Analysis

### 1.0 Executive Summary

The purpose of this technical memorandum (TM) is to present the findings of the staffing analysis performed for the City of St. Joseph, Missouri Water Protection Facility (WPF) staff. A meeting was held with WPF staff on December 10, 2009 to review existing laboratory, operations, and maintenance staffing levels. Both current and future staffing needs were considered and recommendations for the staffing levels are presented herein. Additional facilities, opinions of probable project costs, general layouts, and potential site locations of the proposed facilities are presented in various technical memorandums throughout the Facilities Plan. Specific space requirements for the Administration Building (including the laboratory) and the Maintenance Building are presented in TM-WW-9 – Site Considerations, Utility Improvements, and Ancillary Facilities.

The WPF operations and maintenance (O&M) staff levels currently appear to be adequate. The WPF O&M staff surpasses their peers in efficiency and consistently does more with less; however, this high efficiency is offset by a higher than average overtime percentage. With key staff members set for retirement in the next five years, regulatory oversight requirements, changing water quality criteria, and the need to upgrade facilities at the WPF, there are a number of important recommendations to assist WPF O&M staff in meeting these upcoming challenges.

In the short term (next five years), it is recommended that the City implement the following:

1. Develop a list of core competences and a training program to teach these competences.
2. Implement a “Water Protection Facility Training Program” by late 2010.
3. Hire six new trainees by early 2011.
4. Designate a “maintenance worker” job family to eliminate the need for operator certification for staff members who are specifically assigned to perform maintenance work.

5. Develop a succession plan and identify key staff to receive additional certifications as needed to offset the coming loss of institutional knowledge due to retirements.

In the long term (five years and beyond), it is recommended that:

1. A review of staffing needs and training requirements be performed prior to the start-up of new processes.
2. Staff operators assist with the basic laboratory sampling, allowing laboratory staff to focus on the more complex and difficult analyses.
3. As additional processes are brought online, supervisory control and data acquisition (SCADA) be used to assist in the operation and oversight of the more complex WPF treatment processes.
4. O&M staff be transitioned to focus on the daily WPF O&M needs leaving the larger long-term capital improvements projects for outside contractors. This will allow the WPF staff to address maintenance needs in a more proactive manner.

## **2.0 Staffing Size Analysis and Recommendations**

The City's O&M staff count of 45 persons compared to the WPF's average effluent flow rate of 20 million gallons per day (mgd) is a ratio of 0.44. This ratio indicates that the WPF O&M staff is more efficient than its peers as they exceed the peer median value of 0.31. Treatment plants with high flow rates and small O&M staff counts indicate efficient staffs that are able to do more with less. Efficiency, however, must be balanced with staff workload and exhaustion from working at high levels over an extended time period. Based on discussions and staff interviews from the December 10, 2009 site visit, the WPF O&M staff has a high overtime ratio of approximately seven percent. The national utility overtime target is less than seven percent, in the three to five percent range. The WPF O&M staff overtime is most likely not sustainable long term and indicative of insufficient staff for the type of work they are being asked to perform. Additional staff in combination with refocusing staff efforts on the overall utility

operation may help to reduce staff workload. This is described in more depth within the following sections.

To determine appropriate staffing levels, staffing count adjustment factors are considered. These adjustment factors are defined as site specific limitations and restrictions and/or frictions inherent to the WPF and City that directly affect the number of staff needed to operate and maintain the WPF facility. Based on conversations with the WPF O&M staff, the following six adjustment factors were identified. In addition, key questions related to each factor are presented to illustrate the factors that affect staff size.

1. Staff Stability. What is the staff turnover rate? How are new staff trained? Does the utility have a succession plan? Who will replace staff members as they retire?
2. Certifications. What kind of licenses does the state require an operator to have? How does the City train staff to achieve appropriate certification?
3. Levels of Treatment. What kinds of treatment processes does the plant currently have? Will future processes require more operators and different skill sets? How do water quality regulations influence the existing and future staff size?
4. Industrial Pretreatment Programs. How will industrial pretreatment programs affect the operation of the WPF? Will side streams and split stream treatment of industrial flows require additional staff and/or staff skill sets?
5. Equipment Life Cycle. Are staff able to proactively maintain equipment? Is the City structured to allow staff to anticipate and not react to problems?
6. Additional Facilities at WPF Site. Does the layout of the Water Protection Facility allow staff to perform their work efficiently? Will future processes be convenient or cause staff to be stretched thin across a large plant facility?

All six factors influence the recommended staff count. Specifically, the issues presented in the following sections will be the main drivers for the WPF staffing levels.

A higher staff count with adjustment to the staff's daily tasks is anticipated. The recommendations are also described in more detail in the following sections.

## **2.1 Staff Stability, Certification, and Training**

### **2.1.1 Overall**

The existing WPF O&M staff has been with the facility for a long time, which speaks well of the facility and City management. The negative aspect of this factor is the staff is aging and the facility will be subjected to a loss of institutional knowledge due to retirement. Succession planning, including the training of existing as well as new staff to undertake future key roles and responsibilities, will be imperative to allow the WPF to continue operating well into the future.

Staffing stability and certification requirements are the two leading drivers for the short-term and long-term recommended WPF staffing expansion. Managing these requirements proactively will require the WPF to develop a new approach for hiring additional staff and resolving the anticipated loss of institutional knowledge. In the short term, the City should consider the following points to resolve the competition for capable staff:

1. Determine the core competences.
2. Become a continual training organization with focus on the core competences.
3. Develop a plan for knowledge capture and management with focus on the core competences.

To address the anticipated loss of institutional knowledge, the City is encouraged to develop and implement a Water Protection Facility Training Program by late 2010. In addition, the hiring of six new trainees by early 2011 is recommended to offset the loss of employees due to retirements. Acceptance by the union and human resources will be critical for the success of the training program, trainees, and the long-term success of the WPF.

### **2.1.2 Certification**

The rules imposed by the Missouri Department of Natural Resources (MDNR) regulations Section 10 CSR 20-9.020 (B) and (2-C) limit the City operational staff to licensed personnel. The limitations of the regulations coupled with pending retirements, future changes in treatment processes, and hiring competition from nearby industries place the City in a difficult staff development position. The City has two options: attempt to “hire away” qualified personnel (financially difficult) or create an in-house training program which identifies capable recruits, has a step-wise program leading to full-time employment (attainment of the Class D wastewater license), and a variety of career paths for the WPF worker to pursue within the confines of the City’s employment. It is recommended that the latter option be adopted by the City.

### **2.1.3 Maintenance Worker Designation**

The operations group at the WPF includes a sub-group composed of two staff members that are currently designated as “Maintenance Workers.” This position is focused strictly on maintenance of the collection system pump stations and performs the bulk of both mechanical and minor electrical repairs. Generally speaking, these efforts are classified as a “Collection System” activity by the majority of other utilities in the WPF peer group. For several reasons, this job position should not be classified as a subcategory of “Operators.” By changing the job classification, the operator licensing requirements for these staff members would be avoided. The City should consider re-classifying the collection system efforts into a separate group such as “Collection System O&M Worker.” The new job family would allow for an expanded career path for incoming WPF trainees. Having all WPF staff voluntarily certified as licensed wastewater treatment operators would be a long-term beneficial staffing goal, but not necessary in the short term.

### **2.1.4 Laboratory Staff**

The laboratory staff workload includes activities involved with numerous analytical events not related to the WPF. Laboratory staff duties include:

- Industrial pretreatment program sampling, analysis, and reporting

- Landfill leachate quarterly sampling, analysis, and reporting
- Combined sewer overflow/sanitary sewer overflow (CSO/SSO) sampling, analysis, and reporting
- Missouri River study sampling, analysis, and reporting
- WPF regulatory and process control sampling, analysis, and reporting (i.e., traditional role of laboratory staff)

The first four laboratory efforts, especially the CSO/SSO and Missouri River study efforts can be burdensome and cause potentially overwhelming sampling, analysis, and reporting. In addition, the related labor resources and specialized equipment required to ensure the staff can safely and effectively accomplish all of this work is significant. Continual expanded laboratory efforts will demand more labor, equipment, and laboratory counter space to effectively and efficiently complete these requirements. Further study should be performed to ensure the laboratory facility is not facing a space or resource shortage to sustain the various efforts.

A simpler method to control and minimize the expanding laboratory work load may include:

- Transfer some or all of the WPF process control analysis to the operations group
- Transfer some or all of the simpler WPF regulatory analysis (i.e., BOD, TSS, pH, and fecal coliform) to the operations group

The current operations group will need additional training to handle these recommendations; however, once training is performed, these tasks are well within the capabilities of a licensed operator. The more complex laboratory analyses would be reserved for laboratory staff and allow for an expanded career path for incoming WPF laboratory trainees.

## 2.2 Levels of Treatment

The facility is transitioning from a conventional activated sludge treatment process which is clearly understood by the staff to more complex treatment processes which are not as clearly understood. Disinfection will be required by the end of year 2013 and ammonia removal will likely be required within the next several years.

New centrifugal blowers will be installed to replace the existing positive displacement blowers during the transition to ammonia removal. The City should consider the implementation and expansion of the preventive maintenance program utilizing synthetic lubrication, motor temperature analysis, and local control centers. The new SCADA system should be configured to monitor, record, and/or alarm for a variety of equipment operating points: voltage, amperage, vibration, temperature, pressure, and oil levels.

Addition of the ultraviolet (UV) disinfection system will increase instrumentation and control (I&C) maintenance currently performed by WPF contract personnel. The City should re-direct instrumentation maintenance and basic calibration to be performed by the O&M staff. I&C corrective maintenance should continue to be performed by the contract personnel for at least the next three years. By continuing this contract, the City will have the required coverage while up-grading existing staff member skills and/or hiring new staff. Future SCADA systems may also warrant the addition of one contractual applications software technician. The inclusion of SCADA monitoring and control may allow for continuous on-line analysis or hand-held probes measuring the raw influent and final effluent ammonia (NH<sub>3</sub>-N) concentration, reducing staff sampling duties and possibly allowing for the elimination of the second and/or third shift routine equipment conditional monitoring (hourly walk-about). Furthermore, the new design should consider the need for grab sampling by operations staff for a variety of process control and permit analysis with additional testing shared by all operation shifts.

Future changes in nutrient removal requirements in addition to providing full nitrification and denitrification removal processes may also be required. All of these process changes will directly affect the role, responsibilities, and daily tasks of O&M staff. Staff levels and training and should be studied prior to the start-up of new processes.

### **2.3 Industrial Pretreatment Programs**

The industrial inflows are so significant at the WPF, a separate treatment train is anticipated to ensure the facilities' capability to continue to meet or exceed the operating permit final effluent water quality. The need for this separate treatment train is presented in detail in TM-WW-4 – Nutrient Removal Facilities. The new treatment train will require the operator to take direct responsibility for the process control sampling, analysis, and reporting which is currently a laboratory staff responsibility. Staff levels and training should account for this change.

### **2.4 Equipment Life Cycle and Staff Priorities**

The City benefits from a diversely talented and capable maintenance group. With their variety of skills, the group consistently undertakes equipment replacement efforts that their peers (i.e., the majority of surveyed utilities) would have performed by an outside general contractor and/or by a specialized sub-group within the utility. The City should not assume the maintenance staff will be capable of sustaining this level of effort in the future.

The pressures to complete long-term equipment replacement projects were reflected during discussions with the O&M staff. Furthermore, staff interviews indicated the maintenance work load is currently dominated by corrective maintenance (60 percent) versus preventive maintenance (40 percent). Furthermore, upon discussion, O&M staff are dissatisfied with the maintenance ratio and recognize that being reactive means higher costs for the City, more frequent equipment break-downs, higher overtime requirements, and possible disruption of the facility final effluent water quality. It is likely that the cost savings generated by completing major equipment replacement projects in-house are offset by providing a less thorough preventive maintenance routine than that which could be achieved if O&M staff were able to focus on proactive maintenance activities. It is recommended that large long-term capital improvement projects be contracted out allowing the WPF staff to focus on the day-to-day O&M activities. This will help to rebalance the workload for O&M staff to be more proactive rather than reactive regarding maintenance issues.

## **2.5 Additional Facilities at WPF Site**

As the overall WPF facility size increases with additional treatment processes, additional operators will be needed to cope with the WPF expansion and monitoring and control apparatus. SCADA is planned for specific facilities and will help to offset some of the operator needs.

## **3.0 Summary and Conclusions**

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