Case Study

Orange County Florida Utilities
Pump Station Renewal & Replacement

Background

Orange County Utilities Department (OCU) provides water resources and solid waste recovery services to protect and enrich the lives of the citizens and guests of Orange County, Florida. OCU serves a population of over 1.3 million residents and 66 million guests across a service area of about 1,000 square miles with 144,152 water and 155,571 wastewater premises in two water management districts (SJRWMD, SFWMD).

OCU's Engineering and Field Services divisions are responsible for the Pump Station Renewal & Replacement Program, ensuring the health of 774 pump stations for OCU. The program goal is to ensure the reliability of the Orange County's pump station assets while minimizing life-cycle cost of ownership, and this is measured by proactive assessment of pump stations to determine needs and establish priorities. This must be a sustainable process of inspection, assessment and R/R work completion.

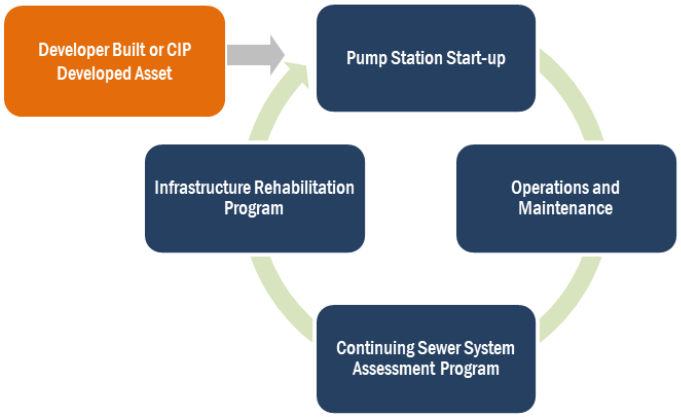


Figure 1. OCU Pump Station Asses Life-cycle.

OCU selected the Pump Station Renewal & Replacement (R/R) program for process improvement due to the impact this program has on asset management, the need for maximum sustainability and efficiency in pump operations, and the potential for application of the results to many other areas within OCU.

Case Study Description

Following the Utility Analysis and Improvement Methodology (UAIM) guidelines, the project was conducted in four steps as follows:

1. Model Legacy Process
    - Developed "As-Is" Model according to Business Process Model and Notation (BPMN) standards
    - Highlighted identified strengths versus opportunities
2. Model Improved Process
    - Developed "To-Be" Model in BPMN
    - Created Responsibility Matrix (Responsible, Accountable, Consulted, Informed or RACI)

- Memorialized the changes in a Pump Station Program Manual

3. Monitor and Measure
    - Developed a Goal Tree
    - Identified Key Performance Indicators (KPIs)
    - Establish Objectives and Targets
4. Make Continual Improvements
    - Implemented performance management
    - Arranged for annual audit and management review

The project applied UAIM methods and created As-Is and To-Be models compliant with the Business Process Model and Notation (BPMN) standard. In the first step, these methods and models supported a "strengths versus opportunities" analysis that was used to isolate areas that require the most attention and that present the greatest potential for advancing the R/R program. With the improvements areas identified, a To-Be model was developed to clarify in a precise way how the improvements will be achieved, and the roles and responsibilities of those impacted by the changes. The To-Be model was also developed in BPMN and, for understanding and communicating roles & responsibilities, a Responsible-Accountable-Consulted-Informed (RACI) matrix was developed.

The project team understood that the R/R processes would be improved in practice only if specific goals were met. To better understand these goals, a goal-directed task analysis (GDTA) was performed, and the analysis clearly showed the most important KPIs; those needed to ensure that the established objectives and targets were met. The To-Be process was memorialized in a new document; the Orange County Utilities Pump Station Program Manual, and on-going performance management processes monitor activities and generate annual audits and management reviews to ensure that changes are implemented and maintained.

Through modeling of the As-Is model in BPMN, specific strengths and opportunities can be seen (Figure 1).

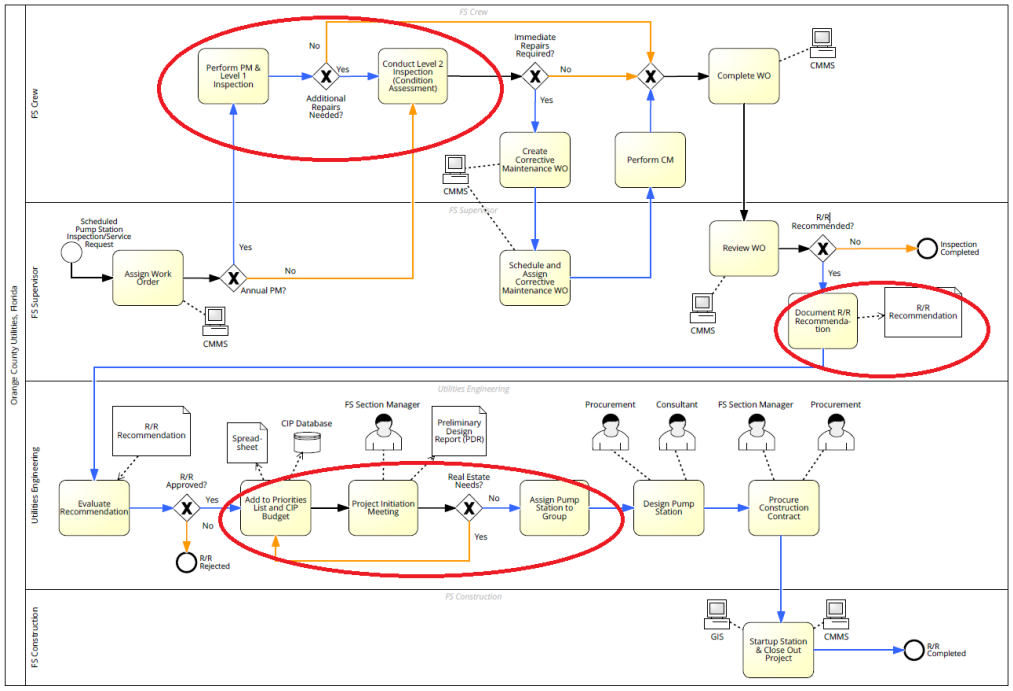


Figure 2. Pump Station R/R As-Is process model.

The model shows how the pump station R/R needs are identified by operations and maintenance staff but that a "Priority list" was maintained by Engineering. It was also clear that projects languished due to real estate or procurement issues. These and other issues resulted in many changes to priorities prior to the R/R project start and loss of efficiency due to rework and delays. As a result, 50% of pump stations were at or past their useful life. Delays resulted in a minimal number of projects (3-5) completed each year.

Many strengths were identified through analysis and together with process issues and gaps (missing steps, need for improved KPIs). These suggested specific opportunities to be explored. OCU has a strong leadership position with highly skilled and knowledgeable staff. Considerable work has gone into developing operational processes and maintenance practices, and sufficient process-level operational controls are in place. Moreover, the strategic vision is stated clearly and well-understood by OCU personnel. Thus, significant improvements could be attained through a better alignment and coordination between operations and engineering roles. This alignment should include well-defined priorities and objectives for both roles, and these can be ensured through greater visibility of KPIs along with internal audit measures and management review. The To-Be process ensures that these opportunities are realized.

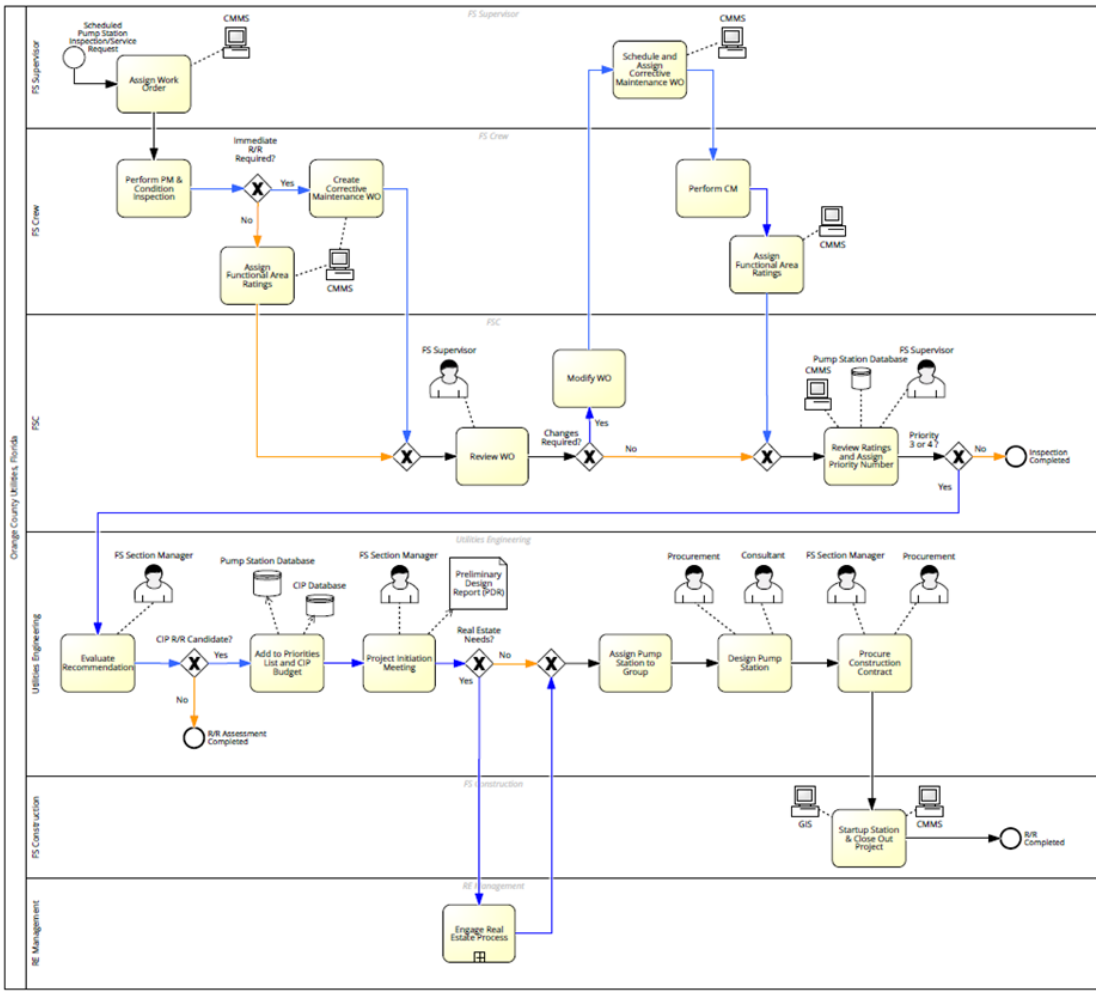


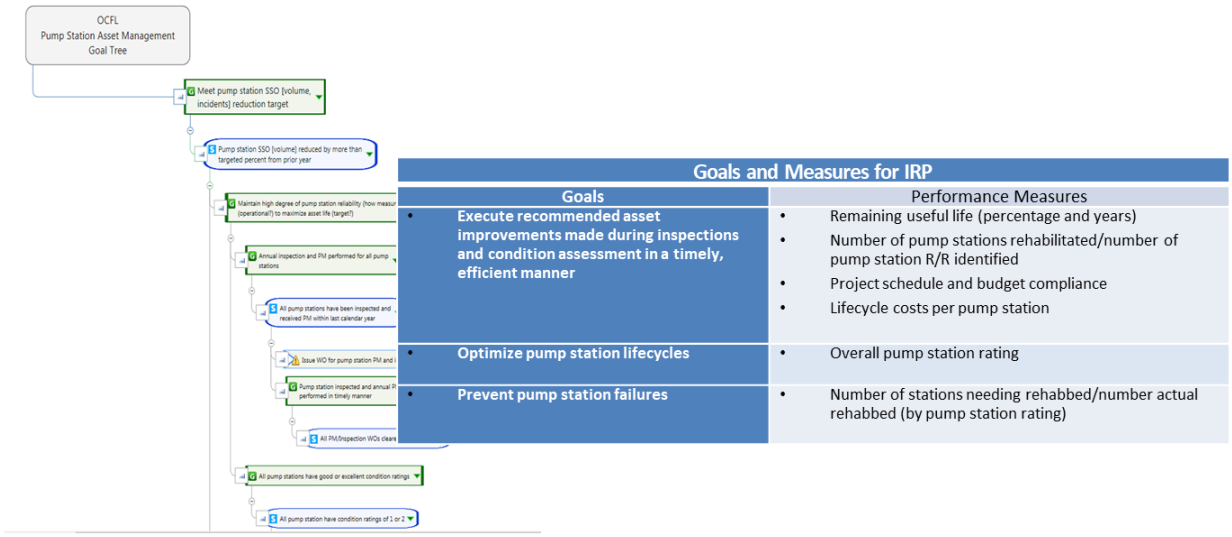
Figure 3. Pump Station R/R To-Be Process.

Strategies

The To-Be process reflects improved alignment and coordination achieved through three main strategies. First, Orange County pump stations are inspected at pump station start-up to provide a baseline and annually during the annual preventive maintenance (PM). Combining the assessment process with annual PM activities maximizes resources and facilitates the timely execution of necessary R/R work to ensure asset needs are addressed prior to failure.

Secondly, a Pump Station R/R program team consisting of stakeholders from both operations and engineering was formalized. This program team meets routinely to evaluate condition assessment ratings, establish plans for addressing issues, track progress and discuss future program needs. The result of the inspection and condition assessment process is the assignment of an overall pump station priority and recommendations for needed R/R. The priority is based on predefined functional area ratings and is used to establish the mechanism to perform the R/R work.

Thirdly, Monitoring and Measurement was examined through analysis of important goals, and how these should be measured in KPIs. Goal and task analysis results in a list of goals and their associated situations. The tree-list shows how goals in business processes are related, and the situations that are most important for satisfying those goals. Importantly, the goals suggest specific KPIs that directly relate to achievement of those goals. Correct KPI definition ensures that business process improvement goals are met, and this analysis makes those goals and KPIs clear, along with the data needed to compute the KPIs. A program manual outlining the program elements, goals and measures, roles and responsibilities assignment and continual improvement opportunities was created and serves as a resource guide, providing pertinent information about workflows and procedures related to the Pump Station Program.



Goals and Measures for IRP

Goals	Performance Measures
• **Execute recommended asset improvements made during inspections and condition assessment in a timely, efficient manner**	• Remaining useful life (percentage and years) • Number of pump stations rehabilitated/number of pump station R/R identified • Project schedule and budget compliance • Lifecycle costs per pump station
• **Optimize pump station lifecycles**	• Overall pump station rating
• **Prevent pump station failures**	• Number of stations needing rehabbed/number actual rehabbed (by pump station rating)

Figure 4. Pump Station R/R - critical goals and related KPIs.

Lessons Learned & Ongoing Challenges

Throughout the project we learned lessons that can be organized based on the UAIM process matrix:

- **People**

  Involving the right stakeholders is extremely important to validate assumptions and garner needed buy-in and support. When and how staff members are engaged is critical to the success of the project. A relatively wide range of stakeholders from all levels of the organization was helpful in the beginning stages when attempting to gather information; however a smaller group representing all was more effective for defining the scope and making strategic decisions. The goal of the project and how the stakeholder personally fits into that goal must be properly defined and articulated. They must understand the value and see the potential return on investment of their time, energy and resources in order to gain their full support.

  Consulting help was used to help facilitate discussions, provide input on best practices and recommendations for improvements. The organization should be the drivers of the improvement strategies, utilizing consultants in a supporting role. Establishing and maintaining this balance can be a challenge.

- **Process**

  Documentation of the To-Be process with clearly defined roles came in the form of a BPMN model, standard operating procedures, a program manual and responsibility matrices for defining tasking and assigning roles. This documentation served to memorialize the improvements and facilitated the change management and training efforts that would follow.

  Routine audit and assessment of the Pump Station R/R program will be conducted on a scheduled cycle as part of Orange County Utilities' management system internal audit and management review requirements.

- **Technology**

  Analysis of both the As-Is and To-Be processes revealed opportunities to expand the use of technology to streamline the process and create efficiencies. Two specific areas for the Pump Station R/R program have been identified:

  - CMMS improvements can capture assessment data
  - SCADA enhancements are needed to support the process