**TOWN OF ADDISON**
**KELLWAY WASTEWATER LIFT STATION ASSESSMENT**
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# Technical Memorandum

## Condition Assessment and Business Risk Evaluation


**May 2017**

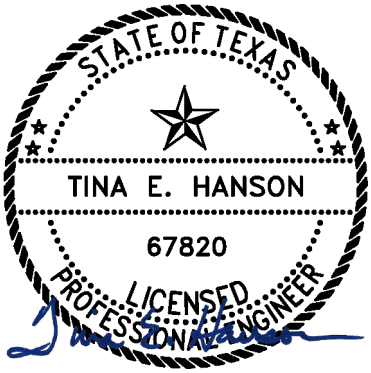
**Prepared by:**


**3010 Gaylord Parkway, Suite 190**
**Frisco, TX 75034**
**TBPE Registration No. F-5713**

**Garver Project No. 16088080**

## Engineer's Certification

I hereby certify that this Condition Assessment and Business Risk Evaluation Technical Memorandum for the Town of Addison Kellway Wastewater Lift Station project was prepared under my direct supervision on May 26, 2017 for the Town of Addison.




Tina E. Hanson, PE
State of Texas PE License No. 67820


Jeffrey L. Sober, PE
State of Texas PE License No. 103772

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## 1.0 Introduction

This technical memorandum presents the results of the condition assessment and the business risk evaluation of the Kellway Lift Station located in Addison, Texas. The Kellway Lift Station was originally constructed in 1996, and services the surrounding residential areas and commercial businesses in sanitary sewage basins B and J (*July 1996, Report on 1996 Wastewater Collection System*). The lift station includes two 50 hp pumps and a buildout for a future third pump. The facility is designed to handle flow events with one pump online and the second utilized as a back-up. The following sections summarize the asset inventory, the condition assessments, the business risk evaluation, and asset replacement recommendations.

## 2.0 Asset Inventory

Garver identified 47 assets at the Kellway Lift Station based on the provided record drawings and a site visit on July 19th, 2016. Each asset was given a unique Asset ID which includes information on the asset's physical location, the building level, the asset type and size, and the equipment number. These unique Asset IDs were incorporated in the Water Environment and Research Foundation (WE&RF) Business Risk Evaluation (BRE) tool. In addition, Garver developed a standard assessment form containing fields for all required information identified by the Town of Addison. A sample condition assessment form is included in Appendix A of this report.

## 3.0 Condition Assessment

Garver performed a separate condition assessment for each of the 47 assets listed in the asset inventory. The assets were divided into three different categories:

- Structural (STR)
- Process and Mechanical (PRS/MEC)
- Electrical (EIC)

The field assessments were performed on July 19th, 2016 by a multi-discipline team of Garver engineers, including a Garver structural engineer, a Garver process/mechanical engineer, and a Garver electrical engineer. Each asset was visually inspected and the overall asset condition was reported. Additionally, field interviews were conducted with the Town staff during the site visit and items such as the asset's reliability, anticipated consequence of failure, and past maintenance history were noted. Specific notes were made for individual assets that required special attention. Along with the condition assessment, at least one photo was provided for each of the assets when practical. Completed condition assessment forms for the Structural, Process and Mechanical, and Electrical categories can be found in Appendices B, C and D of this report respectively.

## 4.0 Business Risk Evaluation

Garver used the WE&RF Business Risk Exposure (BRE) tool to identify critical risk assets, which should be prioritized in the Town's capital improvement program. It is recommended that the critical risk assets be considered for immediate upgrades or replacement at the Kellway Lift Station. Garver incorporated the following categories of information for each asset into the BRE tool:

- Build/Install Date
- Refurb/Replace Date
- Expected Design Life
- Imminent Failure Mode
- At-Risk Components
- Performance Element Rankings

The BRE tool uses the information provided for each category to determine the likelihood of failure for each asset. Additionally, Garver worked with the Town staff to determine the consequence of failure for each asset by considering the following factors:

- Safety, Health, and Welfare
- Environmental Impact
- Process Criticality
- Repair Costs
- Revenue and Aggravation Impact on Customers and Agency

The total Core Risk Score for each asset is the product of the likelihood of failure and the consequence of failure. The values for the likelihood of failure and the consequence of failure for each asset are plotted on a Core Risk Map to determine where the assets fall on the risk spectrum and to identify which assets are Critical Risk Assets. Based on Figure 4-1, four assets from the asset inventory for the Kellway Lift Station are categorized as Critical Risk Assets.

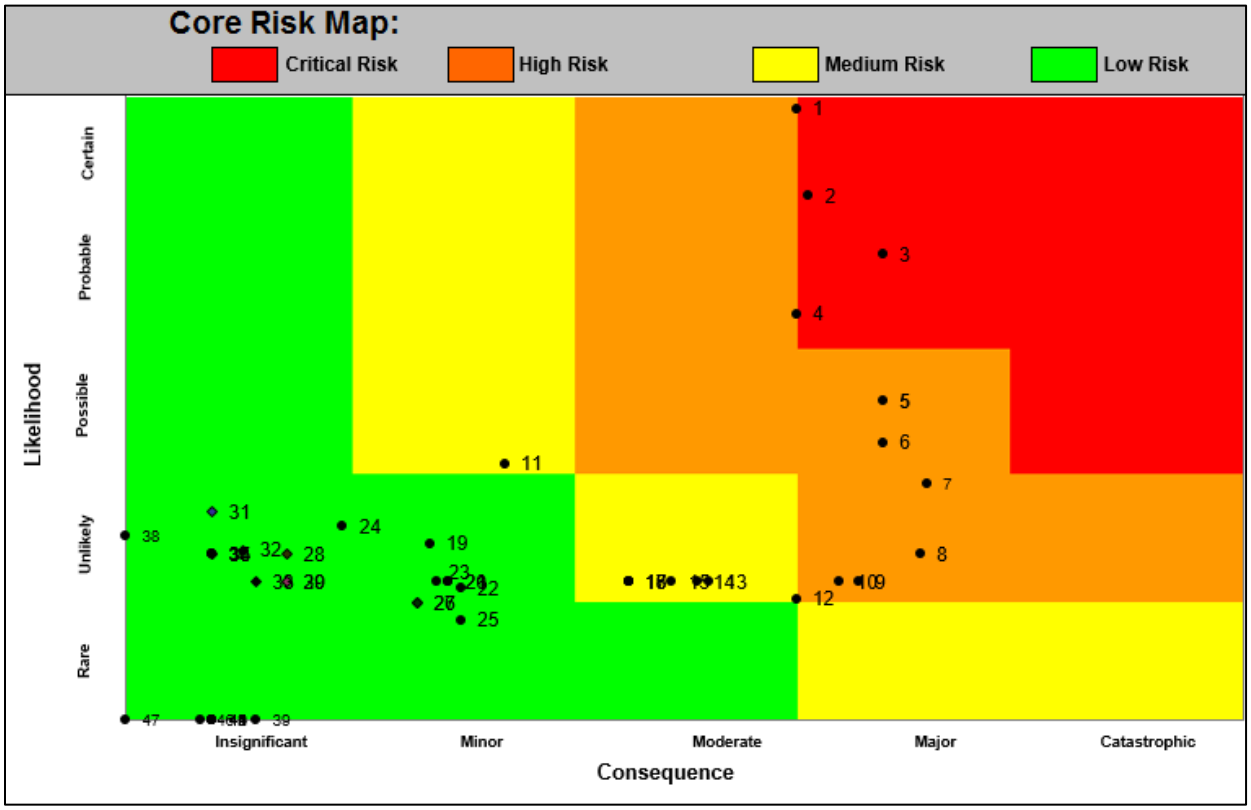


**Figure 4-1: Core Risk Map for Kellway Lift Station**

Table 4-1 provides a description for the likelihood of failure, the consequence of failure, and the Core Risk Score for the four assets identified as Critical Risk Assets in Figure 4-1. Additionally, Table 4-2 provides a similar description for assets identified as High Risk Assets by the WE&RF BRE tool. A complete description of the likelihood of failure, the consequence of failure, and the Core Risk Score for each asset of the Kellway Lift Station is located in Appendix E of this report.

**Table 4-1: Critical Risk Asset Description**

| No. | Asset ID | Asset Name | Likelihood of Failure | Consequence of Failure | Core Risk Score |
|---|---|---|---|---|---|
| 1 | 610-KLS-1-PNL--1 | Automatic Transfer Switch | 9.8 | 6.4 | 62.7 |
| 2 | 610-KLS-0-MSB--3 | MSB-3 (F-1 Exhaust Fan Control Panel, 7.5 HP) | 8.6 | 6.5 | 55.6 |
| 3 | 610-KLS-0-P-5-2 | Pump No. 2 | 7.7 | 7.1 | 54.7 |
| 4 | 610-KLS-1-MSB--1 | Switchboard MSB | 6.9 | 6.4 | 43.8 |

**Table 4-2: High Risk Asset Description**

| No. | Asset ID | Asset Name | Likelihood of Failure | Consequence of Failure | Core Risk Score |
|---|---|---|---|---|---|
| 6 | 610-KLS-0-MSB--1 | MSB-1 (pump controller MCCA) | 5.0 | 7.1 | 35.5 |
| 7 | 610-KLS-1-PNL--1 | SCADA panel/telemetry control panel | 4.4 | 7.5 | 32.8 |
| 8 | 610-KLS-1-EF--1 | Fan F-1 (14,385 CFM) | 3.4 | 7.4 | 25.2 |
| 9 | 610-KLS-WW-STRUCT-- | Wet well Structure | 3.0 | 6.9 | 20.7 |
| 10 | 610-KLS-WW-ULI--1 | Ultrasonic Level Sensor | 3.0 | 6.8 | 20.3 |
| 12 | 610-KLS-1---1 | Service Transformer, electric meter | 2.8 | 6.4 | 17.6 |

## 5.0 Recommendations

Based on the condition assessment and the WE&RF Business Risk Evaluation tool, Garver makes the following recommendations:

1. Completely remove and replace the four Critical Risk Assets (Automatic Transfer Switch, MSB-3, Pump No. 2, and Switchboard MSB) with identical structures, processes, and equipment as the original asset.
2. Both pumps 1 & 2 were originally installed at the same time, and Pump No. 1 (Asset No. 5) is currently in the High Risk Asset range in Figure 4-1. To ensure that both pumps have comparable operation, Garver recommends that Pump No. 1 also be replaced.
3. Continue to monitor and prioritize assets categorized as Critical Risk Assets. After replacing the Critical Risk Assets, Garver recommends that the Town focus on the High Risk Assets.

# Technical Memorandum

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## SCADA Improvements


**May 2017**

**Prepared by:**

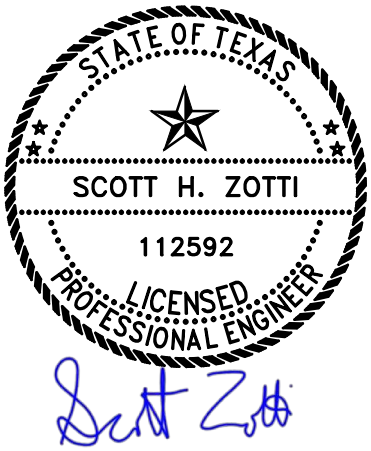

**3010 Gaylord Parkway, Suite 190**
**Frisco, TX 75034**
**TBPE Registration No. F-5713**

**Garver Project No. 16088080**

## Engineer's Certification

I hereby certify that this Regulatory Assessment Technical Memorandum for the Town of Addison Kellway Wastewater Lift Station project was prepared under my direct supervision on May 26, 2017 for the Town of Addison.

Scott H. Zotti, PE
State of Texas PE License No. 112592



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## 1.0 Introduction

A field investigation of the Town of Addison's Kellway Lift Station was conducted on July 19, 2016 to assess the condition of the existing Supervisory Control and Data Acquisition (SCADA) system and to provide recommendations for improvement. A summary of findings and recommendations is included within this report.

## 2.0 Existing SCADA System Overview

The Kellway Lift Station was originally constructed in 1996, and services the surrounding area. The lift station includes two 50 hp pumps and a buildout for a future third pump. The pumps are Fairbanks series 5400 Solids-Handling Pumps with a 10.6-inch impeller diameter. Ultimate lift station capacity is 2.0 MGD (firm) when three pumps are in service with each pump rated for an ultimate capacity of 1.0 MGD. The existing facility is designed to handle flow events with one pump online and the second utilized as a back-up.

The SCADA system operates in conjunction with the pump control panel to operate the pumping system.


**Figure 2-1: Pump Control Panel**


**Figure 2-2: SCADA/Telemetry Panel**

The pump control panel (Figure 2-1) includes the majority of items required to operate the pumps, including hand-off-auto (HOA) switches, status lights, elapsed time meters, reset buttons, and circuit breaker handles. The typical mode of operation for the station is automatic, which places the pumps under control by the programmable logic controller (PLC).

The SCADA/telemetry panel (Figure 2-2) includes status lights for each pump along with a test, reset, and acknowledge push buttons. The SCADA/telemetry panel also includes a sight pane for viewing the interior of the telemetry panel.

The existing SCADA system consists of the following components:

- Single, dedicated SCADA/Telemetry enclosure
- Motorola ACE 3600 Programmable Logic Controller (PLC)
- Two mixed I/O modules plus a spare
- GE MDS 4710 licensed communication device (Radio)
- Milltronics Multiranger Plus level controller

**Figure 2-3: Motorola ACE 3600 PLC and Radio**


**Figure 2-4: Milltronics Multiranger**

It was reported that the lift station is normally monitored and controlled remotely through a Human-Machine-Interface (HMI) software system. The HMI software system currently in use is Wonderware and the alarming notification system is Win-911. This method of control is accomplished by the interfacing the Wonderware software system, the PLC programming, and the pump control panel. The Wonderware system communicates with the PLC using the radio.

The originally designed pump on / pump off control elevations from the 1996 plans have recently been updated, per Town staff. Original, current pump, and recommended control settings are summarized in Table 2-1.

**Table 2-1: Pump Control Settings**

| | Wet Well Level (original) | Wet Well Level (current) | Wet Well Level (future, recommended) |
|---|---|---|---|
| Pump 1 On | 6.5’ | 16.0’ | 5.0’ |
| Pump 2 On | 9.0’ | 17.0’ | 6.0’ |
| Pump 3 On (Future) | NA | NA | 7.5’ |
| All Pumps Off | 4.0’ | 6.0’ | 2.5 |
| High Level Alarm | 11.0’ | | 12.0’ |

If radio communication is unavailable, PLC operation will take place under slightly different control parameters. Town staff are unsure of the difference in control parameters that the PLC override contains. In addition, it was reported that the standard operating procedure for any critical alarm (including loss of communication) is to dispatch staff to the station to investigate the cause of the alarm.

## 3.0 Existing SCADA System Assessment

The SCADA system has received recent upgrades, and is substantially different than the original design. A radio has replaced the original leased telephone line. In addition, Wonderware and Win-911 are now utilized for remote control.

The use of a PLC to control the pump station of this size and magnitude is consistent with standard design practices. The labelling on the PLC indicates that it was installed in 2013 and is considered a relatively new installation. It was reported that there is a maintenance contract with a third party company to provide support for the PLC on an as-needed basis. This contract includes an annual test for the system.

Given the recent improvements, the SCADA system as installed is considered to be in good condition. However, some new improvements to the system would be beneficial.

## 4.0 Recommended Improvements

There are a wide variety of items that will improve the functionality and reliability of the pump station.

Immediate items to consider are:

1. For the safety of employees working on or near electrical equipment, an arc flash hazard assessment should be performed in accordance with the Standard for Electrical Safety in the Workplace as published by the National Fire Protection Agency (NFPA 70E). All

applicable panels and equipment should be labeled with the resulting arc flash hazard in accordance with NFPA 70E.

2. Provide proper ventilation, monitoring, and alarming in accordance with the Standard for Fire Protection in Wastewater Treatment and Collection Facilities as published by the National Fire Protection Agency (NFPA 820). See Attachment A.

3. Provide additional monitoring and alarming for critical equipment in the lift station including:

    (a) Standby power generator
    (b) Automatic transfer switch
    (c) Power monitoring

    Individual input/output points (dry contacts) for the standby power generator and transfer switch can be used to interface these devices with the existing PLC. Power monitoring connections are typically accomplished using a network type of connection and a communication structure conducive to the installed devices.

4. Redesign the control scheme to reduce or eliminate single points of failure.

    (a) Provide non-electronic methods of control for backup purposes (float switches, relay control)
    (b) Provide redundant controlling devices
    (c) Redundant wetwell level transmitter
    (d) Spare pre-programmed PLC processing unit
    (e) Spare I/O cards
    (f) Spare radio

Future improvements to consider include:

1. As noted within the condition assessment forms (see Appendix D), significant improvements to the power distribution system should be considered. These improvements include the addition of a new main circuit breaker, along with a complete replacement of the automatic transfer switch and switchboard MSB.

    A new main circuit breaker will lower the incident energy for the downstream equipment and provide additional overcurrent protection for the station. The automatic transfer switch is not currently operational, and the fused switchboard has visible signs of corrosion. It is recommended to replace the transfer switch with a current model as

typically supplied by the standby power system supplier, and replace the fused switchboard with a new circuit breaker style switchboard.

2. Provide motor protective relays for each motor to provide protection and additional monitoring capabilities. Motor protective relays can provide advanced levels of protection and controls, including starts-per-hour, current unbalance, stalled rotor, contactor failure, frequency, phase current, negative-sequence, and enhanced thermal protection. Motor protective relays can also be used for metering, monitoring, and reporting purposes, including motor start reports, motor start trending, load profile monitoring, and motor operating statistics.

3. Provide solid state starters or variable frequency drives for enhanced control and automation. One solid state starter or variable frequency should be installed for each motor and the size of each unit should be equal to or greater than the 50 horsepower rating of the motor.

4. Employ a Wide-Area-Network (WAN) strategy for communication with a fiber optic backbone.

5. It is recommended that a SCADA system master plan be developed and periodically updated. This SCADA system master plan will evaluate all of the system components and provide recommendations for improvements and/or replacement. The SCADA system master plan evaluation should include an in-depth review of the hardware, software, network, and communication systems of each individual component of the system. The plan should also include a standardized approach to each type of device to ensure continuity across the entire system.

   For support purposes and to ensure continued product support for the entire duration of the life expectancy of the installed SCADA system, it is recommended to periodically evaluate the brand of PLC and software systems for the entire SCADA system network.

# Attachment A

# Standard for Fire Protection in Wastewater Treatment and Collection Facilities

## National Fire Protection Association 820

Minimum safety standards for wastewater collection systems are established by National Fire Protection Association (NFPA) 820 *Standard for Fire Protection in Wastewater Treatment and Collection Facilities*. Adherence to this standard reduces or eliminates the effects of fire or explosion on life and property by maintaining structural integrity, controlling flame and smoke, preventing the release of toxic products, and maintaining serviceability and operation of the facility.

NFPA 820 was originally issued as a recommended practice in 1992 and subsequently revised in 1995 to be a standard, which contains mandatory requirements for wastewater collection and treatment systems. NFPA 820 is updated and published every three years, with the most current edition being published in 2016.

Section 1.3 of NFPA 820 specifically states that all new installations shall comply with the requirements as set forth in the standard. In addition, when additions or modifications are made to the existing facilities, the modifications shall reflect the requirements as set forth in the standard.
Sections 1.3 and 1.4 of NFPA 820 specifically state that the requirements of this standard shall be used by owners in a risk assessment to identify the specific areas that are vulnerable to fire or other loss. In general, the provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in the standard at the time the standard was issued.

Section 1.4.1 of NFPA 820 states that the provisions of this standard shall not apply to facilities, equipment, structure or installations that existing or were approved for construction or installation prior to the effective date of the standard. However, Section 1.4.2 states that in those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

For the purposes of this memorandum, the area classification determination has been developed in accordance with the Engineer's interpretation of the 2016 version of NFPA 820. Final determination of adherence to the requirements of the standard is made by the local authority having jurisdiction.

The following assumptions were made in the development of this memorandum unless otherwise noted.

- The drywell area is physically separated from the wet well.
- All cabling utilized for pump systems, controls, and indication equipment is rated for the respective application and location.
- All cabling utilized in hazardous locations is rated to prevent the migration of gasses through the jacket surrounding the cable.
- Wet well penetrations are rated to prevent the migration of gasses from the respective wet well into non-classified areas.
- Level measurement devices and other control devices installed within the wet well are rated for the associated hazardous location.

This section summarizes key findings and National Electric Code (NEC) classifications for this station based on NFPA 820-2016 criteria.

Wet Well

- Wet well Type: Sanitary Sewer
- Ventilation: Ventilated
- NEC Hazard Classification:
  - Continually ventilated at less than 12 air changes per hour: Class 1, Division 1 (Table 4.2.2, Row 16a)
  - Continually ventilated with at least 12 air changes per hour: Class 1, Division 2 (Table 4.2.2, Row 16b)

Drywell

- Installation: Below grade; physically separated from wet well
- Ventilation: Ventilated
- NEC Hazard Classification:
  - Continually ventilated at less than 6 air change per hour: Class 1, Division 2 (Table 4.2.2, Row 17b)
  - Continually ventilated with at least 6 air changes per hour: Unclassified (Table 4.2.2, Row 17a)

## Recommended Improvements to the Ventilation

1. A full ventilation system evaluation should be performed to ensure complete compliance with Chapter 9 of NFPA 820-2016 and other sections as applicable.

2. The drywell should be continuously ventilated at a minimum of 6 air changes per hour. In addition, the ventilation system should be monitored and alarmed in accordance with section 7.5 of NFPA 820-2016.

3. Relocate the Exhaust Fan Control Panel or the dry transformer to comply with the working spaces requirements of the National Electric Code -- NFPA 70-2014 Table 110.26(A)(1) condition 2.

# Technical Memorandum

## Capacity and Process Control Optimization


**May 2017**

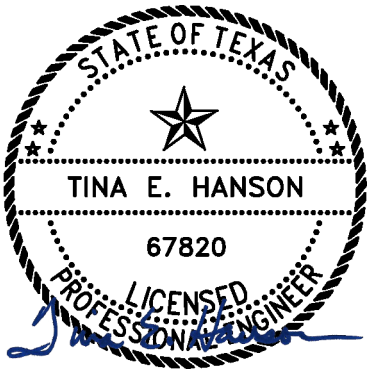
**Prepared by:**


**3010 Gaylord Parkway, Suite 190**
**Frisco, TX 75034**
**TBPE Registration No. F-5713**

**Garver Project No. 16088080**

## Engineer's Certification

I hereby certify that this Capacity and Process Control Optimization Technical Memorandum for the Town of Addison Kellway Wastewater Lift Station project was prepared under my direct supervision on May 26, 2017 for the Town of Addison.




Tina E. Hanson, PE
State of Texas PE License No. 67820


Jeffrey L. Sober, PE
State of Texas PE License No. 103772

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## 1.0 Introduction

This technical memorandum evaluates the existing operation of the Kellway Lift Station located in Addison, Texas. The Kellway Lift Station was originally constructed in 1996, and services the surrounding residential areas and commercial businesses in sanitary sewage basins B and J (*July 1996, Report on 1996 Wastewater Collection System*). The lift station includes two 50 hp pumps and a buildout for a future third pump. The pumps are Fairbanks series 5400 Solids-Handling Pumps with a 10.6-inch impeller diameter. Ultimate lift station capacity is 2.0 MGD (firm) when three pumps are in service with each pump rated for an ultimate capacity of 1.0 MGD. The facility is designed to handle flow events with one pump online and the second utilized as a back-up.

The following sections summarize the historical flow rates, current pump control schemes, and current capacity. Also presented are the process control optimization recommendations.

## 2.0 Historical Flows

Daily flow data for the Kellway Lift Station from January 2014 through August 2016 was analyzed. Flows reported as zero were disregarded in the analysis and considered as outliers. From this data the following information was evaluated:

1. Annual average
2. Monthly averages
3. 25$^{th}$ percentile
4. 75$^{th}$ percentile
5. Minimum
6. Maximum

The monthly and annual results for the data provided are presented in Attachment A.

The Kellway Lift Station's annual average flow for January 2014 through August 2016 is approximately 0.15 MGD. Figure 2-1 depicts the historical flow, the annual average flow, and the lift station capacity with one pump, rated at 910 gpm (1.31 MGD), in operation.

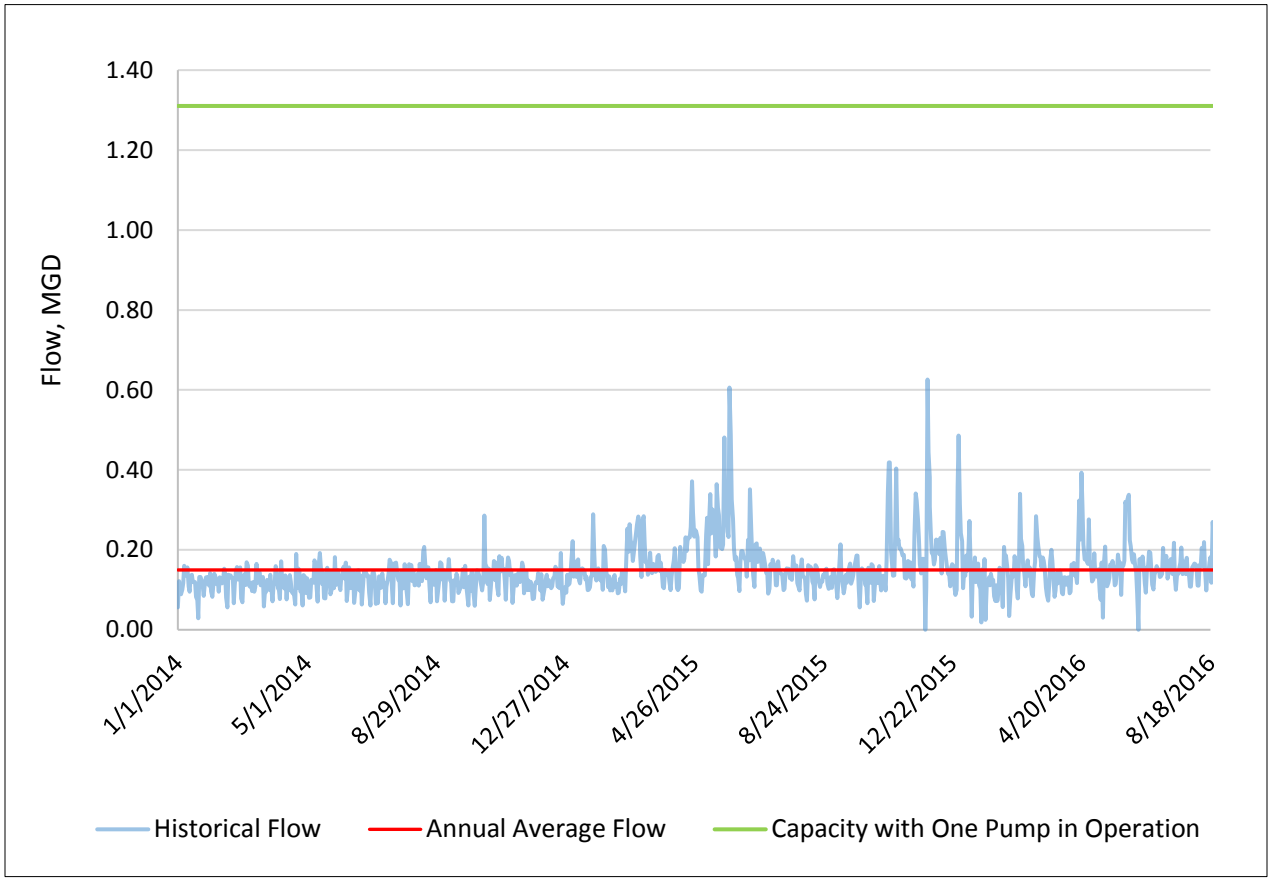


**Figure 2-1: Historical Daily Flow Data from January 2014 to August 2016**

The Temporary Flow Monitoring and Condition Assessment Final Report from October 2015 contains peaking factors for various meter sites. The area containing the Kellway Lift Station exhibits a peaking factor of 2.7 under wet weather conditions. This peaking factor was applied to the average annual flow for the Kellway Lift Station to determine the highest expected peak flow the lift station must handle.

Figure 2-2 shows the historical flow data adjusted by the peaking factor. With the applied peaking factor, flows up 1.69 MGD are possible. In this situation, one pump (1.31 MGD) in operation is insufficient to handle the expected inflows. During May and June of 2015, the Town of Addison experienced several wet weather events, accounting for the higher than average flow rates during that time. During this period, the highest total daily flow is 0.61 MGD, which results in a peak daily flow of 1.64 MGD when adjusted by the peaking factor.

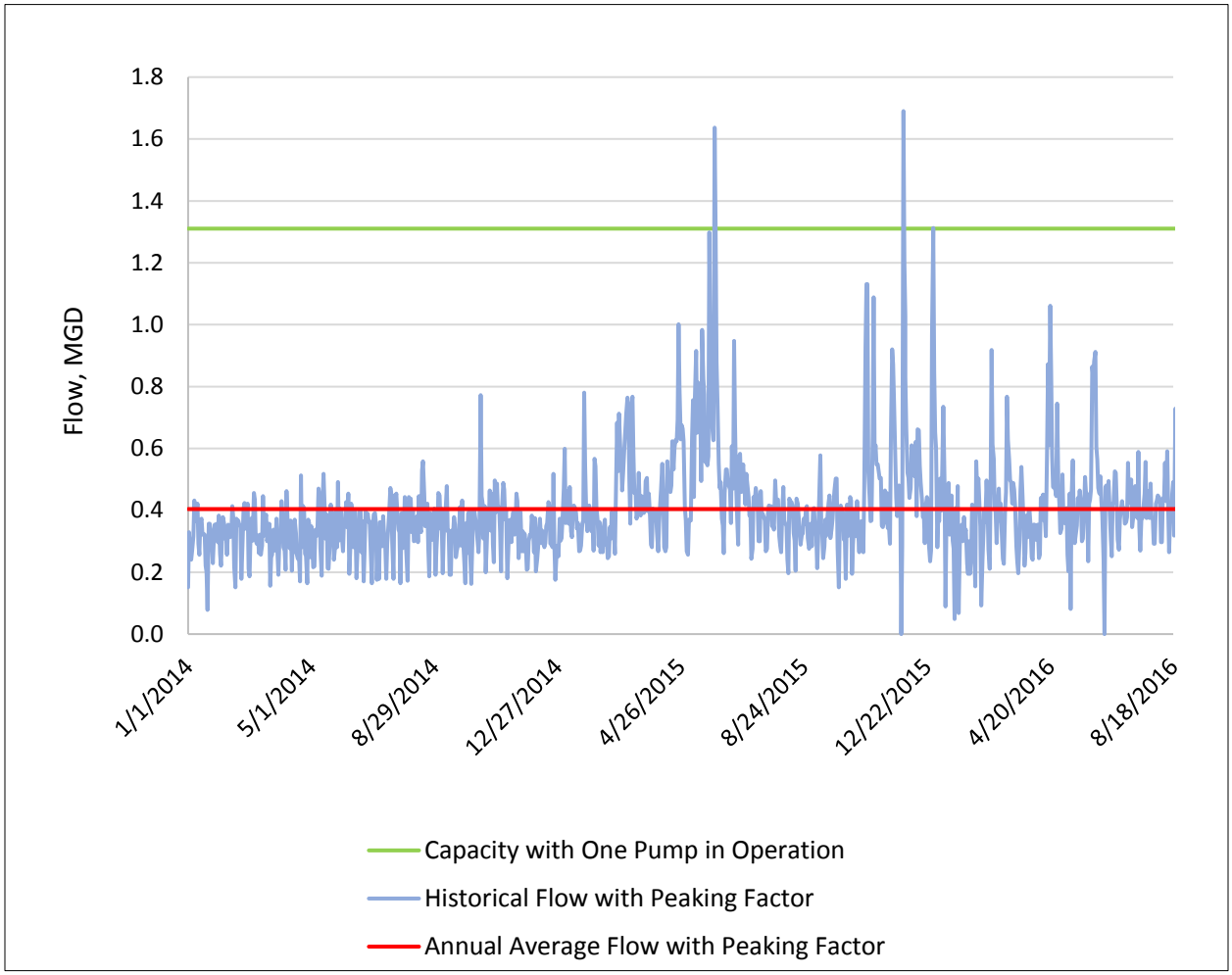


**Figure 2-2: Historical Daily Flow Data Adjusted with Peaking Factor**

## 3.0 Existing Operational Strategy

The Kellway Lift Station currently has two pumps in operation with a build out for a third pump. The existing pumps are Fairbanks series 5400 Solids-Handling Pumps with a 10.6-inch impeller diameter. These pumps operate with a 50 hp U.S. Electrical Motor. The ultimate lift station capacity is rated for 3.0 MGD (2.0 MGD firm with one pump as standby) at full build out.

Under average flow conditions, the facility can adequately handle all flow with one pump online and the second pump operating as a backup. The originally designed pump on / pump off control elevations from the 1996 plans have recently been updated, per Town staff. Original and current pump control settings are summarized in Table 3-1.

**Table 3-1: Pump Control Settings**

| | Wet Well Level (original) | Wet Well Level (current) |
|---|---|---|
| Pump 1 On | 6.5’ | 16.0’ |
| Pump 2 On | 9.0’ | 17.0’ |
| All Pumps Off | 4.0’ | 6.0’ |
| High Level Alarm | 11.0’ | |

The existing 15-inch influent line feeding the wet well is at an elevation of approximately 8.5 feet from the bottom of the wet well to the centerline of the influent pipe. At the current level control settings, the influent pipe will become surcharged. Surcharged pipes often cause settling in the influent line, which can lead to operational concerns over time. Therefore, it is recommended to update the pump control settings to minimize surcharging of the upstream gravity sewer. Refer to Section 7.0 for recommended pump control settings.

## 4.0 Projected Flows

The Kellway Lift Station is expected to handle a total peak daily flow of 2.62 MGD, based on the 1996 Report on the Wastewater Collection System. The flow is divided into Basins B and J with 2.45 MGD from Basin B, and 0.17 MGD from Basin J. Basins B and J consist primarily of commercial and retail properties and one section of multi-family housing. The wastewater master plan for the Town of Addison is currently being updated, which may have an effect on this anticipated peak flow.

The Texas Commission on Environmental Quality (TCEQ) requires that pump stations maintain redundancy. For dual-pump lift stations, this requires that one pump be adequate to handle all anticipated flows, and for three-pump lift stations, two pumps must be able to handle all anticipated flows.

The two existing pumps at the Kellway Lift Station operating together at their rated capacity are able to handle both the maximum expected daily inflow of 1.7 MGD, based on the metered flow data, and the possible maximum of 2.62 MGD from the 1996 report on the Wastewater Collection System. However, this does not meet the redundancy requirements of TCEQ. Therefore, it is recommended that a third pump be installed to meet TCEQ requirements and provide full redundancy. The proposed pump and system curves provided by Odessa Pumps are shown in Figure 4-1.

PENTAIR

**Customer** :
**Project name** : Default

**Pump Performance Datasheet**
Encompass 2.0 - 16.4.1.0

| | | | |
|---|---|---|---|
| Item number | : 024 | Size | : 5" 54X3 |
| Service | : | Stages | : 1 |
| Quantity | : 1 | Based on curve number | : 5-54x3-1800-T5C1A |
| Quote number | : 234453 | Date last saved | : 12 Sep 2016 2:51 PM |

**Operating Conditions**

| | |
|---|---|
| Flow, rated | : 910.0 USgpm |
| Differential head / pressure, rated (requested) | : 90.00 ft |
| Differential head / pressure, rated (actual) | : 90.22 ft |
| Suction pressure, rated / max | : 0.00 / 0.00 psi.g |
| NPSH available, rated | : Ample |
| Frequency | : 60 Hz |

**Performance**

| | |
|---|---|
| Speed, rated | : 1780 rpm |
| Impeller diameter, rated | : 10.52 in |
| Impeller diameter, maximum | : 12.00 in |
| Impeller diameter, minimum | : 9.00 in |
| Efficiency | : 70.11 % |
| NPSH required / margin required | : 24.28 / 0.00 ft |
| nq (imp. eye flow) / S (imp. eye flow) | : 40 / 116 Metric units |
| Minimum Continuous Stable Flow | : 473.0 USgpm |
| Head, maximum, rated diameter | : 116.9 ft |
| Head rise to shutoff | : 29.93 % |
| Flow, best eff. point | : 1,487.0 USgpm |
| Flow ratio, rated / BEP | : 61.20 % |
| Diameter ratio (rated / max) | : 87.67 % |
| Head ratio (rated dia / max dia) | : 67.29 % |
| Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010] | : 1.00 / 1.00 / 1.00 / 1.00 |
| Selection status | : Acceptable |

**Liquid**

| | |
|---|---|
| Liquid type | : Water |
| Additional liquid description | : |
| Solids diameter, max | : 0.00 in |
| Solids concentration, by volume | : 0.00 % |
| Temperature, max | : 68.00 deg F |
| Fluid density, rated / max | : 1.000 / 1.000 SG |
| Viscosity, rated | : 1.00 cP |
| Vapor pressure, rated | : 0.34 psi.a |

**Material**

| | |
|---|---|
| Material selected | : Cast Iron |

**Pressure Data**

| | |
|---|---|
| Maximum working pressure | : 50.61 psi.g |
| Maximum allowable working pressure | : 85.00 psi.g |
| Maximum allowable suction pressure | : N/A |
| Hydrostatic test pressure | : 125.0 psi.g |

**Driver & Power Data**

| | |
|---|---|
| Driver sizing specification | : Maximum power |
| Margin over specification | : 0.00 % |
| Service factor | : 1.00 |
| Power, hydraulic | : 20.68 hp |
| Power, rated | : 29.49 hp |
| Power, maximum, rated diameter | : 33.93 hp |
| Minimum recommended motor rating | : 40.00 hp / 29.83 kW |

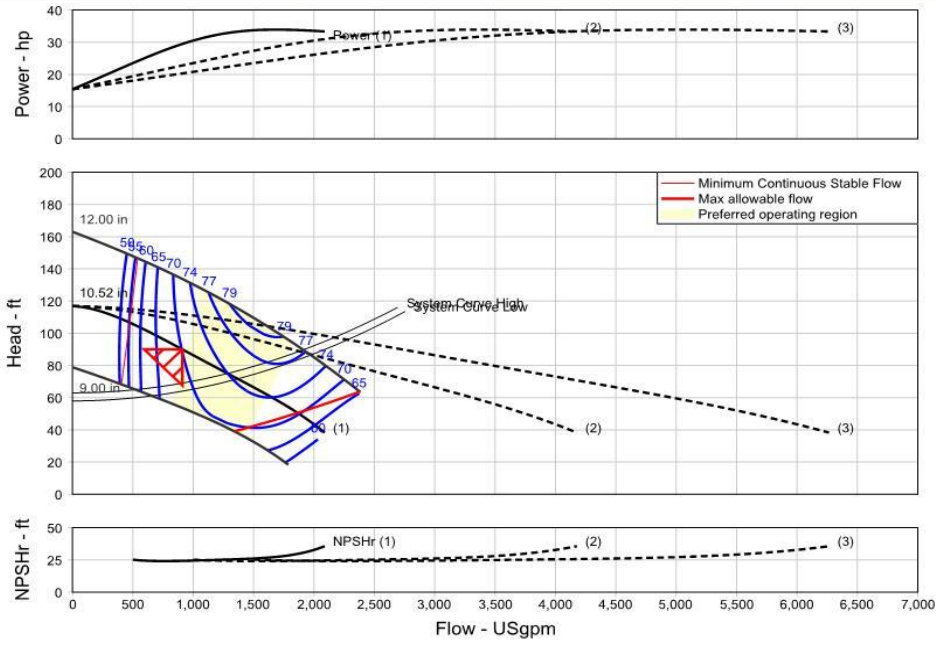


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**Figure 4-1: Proposed Pump and System Curves provided by Odessa Pumps**

## 5.0 Pump Performance

A pump performance curve was provided by Pentair Pump Group for the existing impeller diameter of 10.6 inches. System curves representing the current pump operation for both high and low static heads are shown in Figure 5-1 and Figure 5-2. These curves correspond to the system conditions at the minimum and maximum expected water surface elevations in the wet well, and when discharge from the lift station passes through both the 8- and 12-inch force mains, it is shown as dashed lines. However, according to Town staff, the discharge flow normally is restricted to just the 8-inch force main, with the 12-inch force main closed off. To account for this change in flow pattern, a second set of system curves are displayed also as solid lines. The field test pump curves are based on field measurements recorded by Garver and Town staff on August 19th, 2016 for both Pump 1 and Pump 2 for various flow rates and water surface elevations in the wet well, with all flow passing through only the 8-inch force main.

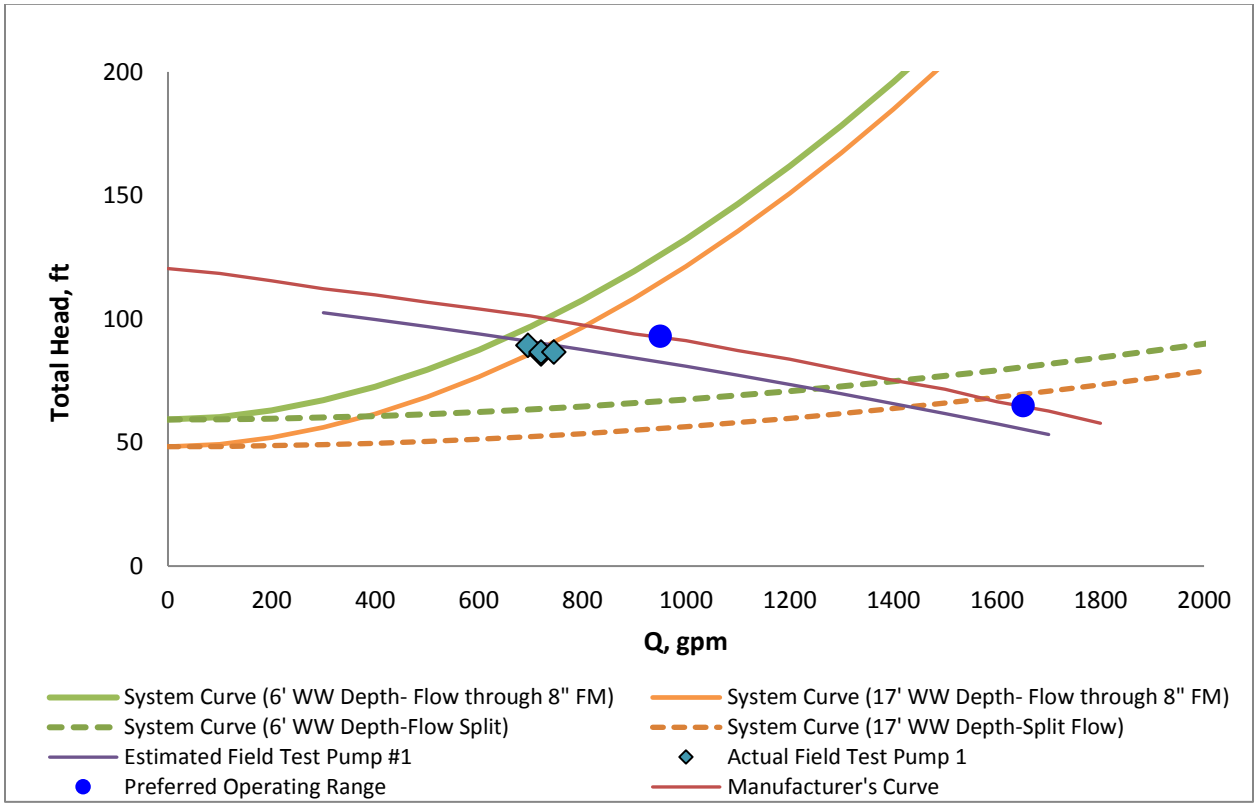


**Figure 5-1: Existing Pump 1 Performance and System Curves**

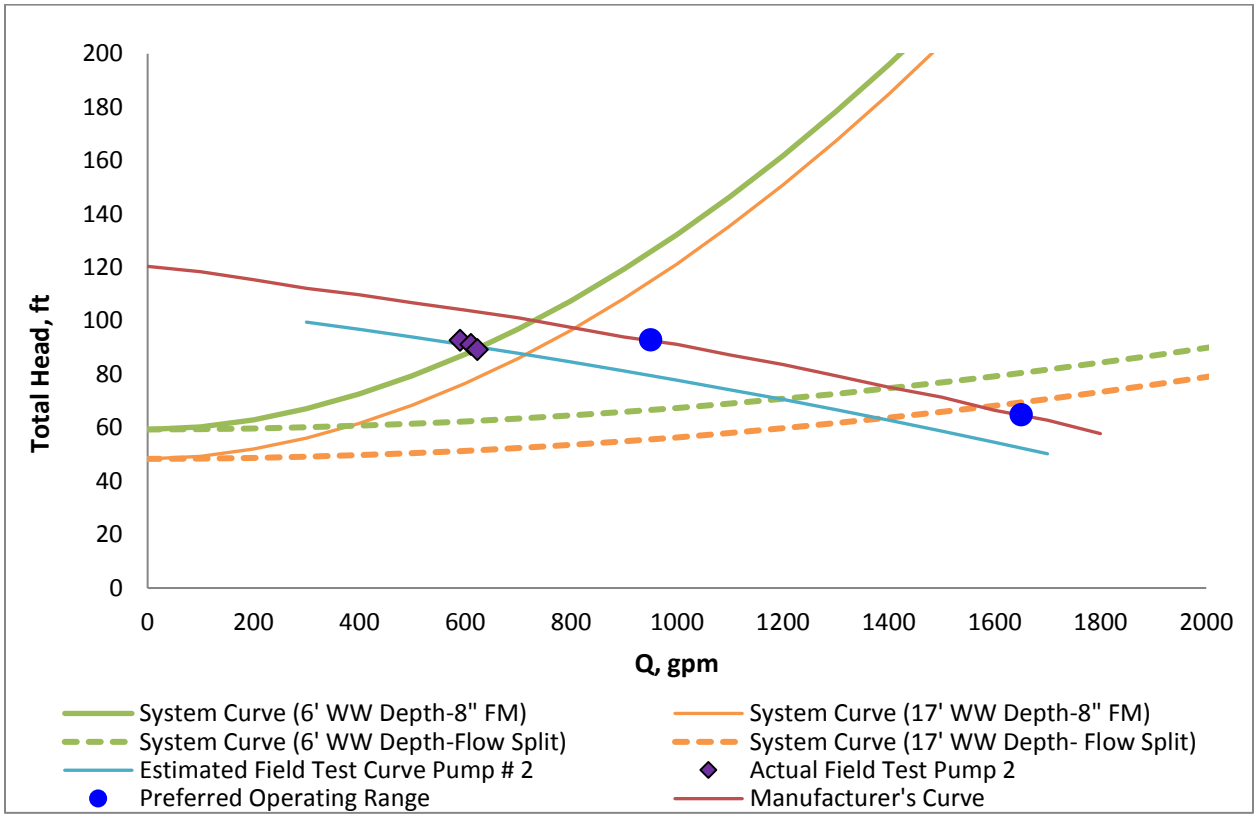


**Figure 5-2: Existing Pump 2 Performance and System Curves**

Based on the field test where only the 8-inch force main was in service, Pumps 1 and 2 are currently operating out of the preferred operation range as the system curves intersect the pump curves to the left of the preferred operating range. However, if the discharge flow passes through both of the force mains, the system curve intersects the pump curve within the pump operating range, resulting in greater pumping efficiency and a longer life for the pump equipment.

The current pump impellers are not performing as designed, as the pump curves from the field test do not align with the manufacturer's pump curve for an impeller size of 10.6 inches. Using the system curve for all the flow passing through only the 8-inch force main and the field test curves, Pumps 1 and 2 show reduced capacities of 9.1% (70 gpm) and 14.3% (110 gpm) respectively. It is likely that the pump impellers are worn resulting in diminished capacity and inefficient operation. Replacing the impellers of the existing pumps is recommended in order to restore pump capacity and increase the pump efficiency.

Upon installing the third pump and replacing the impellers of the existing pumps, two pumps will handle the expected peak daily flow of 1820 gpm (2.62 MGD) and the third pump will operate as

a backup. Figure 5-3 shows the proposed operating points for two pumps in parallel, each rated for a flow of approximately 910 gpm (1.31 MGD) and a differential head of 90 feet. System curves representing the proposed pump control operation were prepared for both high and low static heads, corresponding to the system conditions at the minimum and maximum expected water surface elevation in the wet well with the flow passing through both the 8- and 12-inch force mains. The proposed pump control operation points are described in Section 7.0 Recommendations.

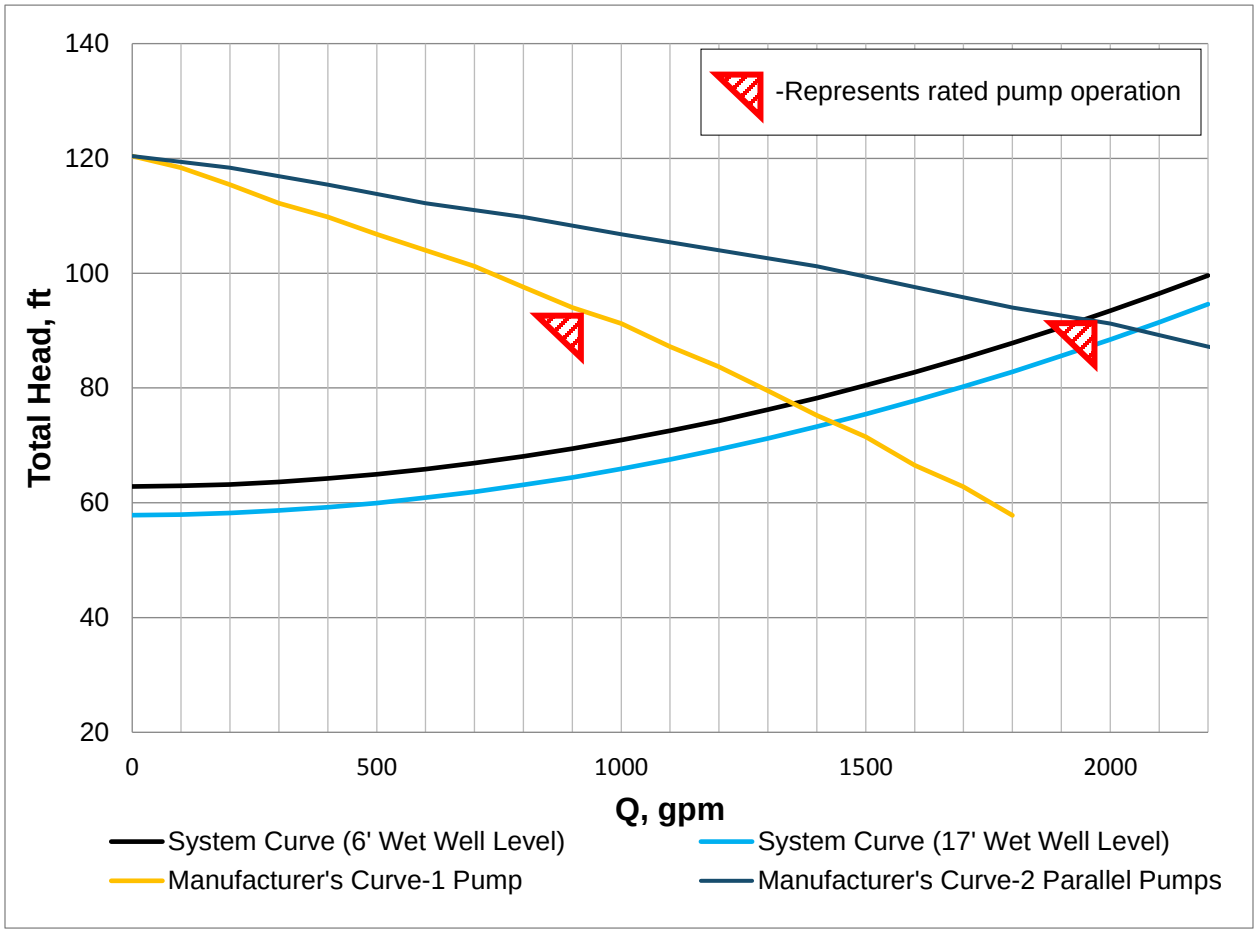


**Figure 5-3: Proposed Operating Points for Recommended System Changes**

## 6.0 Evaluation of Pipe Suction Velocities

The individual pipe sections were evaluated based on the proposed changes in pump capacity to determine if the pipe suction velocities are in the range of 3 ft/s to 7 ft/s as required by Section §217.62 (c) of the Texas Administrative Code (TAC). Pipe suction velocities were calculated for both single and dual-pump operation. Table 6-1 shows the suction velocities for the different pipe diameters in the Kellway Lift Station under different operating conditions.

**Table 6-1: Pipe Suction Velocities for Various Diameters and Operating Conditions**

| Pipe Diameter (in) | Velocity (ft/s) for 1 Pump Operating (1320 gpm) | Velocity (ft/s) for 2 Pumps Operating (1820 gpm) |
|---|---|---|
| 8 | **8.4** | 5.8 |
| 10 | 5.4 | 3.7 |
| 12 | 3.7 | **2.6** |

Although some of the pipe velocities are greater than the maximum velocity of 7 ft/s specified by Section §217.62 (c) of the TAC, these velocities occur in relatively short spans of pipe and are unlikely to cause high friction losses in the system. When two pumps are in operation, the velocities in the 12-inch pipes are less than the required 3 ft/s specified by TCEQ regulations. However, as the system normally operates with only 1 pump, the system will have sufficient flushing velocity a majority of the time, which minimizes the likelihood of sediment deposit.

## 7.0 Recommendations

After evaluating the data outlined in previous sections and analyzing the findings, the following improvements are recommended:

1. Install a third pump for redundancy and for peak flow capacity. The pump controls should include alternation between all three pumps so the pumps wear evenly.
2. Replace impellers of existing pumps with same diameter impeller as originally designed (10.6 inch) to restore pump capacity and increase efficiency.

In order to prevent settling in the existing 15-inch influent line feeding the wet well, and to aid in odor control, new pump control settings are recommended as shown in Table 7-1.

**Table 7-1: Recommended Pump Control Settings**

| | Wet Well Level (recommended) |
|---|---|
| Pump 1 On | 5.0’ |
| Pump 2 On | 6.0’ |
| Pump 3 On | 7.5’ |
| All Pumps Off | 2.5’ |
| High Level Alarm | 12.0’ |

The recommended pump control settings are designed so that the number of starts per hour for each pump is minimized, reducing wear and tear on the pump motor. The high level alarm is set at the wet well level from 1996 plans for the ultimate design of 3 pumps.

# Attachment A

**Table A-1: Historical Daily Flow Data Analysis**

| | Average Monthly Influent Flow (MGD) | 25th Percentile Flow (MGD) | 75th Percentile Flow (MGD) | Minimum Flow (MGD) | Maximum Flow (MGD) |
|---|---|---|---|---|---|
| January 2014 | 0.114 | 0.096 | 0.132 | 0.029 | 0.160 |
| February 2014 | 0.121 | 0.112 | 0.140 | 0.056 | 0.157 |
| March 2014 | 0.114 | 0.097 | 0.132 | 0.058 | 0.169 |
| April 2014 | 0.116 | 0.094 | 0.137 | 0.061 | 0.190 |
| May 2014 | 0.125 | 0.103 | 0.150 | 0.070 | 0.192 |
| June 2014 | 0.121 | 0.099 | 0.146 | 0.061 | 0.168 |
| July 2014 | 0.123 | 0.105 | 0.145 | 0.061 | 0.175 |
| August 2014 | 0.131 | 0.111 | 0.156 | 0.064 | 0.207 |
| September 2014 | 0.121 | 0.099 | 0.144 | 0.061 | 0.177 |
| October 2014 | 0.137 | 0.107 | 0.153 | 0.060 | 0.286 |
| November 2014 | 0.123 | 0.099 | 0.146 | 0.067 | 0.181 |
| December 2014 | 0.117 | 0.104 | 0.133 | 0.065 | 0.192 |
| January 2015 | 0.145 | 0.123 | 0.154 | 0.099 | 0.289 |
| February 2015 | 0.149 | 0.108 | 0.193 | 0.091 | 0.264 |
| March 2015 | 0.181 | 0.145 | 0.216 | 0.104 | 0.284 |
| April 2015 | 0.191 | 0.147 | 0.231 | 0.099 | 0.371 |
| May 2015 | 0.260 | 0.183 | 0.305 | 0.095 | 0.606 |
| June 2015 | 0.185 | 0.166 | 0.203 | 0.097 | 0.351 |
| July 2015 | 0.142 | 0.125 | 0.160 | 0.090 | 0.184 |
| August 2015 | 0.129 | 0.107 | 0.153 | 0.073 | 0.176 |
| September 2015 | 0.135 | 0.115 | 0.156 | 0.056 | 0.214 |
| October 2015 | 0.171 | 0.118 | 0.172 | 0.066 | 0.419 |
| November 2015 | 0.214 | 0.132 | 0.230 | 0.106 | 0.626 |
| December 2015 | 0.203 | 0.156 | 0.242 | 0.087 | 0.486 |
| January 2016 | 0.129 | 0.107 | 0.151 | 0.018 | 0.272 |
| February 2016 | 0.143 | 0.103 | 0.176 | 0.034 | 0.340 |
| March 2016 | 0.149 | 0.112 | 0.174 | 0.073 | 0.284 |
| April 2016 | 0.171 | 0.124 | 0.186 | 0.089 | 0.393 |
| May 2016 | 0.147 | 0.118 | 0.168 | 0.030 | 0.320 |
| June 2016 | 0.174 | 0.142 | 0.190 | 0.090 | 0.338 |
| July 2016 | 0.151 | 0.138 | 0.168 | 0.100 | 0.218 |
| August 2016 | 0.163 | 0.137 | 0.175 | 0.098 | 0.270 |
| **Annual** | **0.150** | **0.112** | **0.168** | **0.000** | **0.626** |

**Table A-2: Historical Daily Flow Data**

| Date | Daily Flow (MGD) | Average Daily Flow*Peaking Factor (MGD) |
|---|---|---|
| 1/1/2014 | 0.056 | 0.1512 |
| 1/2/2014 | 0.122 | 0.3294 |
| 1/3/2014 | 0.096 | 0.2592 |
| 1/4/2014 | 0.089 | 0.2403 |
| 1/5/2014 | 0.1 | 0.27 |
| 1/6/2014 | 0.117 | 0.3159 |
| 1/7/2014 | 0.16 | 0.432 |
| 1/8/2014 | 0.139 | 0.3753 |
| 1/9/2014 | 0.135 | 0.3645 |
| 1/10/2014 | 0.156 | 0.4212 |
| 1/11/2014 | 0.108 | 0.2916 |
| 1/12/2014 | 0.095 | 0.2565 |
| 1/13/2014 | 0.134 | 0.3618 |
| 1/14/2014 | 0.138 | 0.3726 |
| 1/15/2014 | 0.119 | 0.3213 |
| 1/16/2014 | 0.12 | 0.324 |
| 1/17/2014 | 0.119 | 0.3213 |
| 1/18/2014 | 0.082 | 0.2214 |
| 1/19/2014 | 0.074 | 0.1998 |
| 1/20/2014 | 0.029 | 0.0783 |
| 1/21/2014 | 0.132 | 0.3564 |
| 1/22/2014 | 0.132 | 0.3564 |
| 1/23/2014 | 0.125 | 0.3375 |
| 1/24/2014 | 0.118 | 0.3186 |
| 1/25/2014 | 0.085 | 0.2295 |
| 1/26/2014 | 0.111 | 0.2997 |
| 1/27/2014 | 0.131 | 0.3537 |
| 1/28/2014 | 0.116 | 0.3132 |
| 1/29/2014 | 0.132 | 0.3564 |
| 1/30/2014 | 0.11 | 0.297 |
| 1/31/2014 | 0.142 | 0.3834 |
| 2/1/2014 | 0.096 | 0.2592 |
| 2/2/2014 | 0.082 | 0.2214 |
| 2/3/2014 | 0.112 | 0.3024 |
| 2/4/2014 | 0.14 | 0.378 |
| 2/5/2014 | 0.132 | 0.3564 |
| 2/6/2014 | 0.114 | 0.3078 |
| 2/7/2014 | 0.122 | 0.3294 |

| | | |
|---|---|---|
| 2/8/2014 | 0.095 | 0.2565 |
| 2/9/2014 | 0.131 | 0.3537 |
| 2/10/2014 | 0.121 | 0.3267 |
| 2/11/2014 | 0.116 | 0.3132 |
| 2/12/2014 | 0.121 | 0.3267 |
| 2/13/2014 | 0.153 | 0.4131 |
| 2/14/2014 | 0.14 | 0.378 |
| 2/15/2014 | 0.081 | 0.2187 |
| 2/16/2014 | 0.056 | 0.1512 |
| 2/17/2014 | 0.138 | 0.3726 |
| 2/18/2014 | 0.136 | 0.3672 |
| 2/19/2014 | 0.136 | 0.3672 |
| 2/20/2014 | 0.13 | 0.351 |
| 2/21/2014 | 0.13 | 0.351 |
| 2/22/2014 | 0.066 | 0.1782 |
| 2/23/2014 | 0.113 | 0.3051 |
| 2/24/2014 | 0.15 | 0.405 |
| 2/25/2014 | 0.157 | 0.4239 |
| 2/26/2014 | 0.126 | 0.3402 |
| 2/27/2014 | 0.149 | 0.4023 |
| 2/28/2014 | 0.156 | 0.4212 |
| 3/1/2014 | 0.078 | 0.2106 |
| 3/2/2014 | 0.069 | 0.1863 |
| 3/3/2014 | 0.13 | 0.351 |
| 3/4/2014 | 0.139 | 0.3753 |
| 3/5/2014 | 0.112 | 0.3024 |
| 3/6/2014 | 0.169 | 0.4563 |
| 3/7/2014 | 0.161 | 0.4347 |
| 3/8/2014 | 0.112 | 0.3024 |
| 3/9/2014 | 0.108 | 0.2916 |
| 3/10/2014 | 0.118 | 0.3186 |
| 3/11/2014 | 0.097 | 0.2619 |
| 3/12/2014 | 0.119 | 0.3213 |
| 3/13/2014 | 0.095 | 0.2565 |
| 3/14/2014 | 0.106 | 0.2862 |
| 3/15/2014 | 0.165 | 0.4455 |
| 3/16/2014 | 0.118 | 0.3186 |
| 3/17/2014 | 0.139 | 0.3753 |
| 3/18/2014 | 0.143 | 0.3861 |
| 3/19/2014 | 0.111 | 0.2997 |
| 3/20/2014 | 0.117 | 0.3159 |
| 3/21/2014 | 0.132 | 0.3564 |

| | | |
|---|---|---|
| 3/22/2014 | 0.058 | 0.1566 |
| 3/23/2014 | 0.092 | 0.2484 |
| 3/24/2014 | 0.095 | 0.2565 |
| 3/25/2014 | 0.125 | 0.3375 |
| 3/26/2014 | 0.117 | 0.3159 |
| 3/27/2014 | 0.1 | 0.27 |
| 3/28/2014 | 0.138 | 0.3726 |
| 3/29/2014 | 0.098 | 0.2646 |
| 3/30/2014 | 0.071 | 0.1917 |
| 3/31/2014 | 0.109 | 0.2943 |
| 4/1/2014 | 0.12 | 0.324 |
| 4/2/2014 | 0.159 | 0.4293 |
| 4/3/2014 | 0.143 | 0.3861 |
| 4/4/2014 | 0.104 | 0.2808 |
| 4/5/2014 | 0.1 | 0.27 |
| 4/6/2014 | 0.077 | 0.2079 |
| 4/7/2014 | 0.171 | 0.4617 |
| 4/8/2014 | 0.127 | 0.3429 |
| 4/9/2014 | 0.132 | 0.3564 |
| 4/10/2014 | 0.103 | 0.2781 |
| 4/11/2014 | 0.136 | 0.3672 |
| 4/12/2014 | 0.076 | 0.2052 |
| 4/13/2014 | 0.115 | 0.3105 |
| 4/14/2014 | 0.098 | 0.2646 |
| 4/15/2014 | 0.137 | 0.3699 |
| 4/16/2014 | 0.121 | 0.3267 |
| 4/17/2014 | 0.095 | 0.2565 |
| 4/18/2014 | 0.09 | 0.243 |
| 4/19/2014 | 0.09 | 0.243 |
| 4/20/2014 | 0.063 | 0.1701 |
| 4/21/2014 | 0.19 | 0.513 |
| 4/22/2014 | 0.104 | 0.2808 |
| 4/23/2014 | 0.153 | 0.4131 |
| 4/24/2014 | 0.148 | 0.3996 |
| 4/25/2014 | 0.096 | 0.2592 |
| 4/26/2014 | 0.094 | 0.2538 |
| 4/27/2014 | 0.061 | 0.1647 |
| 4/28/2014 | 0.137 | 0.3699 |
| 4/29/2014 | 0.133 | 0.3591 |
| 4/30/2014 | 0.092 | 0.2484 |
| 5/1/2014 | 0.129 | 0.3483 |
| 5/2/2014 | 0.107 | 0.2889 |

| | | |
|---|---|---|
| 5/3/2014 | 0.08 | 0.216 |
| 5/4/2014 | 0.081 | 0.2187 |
| 5/5/2014 | 0.125 | 0.3375 |
| 5/6/2014 | 0.125 | 0.3375 |
| 5/7/2014 | 0.118 | 0.3186 |
| 5/8/2014 | 0.174 | 0.4698 |
| 5/9/2014 | 0.166 | 0.4482 |
| 5/10/2014 | 0.103 | 0.2781 |
| 5/11/2014 | 0.07 | 0.189 |
| 5/12/2014 | 0.16 | 0.432 |
| 5/13/2014 | 0.192 | 0.5184 |
| 5/14/2014 | 0.157 | 0.4239 |
| 5/15/2014 | 0.114 | 0.3078 |
| 5/16/2014 | 0.143 | 0.3861 |
| 5/17/2014 | 0.079 | 0.2133 |
| 5/18/2014 | 0.078 | 0.2106 |
| 5/19/2014 | 0.11 | 0.297 |
| 5/20/2014 | 0.155 | 0.4185 |
| 5/21/2014 | 0.122 | 0.3294 |
| 5/22/2014 | 0.145 | 0.3915 |
| 5/23/2014 | 0.089 | 0.2403 |
| 5/24/2014 | 0.101 | 0.2727 |
| 5/25/2014 | 0.147 | 0.3969 |
| 5/26/2014 | 0.104 | 0.2808 |
| 5/27/2014 | 0.182 | 0.4914 |
| 5/28/2014 | 0.112 | 0.3024 |
| 5/29/2014 | 0.15 | 0.405 |
| 5/30/2014 | 0.148 | 0.3996 |
| 5/31/2014 | 0.114 | 0.3078 |
| 6/1/2014 | 0.099 | 0.2673 |
| 6/2/2014 | 0.134 | 0.3618 |
| 6/3/2014 | 0.136 | 0.3672 |
| 6/4/2014 | 0.158 | 0.4266 |
| 6/5/2014 | 0.128 | 0.3456 |
| 6/6/2014 | 0.168 | 0.4536 |
| 6/7/2014 | 0.072 | 0.1944 |
| 6/8/2014 | 0.099 | 0.2673 |
| 6/9/2014 | 0.156 | 0.4212 |
| 6/10/2014 | 0.148 | 0.3996 |
| 6/11/2014 | 0.104 | 0.2808 |
| 6/12/2014 | 0.145 | 0.3915 |
| 6/13/2014 | 0.146 | 0.3942 |

| | | |
|---|---|---|
| 6/14/2014 | 0.067 | 0.1809 |
| 6/15/2014 | 0.097 | 0.2619 |
| 6/16/2014 | 0.109 | 0.2943 |
| 6/17/2014 | 0.148 | 0.3996 |
| 6/18/2014 | 0.149 | 0.4023 |
| 6/19/2014 | 0.098 | 0.2646 |
| 6/20/2014 | 0.135 | 0.3645 |
| 6/21/2014 | 0.063 | 0.1701 |
| 6/22/2014 | 0.101 | 0.2727 |
| 6/23/2014 | 0.147 | 0.3969 |
| 6/24/2014 | 0.139 | 0.3753 |
| 6/25/2014 | 0.144 | 0.3888 |
| 6/26/2014 | 0.134 | 0.3618 |
| 6/27/2014 | 0.135 | 0.3645 |
| 6/28/2014 | 0.093 | 0.2511 |
| 6/29/2014 | 0.061 | 0.1647 |
| 6/30/2014 | 0.125 | 0.3375 |
| 7/1/2014 | 0.143 | 0.3861 |
| 7/2/2014 | 0.145 | 0.3915 |
| 7/3/2014 | 0.133 | 0.3591 |
| 7/4/2014 | 0.065 | 0.1755 |
| 7/5/2014 | 0.101 | 0.2727 |
| 7/6/2014 | 0.066 | 0.1782 |
| 7/7/2014 | 0.134 | 0.3618 |
| 7/8/2014 | 0.133 | 0.3591 |
| 7/9/2014 | 0.105 | 0.2835 |
| 7/10/2014 | 0.141 | 0.3807 |
| 7/11/2014 | 0.119 | 0.3213 |
| 7/12/2014 | 0.116 | 0.3132 |
| 7/13/2014 | 0.066 | 0.1782 |
| 7/14/2014 | 0.108 | 0.2916 |
| 7/15/2014 | 0.125 | 0.3375 |
| 7/16/2014 | 0.143 | 0.3861 |
| 7/17/2014 | 0.175 | 0.4725 |
| 7/18/2014 | 0.168 | 0.4536 |
| 7/19/2014 | 0.109 | 0.2943 |
| 7/20/2014 | 0.066 | 0.1782 |
| 7/21/2014 | 0.166 | 0.4482 |
| 7/22/2014 | 0.162 | 0.4374 |
| 7/23/2014 | 0.168 | 0.4536 |
| 7/24/2014 | 0.14 | 0.378 |
| 7/25/2014 | 0.125 | 0.3375 |

| | | |
|---|---|---|
| 7/26/2014 | 0.122 | 0.3294 |
| 7/27/2014 | 0.061 | 0.1647 |
| 7/28/2014 | 0.145 | 0.3915 |
| 7/29/2014 | 0.103 | 0.2781 |
| 7/30/2014 | 0.106 | 0.2862 |
| 7/31/2014 | 0.164 | 0.4428 |
| 8/1/2014 | 0.112 | 0.3024 |
| 8/2/2014 | 0.089 | 0.2403 |
| 8/3/2014 | 0.064 | 0.1728 |
| 8/4/2014 | 0.164 | 0.4428 |
| 8/5/2014 | 0.161 | 0.4347 |
| 8/6/2014 | 0.162 | 0.4374 |
| 8/7/2014 | 0.122 | 0.3294 |
| 8/8/2014 | 0.149 | 0.4023 |
| 8/9/2014 | 0.111 | 0.2997 |
| 8/10/2014 | 0.112 | 0.3024 |
| 8/11/2014 | 0.117 | 0.3159 |
| 8/12/2014 | 0.141 | 0.3807 |
| 8/13/2014 | 0.11 | 0.297 |
| 8/14/2014 | 0.165 | 0.4455 |
| 8/15/2014 | 0.127 | 0.3429 |
| 8/16/2014 | 0.122 | 0.3294 |
| 8/17/2014 | 0.196 | 0.5292 |
| 8/18/2014 | 0.207 | 0.5589 |
| 8/19/2014 | 0.168 | 0.4536 |
| 8/20/2014 | 0.129 | 0.3483 |
| 8/21/2014 | 0.155 | 0.4185 |
| 8/22/2014 | 0.156 | 0.4212 |
| 8/23/2014 | 0.102 | 0.2754 |
| 8/24/2014 | 0.069 | 0.1863 |
| 8/25/2014 | 0.145 | 0.3915 |
| 8/26/2014 | 0.13 | 0.351 |
| 8/27/2014 | 0.113 | 0.3051 |
| 8/28/2014 | 0.137 | 0.3699 |
| 8/29/2014 | 0.15 | 0.405 |
| 8/30/2014 | 0.071 | 0.1917 |
| 8/31/2014 | 0.102 | 0.2754 |
| 9/1/2014 | 0.124 | 0.3348 |
| 9/2/2014 | 0.169 | 0.4563 |
| 9/3/2014 | 0.166 | 0.4482 |
| 9/4/2014 | 0.126 | 0.3402 |
| 9/5/2014 | 0.15 | 0.405 |

| | | |
|---|---|---|
| 9/6/2014 | 0.073 | 0.1971 |
| 9/7/2014 | 0.116 | 0.3132 |
| 9/8/2014 | 0.143 | 0.3861 |
| 9/9/2014 | 0.146 | 0.3942 |
| 9/10/2014 | 0.177 | 0.4779 |
| 9/11/2014 | 0.123 | 0.3321 |
| 9/12/2014 | 0.124 | 0.3348 |
| 9/13/2014 | 0.071 | 0.1917 |
| 9/14/2014 | 0.071 | 0.1917 |
| 9/15/2014 | 0.124 | 0.3348 |
| 9/16/2014 | 0.113 | 0.3051 |
| 9/17/2014 | 0.14 | 0.378 |
| 9/18/2014 | 0.131 | 0.3537 |
| 9/19/2014 | 0.092 | 0.2484 |
| 9/20/2014 | 0.1 | 0.27 |
| 9/21/2014 | 0.107 | 0.2889 |
| 9/22/2014 | 0.125 | 0.3375 |
| 9/23/2014 | 0.152 | 0.4104 |
| 9/24/2014 | 0.106 | 0.2862 |
| 9/25/2014 | 0.16 | 0.432 |
| 9/26/2014 | 0.113 | 0.3051 |
| 9/27/2014 | 0.092 | 0.2484 |
| 9/28/2014 | 0.061 | 0.1647 |
| 9/29/2014 | 0.133 | 0.3591 |
| 9/30/2014 | 0.097 | 0.2619 |
| 10/1/2014 | 0.144 | 0.3888 |
| 10/2/2014 | 0.147 | 0.3969 |
| 10/3/2014 | 0.092 | 0.2484 |
| 10/4/2014 | 0.06 | 0.162 |
| 10/5/2014 | 0.103 | 0.2781 |
| 10/6/2014 | 0.149 | 0.4023 |
| 10/7/2014 | 0.147 | 0.3969 |
| 10/8/2014 | 0.138 | 0.3726 |
| 10/9/2014 | 0.128 | 0.3456 |
| 10/10/2014 | 0.112 | 0.3024 |
| 10/11/2014 | 0.098 | 0.2646 |
| 10/12/2014 | 0.124 | 0.3348 |
| 10/13/2014 | 0.286 | 0.7722 |
| 10/14/2014 | 0.165 | 0.4455 |
| 10/15/2014 | 0.157 | 0.4239 |
| 10/16/2014 | 0.114 | 0.3078 |
| 10/17/2014 | 0.153 | 0.4131 |

| | | |
|---|---|---|
| 10/18/2014 | 0.074 | 0.1998 |
| 10/19/2014 | 0.103 | 0.2781 |
| 10/20/2014 | 0.15 | 0.405 |
| 10/21/2014 | 0.135 | 0.3645 |
| 10/22/2014 | 0.172 | 0.4644 |
| 10/23/2014 | 0.124 | 0.3348 |
| 10/24/2014 | 0.168 | 0.4536 |
| 10/25/2014 | 0.107 | 0.2889 |
| 10/26/2014 | 0.086 | 0.2322 |
| 10/27/2014 | 0.184 | 0.4968 |
| 10/28/2014 | 0.146 | 0.3942 |
| 10/29/2014 | 0.18 | 0.486 |
| 10/30/2014 | 0.148 | 0.3996 |
| 10/31/2014 | 0.152 | 0.4104 |
| 11/1/2014 | 0.122 | 0.3294 |
| 11/2/2014 | 0.075 | 0.2025 |
| 11/3/2014 | 0.151 | 0.4077 |
| 11/4/2014 | 0.181 | 0.4887 |
| 11/5/2014 | 0.173 | 0.4671 |
| 11/6/2014 | 0.137 | 0.3699 |
| 11/7/2014 | 0.149 | 0.4023 |
| 11/8/2014 | 0.067 | 0.1809 |
| 11/9/2014 | 0.099 | 0.2673 |
| 11/10/2014 | 0.136 | 0.3672 |
| 11/11/2014 | 0.137 | 0.3699 |
| 11/12/2014 | 0.11 | 0.297 |
| 11/13/2014 | 0.137 | 0.3699 |
| 11/14/2014 | 0.146 | 0.3942 |
| 11/15/2014 | 0.119 | 0.3213 |
| 11/16/2014 | 0.126 | 0.3402 |
| 11/17/2014 | 0.168 | 0.4536 |
| 11/18/2014 | 0.159 | 0.4293 |
| 11/19/2014 | 0.091 | 0.2457 |
| 11/20/2014 | 0.12 | 0.324 |
| 11/21/2014 | 0.146 | 0.3942 |
| 11/22/2014 | 0.099 | 0.2673 |
| 11/23/2014 | 0.123 | 0.3321 |
| 11/24/2014 | 0.099 | 0.2673 |
| 11/25/2014 | 0.12 | 0.324 |
| 11/26/2014 | 0.107 | 0.2889 |
| 11/27/2014 | 0.077 | 0.2079 |
| 11/28/2014 | 0.078 | 0.2106 |

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|---|---|---|
| 11/29/2014 | 0.111 | 0.2997 |
| 11/30/2014 | 0.119 | 0.3213 |
| 12/1/2014 | 0.117 | 0.3159 |
| 12/2/2014 | 0.142 | 0.3834 |
| 12/3/2014 | 0.126 | 0.3402 |
| 12/4/2014 | 0.098 | 0.2646 |
| 12/5/2014 | 0.139 | 0.3753 |
| 12/6/2014 | 0.075 | 0.2025 |
| 12/7/2014 | 0.089 | 0.2403 |
| 12/8/2014 | 0.103 | 0.2781 |
| 12/9/2014 | 0.127 | 0.3429 |
| 12/10/2014 | 0.138 | 0.3726 |
| 12/11/2014 | 0.109 | 0.2943 |
| 12/12/2014 | 0.124 | 0.3348 |
| 12/13/2014 | 0.11 | 0.297 |
| 12/14/2014 | 0.104 | 0.2808 |
| 12/15/2014 | 0.109 | 0.2943 |
| 12/16/2014 | 0.129 | 0.3483 |
| 12/17/2014 | 0.133 | 0.3591 |
| 12/18/2014 | 0.158 | 0.4266 |
| 12/19/2014 | 0.153 | 0.4131 |
| 12/20/2014 | 0.108 | 0.2916 |
| 12/21/2014 | 0.108 | 0.2916 |
| 12/22/2014 | 0.104 | 0.2808 |
| 12/23/2014 | 0.192 | 0.5184 |
| 12/24/2014 | 0.106 | 0.2862 |
| 12/25/2014 | 0.065 | 0.1755 |
| 12/26/2014 | 0.097 | 0.2619 |
| 12/27/2014 | 0.106 | 0.2862 |
| 12/28/2014 | 0.093 | 0.2511 |
| 12/29/2014 | 0.138 | 0.3726 |
| 12/30/2014 | 0.112 | 0.3024 |
| 12/31/2014 | 0.115 | 0.3105 |
| 1/1/2015 | 0.138 | 0.3726 |
| 1/2/2015 | 0.174 | 0.4698 |
| 1/3/2015 | 0.222 | 0.5994 |
| 1/4/2015 | 0.133 | 0.3591 |
| 1/5/2015 | 0.171 | 0.4617 |
| 1/6/2015 | 0.134 | 0.3618 |
| 1/7/2015 | 0.132 | 0.3564 |
| 1/8/2015 | 0.176 | 0.4752 |
| 1/9/2015 | 0.123 | 0.3321 |

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| 1/10/2015 | 0.116 | 0.3132 |
| 1/11/2015 | 0.15 | 0.405 |
| 1/12/2015 | 0.154 | 0.4158 |
| 1/13/2015 | 0.151 | 0.4077 |
| 1/14/2015 | 0.145 | 0.3915 |
| 1/15/2015 | 0.126 | 0.3402 |
| 1/16/2015 | 0.133 | 0.3591 |
| 1/17/2015 | 0.099 | 0.2673 |
| 1/18/2015 | 0.1 | 0.27 |
| 1/19/2015 | 0.106 | 0.2862 |
| 1/20/2015 | 0.132 | 0.3564 |
| 1/21/2015 | 0.136 | 0.3672 |
| 1/22/2015 | 0.289 | 0.7803 |
| 1/23/2015 | 0.202 | 0.5454 |
| 1/24/2015 | 0.138 | 0.3726 |
| 1/25/2015 | 0.123 | 0.3321 |
| 1/26/2015 | 0.144 | 0.3888 |
| 1/27/2015 | 0.154 | 0.4158 |
| 1/28/2015 | 0.136 | 0.3672 |
| 1/29/2015 | 0.123 | 0.3321 |
| 1/30/2015 | 0.149 | 0.4023 |
| 1/31/2015 | 0.1 | 0.27 |
| 2/1/2015 | 0.21 | 0.567 |
| 2/2/2015 | 0.201 | 0.5427 |
| 2/3/2015 | 0.152 | 0.4104 |
| 2/4/2015 | 0.135 | 0.3645 |
| 2/5/2015 | 0.106 | 0.2862 |
| 2/6/2015 | 0.134 | 0.3618 |
| 2/7/2015 | 0.098 | 0.2646 |
| 2/8/2015 | 0.11 | 0.297 |
| 2/9/2015 | 0.098 | 0.2646 |
| 2/10/2015 | 0.128 | 0.3456 |
| 2/11/2015 | 0.137 | 0.3699 |
| 2/12/2015 | 0.107 | 0.2889 |
| 2/13/2015 | 0.114 | 0.3078 |
| 2/14/2015 | 0.091 | 0.2457 |
| 2/15/2015 | 0.093 | 0.2511 |
| 2/16/2015 | 0.128 | 0.3456 |
| 2/17/2015 | 0.114 | 0.3078 |
| 2/18/2015 | 0.146 | 0.3942 |
| 2/19/2015 | 0.133 | 0.3591 |
| 2/20/2015 | 0.122 | 0.3294 |

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|---|---|---|
| 2/21/2015 | 0.096 | 0.2592 |
| 2/22/2015 | 0.187 | 0.5049 |
| 2/23/2015 | 0.253 | 0.6831 |
| 2/24/2015 | 0.195 | 0.5265 |
| 2/25/2015 | 0.264 | 0.7128 |
| 2/26/2015 | 0.224 | 0.6048 |
| 2/27/2015 | 0.212 | 0.5724 |
| 2/28/2015 | 0.172 | 0.4644 |
| 3/1/2015 | 0.192 | 0.5184 |
| 3/2/2015 | 0.222 | 0.5994 |
| 3/3/2015 | 0.242 | 0.6534 |
| 3/4/2015 | 0.263 | 0.7101 |
| 3/5/2015 | 0.283 | 0.7641 |
| 3/6/2015 | 0.272 | 0.7344 |
| 3/7/2015 | 0.185 | 0.4995 |
| 3/8/2015 | 0.132 | 0.3564 |
| 3/9/2015 | 0.273 | 0.7371 |
| 3/10/2015 | 0.284 | 0.7668 |
| 3/11/2015 | 0.216 | 0.5832 |
| 3/12/2015 | 0.169 | 0.4563 |
| 3/13/2015 | 0.17 | 0.459 |
| 3/14/2015 | 0.138 | 0.3726 |
| 3/15/2015 | 0.146 | 0.3942 |
| 3/16/2015 | 0.193 | 0.5211 |
| 3/17/2015 | 0.153 | 0.4131 |
| 3/18/2015 | 0.142 | 0.3834 |
| 3/19/2015 | 0.165 | 0.4455 |
| 3/20/2015 | 0.152 | 0.4104 |
| 3/21/2015 | 0.145 | 0.3915 |
| 3/22/2015 | 0.147 | 0.3969 |
| 3/23/2015 | 0.183 | 0.4941 |
| 3/24/2015 | 0.187 | 0.5049 |
| 3/25/2015 | 0.147 | 0.3969 |
| 3/26/2015 | 0.168 | 0.4536 |
| 3/27/2015 | 0.14 | 0.378 |
| 3/28/2015 | 0.107 | 0.2889 |
| 3/29/2015 | 0.104 | 0.2808 |
| 3/30/2015 | 0.15 | 0.405 |
| 3/31/2015 | 0.138 | 0.3726 |
| 4/1/2015 | 0.145 | 0.3915 |
| 4/2/2015 | 0.147 | 0.3969 |
| 4/3/2015 | 0.122 | 0.3294 |

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|---|---|---|
| 4/4/2015 | 0.099 | 0.2673 |
| 4/5/2015 | 0.133 | 0.3591 |
| 4/6/2015 | 0.153 | 0.4131 |
| 4/7/2015 | 0.173 | 0.4671 |
| 4/8/2015 | 0.204 | 0.5508 |
| 4/9/2015 | 0.167 | 0.4509 |
| 4/10/2015 | 0.104 | 0.2808 |
| 4/11/2015 | 0.099 | 0.2673 |
| 4/12/2015 | 0.104 | 0.2808 |
| 4/13/2015 | 0.207 | 0.5589 |
| 4/14/2015 | 0.18 | 0.486 |
| 4/15/2015 | 0.187 | 0.5049 |
| 4/16/2015 | 0.17 | 0.459 |
| 4/17/2015 | 0.178 | 0.4806 |
| 4/18/2015 | 0.231 | 0.6237 |
| 4/19/2015 | 0.197 | 0.5319 |
| 4/20/2015 | 0.223 | 0.6021 |
| 4/21/2015 | 0.232 | 0.6264 |
| 4/22/2015 | 0.231 | 0.6237 |
| 4/23/2015 | 0.257 | 0.6939 |
| 4/24/2015 | 0.371 | 1.0017 |
| 4/25/2015 | 0.293 | 0.7911 |
| 4/26/2015 | 0.233 | 0.6291 |
| 4/27/2015 | 0.25 | 0.675 |
| 4/28/2015 | 0.246 | 0.6642 |
| 4/29/2015 | 0.231 | 0.6237 |
| 4/30/2015 | 0.152 | 0.4104 |
| 5/1/2015 | 0.136 | 0.3672 |
| 5/2/2015 | 0.099 | 0.2673 |
| 5/3/2015 | 0.095 | 0.2565 |
| 5/4/2015 | 0.137 | 0.3699 |
| 5/5/2015 | 0.136 | 0.3672 |
| 5/6/2015 | 0.136 | 0.3672 |
| 5/7/2015 | 0.236 | 0.6372 |
| 5/8/2015 | 0.28 | 0.756 |
| 5/9/2015 | 0.164 | 0.4428 |
| 5/10/2015 | 0.283 | 0.7641 |
| 5/11/2015 | 0.339 | 0.9153 |
| 5/12/2015 | 0.241 | 0.6507 |
| 5/13/2015 | 0.301 | 0.8127 |
| 5/14/2015 | 0.247 | 0.6669 |
| 5/15/2015 | 0.274 | 0.7398 |

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|---|---|---|
| 5/16/2015 | 0.183 | 0.4941 |
| 5/17/2015 | 0.364 | 0.9828 |
| 5/18/2015 | 0.305 | 0.8235 |
| 5/19/2015 | 0.287 | 0.7749 |
| 5/20/2015 | 0.206 | 0.5562 |
| 5/21/2015 | 0.208 | 0.5616 |
| 5/22/2015 | 0.202 | 0.5454 |
| 5/23/2015 | 0.213 | 0.5751 |
| 5/24/2015 | 0.481 | 1.2987 |
| 5/25/2015 | 0.288 | 0.7776 |
| 5/26/2015 | 0.307 | 0.8289 |
| 5/27/2015 | 0.246 | 0.6642 |
| 5/28/2015 | 0.232 | 0.6264 |
| 5/29/2015 | 0.606 | 1.6362 |
| 5/30/2015 | 0.488 | 1.3176 |
| 5/31/2015 | 0.326 | 0.8802 |
| 6/1/2015 | 0.278 | 0.7506 |
| 6/2/2015 | 0.204 | 0.5508 |
| 6/3/2015 | 0.175 | 0.4725 |
| 6/4/2015 | 0.182 | 0.4914 |
| 6/5/2015 | 0.138 | 0.3726 |
| 6/6/2015 | 0.13 | 0.351 |
| 6/7/2015 | 0.097 | 0.2619 |
| 6/8/2015 | 0.169 | 0.4563 |
| 6/9/2015 | 0.197 | 0.5319 |
| 6/10/2015 | 0.197 | 0.5319 |
| 6/11/2015 | 0.182 | 0.4914 |
| 6/12/2015 | 0.178 | 0.4806 |
| 6/13/2015 | 0.173 | 0.4671 |
| 6/14/2015 | 0.133 | 0.3591 |
| 6/15/2015 | 0.225 | 0.6075 |
| 6/16/2015 | 0.174 | 0.4698 |
| 6/17/2015 | 0.351 | 0.9477 |
| 6/18/2015 | 0.251 | 0.6777 |
| 6/19/2015 | 0.185 | 0.4995 |
| 6/20/2015 | 0.137 | 0.3699 |
| 6/21/2015 | 0.107 | 0.2889 |
| 6/22/2015 | 0.213 | 0.5751 |
| 6/23/2015 | 0.216 | 0.5832 |
| 6/24/2015 | 0.17 | 0.459 |
| 6/25/2015 | 0.19 | 0.513 |
| 6/26/2015 | 0.203 | 0.5481 |

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|---|---|---|
| 6/27/2015 | 0.175 | 0.4725 |
| 6/28/2015 | 0.155 | 0.4185 |
| 6/29/2015 | 0.192 | 0.5184 |
| 6/30/2015 | 0.18 | 0.486 |
| 7/1/2015 | 0.165 | 0.4455 |
| 7/2/2015 | 0.142 | 0.3834 |
| 7/3/2015 | 0.146 | 0.3942 |
| 7/4/2015 | 0.09 | 0.243 |
| 7/5/2015 | 0.102 | 0.2754 |
| 7/6/2015 | 0.164 | 0.4428 |
| 7/7/2015 | 0.154 | 0.4158 |
| 7/8/2015 | 0.175 | 0.4725 |
| 7/9/2015 | 0.167 | 0.4509 |
| 7/10/2015 | 0.159 | 0.4293 |
| 7/11/2015 | 0.111 | 0.2997 |
| 7/12/2015 | 0.111 | 0.2997 |
| 7/13/2015 | 0.171 | 0.4617 |
| 7/14/2015 | 0.145 | 0.3915 |
| 7/15/2015 | 0.144 | 0.3888 |
| 7/16/2015 | 0.14 | 0.378 |
| 7/17/2015 | 0.136 | 0.3672 |
| 7/18/2015 | 0.099 | 0.2673 |
| 7/19/2015 | 0.102 | 0.2754 |
| 7/20/2015 | 0.144 | 0.3888 |
| 7/21/2015 | 0.154 | 0.4158 |
| 7/22/2015 | 0.151 | 0.4077 |
| 7/23/2015 | 0.153 | 0.4131 |
| 7/24/2015 | 0.129 | 0.3483 |
| 7/25/2015 | 0.133 | 0.3591 |
| 7/26/2015 | 0.125 | 0.3375 |
| 7/27/2015 | 0.184 | 0.4968 |
| 7/28/2015 | 0.16 | 0.432 |
| 7/29/2015 | 0.16 | 0.432 |
| 7/30/2015 | 0.161 | 0.4347 |
| 7/31/2015 | 0.117 | 0.3159 |
| 8/1/2015 | 0.106 | 0.2862 |
| 8/2/2015 | 0.098 | 0.2646 |
| 8/3/2015 | 0.15 | 0.405 |
| 8/4/2015 | 0.176 | 0.4752 |
| 8/5/2015 | 0.136 | 0.3672 |
| 8/6/2015 | 0.132 | 0.3564 |
| 8/7/2015 | 0.13 | 0.351 |

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| 8/8/2015 | 0.089 | 0.2403 |
| 8/9/2015 | 0.073 | 0.1971 |
| 8/10/2015 | 0.162 | 0.4374 |
| 8/11/2015 | 0.158 | 0.4266 |
| 8/12/2015 | 0.158 | 0.4266 |
| 8/13/2015 | 0.154 | 0.4158 |
| 8/14/2015 | 0.121 | 0.3267 |
| 8/15/2015 | 0.112 | 0.3024 |
| 8/16/2015 | 0.076 | 0.2052 |
| 8/17/2015 | 0.162 | 0.4374 |
| 8/18/2015 | 0.156 | 0.4212 |
| 8/19/2015 | 0.14 | 0.378 |
| 8/20/2015 | 0.122 | 0.3294 |
| 8/21/2015 | 0.107 | 0.2889 |
| 8/22/2015 | 0.119 | 0.3213 |
| 8/23/2015 | 0.12 | 0.324 |
| 8/24/2015 | 0.138 | 0.3726 |
| 8/25/2015 | 0.132 | 0.3564 |
| 8/26/2015 | 0.15 | 0.405 |
| 8/27/2015 | 0.153 | 0.4131 |
| 8/28/2015 | 0.115 | 0.3105 |
| 8/29/2015 | 0.102 | 0.2754 |
| 8/30/2015 | 0.106 | 0.2862 |
| 8/31/2015 | 0.132 | 0.3564 |
| 9/1/2015 | 0.105 | 0.2835 |
| 9/2/2015 | 0.15 | 0.405 |
| 9/3/2015 | 0.151 | 0.4077 |
| 9/4/2015 | 0.125 | 0.3375 |
| 9/5/2015 | 0.118 | 0.3186 |
| 9/6/2015 | 0.079 | 0.2133 |
| 9/7/2015 | 0.114 | 0.3078 |
| 9/8/2015 | 0.158 | 0.4266 |
| 9/9/2015 | 0.214 | 0.5778 |
| 9/10/2015 | 0.13 | 0.351 |
| 9/11/2015 | 0.12 | 0.324 |
| 9/12/2015 | 0.091 | 0.2457 |
| 9/13/2015 | 0.105 | 0.2835 |
| 9/14/2015 | 0.137 | 0.3699 |
| 9/15/2015 | 0.118 | 0.3186 |
| 9/16/2015 | 0.142 | 0.3834 |
| 9/17/2015 | 0.156 | 0.4212 |
| 9/18/2015 | 0.166 | 0.4482 |

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|---|---|---|
| 9/19/2015 | 0.115 | 0.3105 |
| 9/20/2015 | 0.126 | 0.3402 |
| 9/21/2015 | 0.138 | 0.3726 |
| 9/22/2015 | 0.157 | 0.4239 |
| 9/23/2015 | 0.172 | 0.4644 |
| 9/24/2015 | 0.186 | 0.5022 |
| 9/25/2015 | 0.186 | 0.5022 |
| 9/26/2015 | 0.103 | 0.2781 |
| 9/27/2015 | 0.056 | 0.1512 |
| 9/28/2015 | 0.136 | 0.3672 |
| 9/29/2015 | 0.154 | 0.4158 |
| 9/30/2015 | 0.149 | 0.4023 |
| 10/1/2015 | 0.146 | 0.3942 |
| 10/2/2015 | 0.113 | 0.3051 |
| 10/3/2015 | 0.118 | 0.3186 |
| 10/4/2015 | 0.066 | 0.1782 |
| 10/5/2015 | 0.155 | 0.4185 |
| 10/6/2015 | 0.145 | 0.3915 |
| 10/7/2015 | 0.118 | 0.3186 |
| 10/8/2015 | 0.164 | 0.4428 |
| 10/9/2015 | 0.16 | 0.432 |
| 10/10/2015 | 0.072 | 0.1944 |
| 10/11/2015 | 0.107 | 0.2889 |
| 10/12/2015 | 0.135 | 0.3645 |
| 10/13/2015 | 0.149 | 0.4023 |
| 10/14/2015 | 0.117 | 0.3159 |
| 10/15/2015 | 0.159 | 0.4293 |
| 10/16/2015 | 0.119 | 0.3213 |
| 10/17/2015 | 0.098 | 0.2646 |
| 10/18/2015 | 0.134 | 0.3618 |
| 10/19/2015 | 0.135 | 0.3645 |
| 10/20/2015 | 0.127 | 0.3429 |
| 10/21/2015 | 0.098 | 0.2646 |
| 10/22/2015 | 0.174 | 0.4698 |
| 10/23/2015 | 0.344 | 0.9288 |
| 10/24/2015 | 0.419 | 1.1313 |
| 10/25/2015 | 0.419 | 1.1313 |
| 10/26/2015 | 0.195 | 0.5265 |
| 10/27/2015 | 0.164 | 0.4428 |
| 10/28/2015 | 0.135 | 0.3645 |
| 10/29/2015 | 0.136 | 0.3672 |
| 10/30/2015 | 0.241 | 0.6507 |

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|---|---|---|
| 10/31/2015 | 0.403 | 1.0881 |
| 10/31/2015 | 0.216 | 0.5832 |
| 11/1/2015 | 0.226 | 0.6102 |
| 11/2/2015 | 0.203 | 0.5481 |
| 11/3/2015 | 0.203 | 0.5481 |
| 11/4/2015 | 0.195 | 0.5265 |
| 11/5/2015 | 0.186 | 0.5022 |
| 11/6/2015 | 0.187 | 0.5049 |
| 11/7/2015 | 0.13 | 0.351 |
| 11/8/2015 | 0.128 | 0.3456 |
| 11/9/2015 | 0.132 | 0.3564 |
| 11/10/2015 | 0.172 | 0.4644 |
| 11/11/2015 | 0.134 | 0.3618 |
| 11/12/2015 | 0.169 | 0.4563 |
| 11/13/2015 | 0.127 | 0.3429 |
| 11/14/2015 | 0.127 | 0.3429 |
| 11/15/2015 | 0.108 | 0.2916 |
| 11/16/2015 | 0.237 | 0.6399 |
| 11/17/2015 | 0.341 | 0.9207 |
| 11/18/2015 | 0.323 | 0.8721 |
| 11/19/2015 | 0.277 | 0.7479 |
| 11/20/2015 | 0.227 | 0.6129 |
| 11/21/2015 | 0.163 | 0.4401 |
| 11/22/2015 | 0.141 | 0.3807 |
| 11/23/2015 | 0.177 | 0.4779 |
| 11/24/2015 | 0.178 | 0.4806 |
| 11/25/2015 | 0.158 | 0.4266 |
| 11/26/2015 | 0 | 0 |
| 11/27/2015 | 0.106 | 0.2862 |
| 11/28/2015 | 0.626 | 1.6902 |
| 11/29/2015 | 0.444 | 1.1988 |
| 11/30/2015 | 0.381 | 1.0287 |
| 12/1/2015 | 0.308 | 0.8316 |
| 12/2/2015 | 0.246 | 0.6642 |
| 12/3/2015 | 0.193 | 0.5211 |
| 12/4/2015 | 0.187 | 0.5049 |
| 12/5/2015 | 0.163 | 0.4401 |
| 12/6/2015 | 0.175 | 0.4725 |
| 12/7/2015 | 0.226 | 0.6102 |
| 12/8/2015 | 0.195 | 0.5265 |
| 12/9/2015 | 0.223 | 0.6021 |
| 12/10/2015 | 0.189 | 0.5103 |

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|---|---|---|
| 12/11/2015 | 0.23 | 0.621 |
| 12/12/2015 | 0.141 | 0.3807 |
| 12/13/2015 | 0.245 | 0.6615 |
| 12/14/2015 | 0.244 | 0.6588 |
| 12/15/2015 | 0.202 | 0.5454 |
| 12/16/2015 | 0.181 | 0.4887 |
| 12/17/2015 | 0.161 | 0.4347 |
| 12/18/2015 | 0.14 | 0.378 |
| 12/19/2015 | 0.143 | 0.3861 |
| 12/20/2015 | 0.109 | 0.2943 |
| 12/21/2015 | 0.156 | 0.4212 |
| 12/22/2015 | 0.164 | 0.4428 |
| 12/23/2015 | 0.159 | 0.4293 |
| 12/24/2015 | 0.108 | 0.2916 |
| 12/25/2015 | 0.087 | 0.2349 |
| 12/26/2015 | 0.1 | 0.27 |
| 12/27/2015 | 0.358 | 0.9666 |
| 12/28/2015 | 0.486 | 1.3122 |
| 12/29/2015 | 0.314 | 0.8478 |
| 12/30/2015 | 0.242 | 0.6534 |
| 12/31/2015 | 0.222 | 0.5994 |
| 1/1/2016 | 0.104 | 0.2808 |
| 1/2/2016 | 0.14 | 0.378 |
| 1/3/2016 | 0.135 | 0.3645 |
| 1/4/2016 | 0.186 | 0.5022 |
| 1/5/2016 | 0.148 | 0.3996 |
| 1/6/2016 | 0.204 | 0.5508 |
| 1/7/2016 | 0.272 | 0.7344 |
| 1/8/2016 | 0.181 | 0.4887 |
| 1/9/2016 | 0.033 | 0.0891 |
| 1/10/2016 | 0.133 | 0.3591 |
| 1/11/2016 | 0.146 | 0.3942 |
| 1/12/2016 | 0.181 | 0.4887 |
| 1/13/2016 | 0.119 | 0.3213 |
| 1/14/2016 | 0.138 | 0.3726 |
| 1/15/2016 | 0.166 | 0.4482 |
| 1/16/2016 | 0.112 | 0.3024 |
| 1/17/2016 | 0.102 | 0.2754 |
| 1/18/2016 | 0.018 | 0.0486 |
| 1/19/2016 | 0.151 | 0.4077 |
| 1/20/2016 | 0.107 | 0.2889 |
| 1/21/2016 | 0.177 | 0.4779 |

| | | |
|---|---|---|
| 1/22/2016 | 0.025 | 0.0675 |
| 1/23/2016 | 0.111 | 0.2997 |
| 1/24/2016 | 0.114 | 0.3078 |
| 1/25/2016 | 0.131 | 0.3537 |
| 1/26/2016 | 0.111 | 0.2997 |
| 1/27/2016 | 0.14 | 0.378 |
| 1/28/2016 | 0.121 | 0.3267 |
| 1/29/2016 | 0.125 | 0.3375 |
| 1/30/2016 | 0.084 | 0.2268 |
| 1/31/2016 | 0.072 | 0.1944 |
| 2/1/2016 | 0.111 | 0.2997 |
| 2/2/2016 | 0.072 | 0.1944 |
| 2/3/2016 | 0.097 | 0.2619 |
| 2/4/2016 | 0.155 | 0.4185 |
| 2/5/2016 | 0.135 | 0.3645 |
| 2/6/2016 | 0.105 | 0.2835 |
| 2/7/2016 | 0.057 | 0.1539 |
| 2/8/2016 | 0.207 | 0.5589 |
| 2/9/2016 | 0.173 | 0.4671 |
| 2/10/2016 | 0.186 | 0.5022 |
| 2/11/2016 | 0.157 | 0.4239 |
| 2/12/2016 | 0.129 | 0.3483 |
| 2/13/2016 | 0.034 | 0.0918 |
| 2/14/2016 | 0.089 | 0.2403 |
| 2/15/2016 | 0.12 | 0.324 |
| 2/16/2016 | 0.148 | 0.3996 |
| 2/17/2016 | 0.134 | 0.3618 |
| 2/18/2016 | 0.184 | 0.4968 |
| 2/19/2016 | 0.156 | 0.4212 |
| 2/20/2016 | 0.101 | 0.2727 |
| 2/21/2016 | 0.078 | 0.2106 |
| 2/22/2016 | 0.179 | 0.4833 |
| 2/23/2016 | 0.34 | 0.918 |
| 2/24/2016 | 0.227 | 0.6129 |
| 2/25/2016 | 0.21 | 0.567 |
| 2/26/2016 | 0.153 | 0.4131 |
| 2/27/2016 | 0.145 | 0.3915 |
| 2/28/2016 | 0.109 | 0.2943 |
| 2/29/2016 | 0.153 | 0.4131 |
| 3/1/2016 | 0.174 | 0.4698 |
| 3/2/2016 | 0.136 | 0.3672 |
| 3/3/2016 | 0.156 | 0.4212 |

| | | |
|---|---|---|
| 3/4/2016 | 0.115 | 0.3105 |
| 3/5/2016 | 0.09 | 0.243 |
| 3/6/2016 | 0.084 | 0.2268 |
| 3/7/2016 | 0.147 | 0.3969 |
| 3/8/2016 | 0.17 | 0.459 |
| 3/9/2016 | 0.284 | 0.7668 |
| 3/10/2016 | 0.233 | 0.6291 |
| 3/11/2016 | 0.209 | 0.5643 |
| 3/12/2016 | 0.184 | 0.4968 |
| 3/13/2016 | 0.182 | 0.4914 |
| 3/14/2016 | 0.156 | 0.4212 |
| 3/15/2016 | 0.181 | 0.4887 |
| 3/16/2016 | 0.173 | 0.4671 |
| 3/17/2016 | 0.154 | 0.4158 |
| 3/18/2016 | 0.105 | 0.2835 |
| 3/19/2016 | 0.086 | 0.2322 |
| 3/20/2016 | 0.073 | 0.1971 |
| 3/21/2016 | 0.112 | 0.3024 |
| 3/22/2016 | 0.171 | 0.4617 |
| 3/23/2016 | 0.2 | 0.54 |
| 3/24/2016 | 0.172 | 0.4644 |
| 3/25/2016 | 0.131 | 0.3537 |
| 3/26/2016 | 0.082 | 0.2214 |
| 3/27/2016 | 0.098 | 0.2646 |
| 3/28/2016 | 0.142 | 0.3834 |
| 3/29/2016 | 0.116 | 0.3132 |
| 3/30/2016 | 0.146 | 0.3942 |
| 3/31/2016 | 0.148 | 0.3996 |
| 4/1/2016 | 0.131 | 0.3537 |
| 4/2/2016 | 0.092 | 0.2484 |
| 4/3/2016 | 0.089 | 0.2403 |
| 4/4/2016 | 0.131 | 0.3537 |
| 4/5/2016 | 0.131 | 0.3537 |
| 4/6/2016 | 0.113 | 0.3051 |
| 4/7/2016 | 0.125 | 0.3375 |
| 4/8/2016 | 0.131 | 0.3537 |
| 4/9/2016 | 0.091 | 0.2457 |
| 4/10/2016 | 0.095 | 0.2565 |
| 4/11/2016 | 0.163 | 0.4401 |
| 4/12/2016 | 0.16 | 0.432 |
| 4/13/2016 | 0.167 | 0.4509 |
| 4/14/2016 | 0.136 | 0.3672 |

| | | |
|---|---|---|
| 4/15/2016 | 0.137 | 0.3699 |
| 4/16/2016 | 0.117 | 0.3159 |
| 4/17/2016 | 0.224 | 0.6048 |
| 4/18/2016 | 0.323 | 0.8721 |
| 4/19/2016 | 0.226 | 0.6102 |
| 4/20/2016 | 0.393 | 1.0611 |
| 4/21/2016 | 0.311 | 0.8397 |
| 4/22/2016 | 0.214 | 0.5778 |
| 4/23/2016 | 0.176 | 0.4752 |
| 4/24/2016 | 0.175 | 0.4725 |
| 4/25/2016 | 0.173 | 0.4671 |
| 4/26/2016 | 0.165 | 0.4455 |
| 4/27/2016 | 0.276 | 0.7452 |
| 4/28/2016 | 0.175 | 0.4725 |
| 4/29/2016 | 0.157 | 0.4239 |
| 4/30/2016 | 0.121 | 0.3267 |
| 5/1/2016 | 0.126 | 0.3402 |
| 5/2/2016 | 0.191 | 0.5157 |
| 5/3/2016 | 0.139 | 0.3753 |
| 5/4/2016 | 0.133 | 0.3591 |
| 5/5/2016 | 0.149 | 0.4023 |
| 5/6/2016 | 0.151 | 0.4077 |
| 5/7/2016 | 0.095 | 0.2565 |
| 5/8/2016 | 0.075 | 0.2025 |
| 5/9/2016 | 0.168 | 0.4536 |
| 5/10/2016 | 0.03 | 0.081 |
| 5/11/2016 | 0.164 | 0.4428 |
| 5/12/2016 | 0.208 | 0.5616 |
| 5/13/2016 | 0.129 | 0.3483 |
| 5/14/2016 | 0.109 | 0.2943 |
| 5/15/2016 | 0.118 | 0.3186 |
| 5/16/2016 | 0.13 | 0.351 |
| 5/17/2016 | 0.163 | 0.4401 |
| 5/18/2016 | 0.158 | 0.4266 |
| 5/19/2016 | 0.172 | 0.4644 |
| 5/20/2016 | 0.157 | 0.4239 |
| 5/21/2016 | 0.111 | 0.2997 |
| 5/22/2016 | 0.114 | 0.3078 |
| 5/23/2016 | 0.15 | 0.405 |
| 5/24/2016 | 0.188 | 0.5076 |
| 5/25/2016 | 0.168 | 0.4536 |
| 5/26/2016 | 0.168 | 0.4536 |

| | | |
|---|---|---|
| 5/27/2016 | 0.087 | 0.2349 |
| 5/28/2016 | 0.156 | 0.4212 |
| 5/29/2016 | 0.161 | 0.4347 |
| 5/30/2016 | 0.173 | 0.4671 |
| 5/31/2016 | 0.32 | 0.864 |
| 6/1/2016 | 0.308 | 0.8316 |
| 6/2/2016 | 0.327 | 0.8829 |
| 6/3/2016 | 0.338 | 0.9126 |
| 6/4/2016 | 0.224 | 0.6048 |
| 6/5/2016 | 0.209 | 0.5643 |
| 6/6/2016 | 0.175 | 0.4725 |
| 6/7/2016 | 0.168 | 0.4536 |
| 6/8/2016 | 0.189 | 0.5103 |
| 6/9/2016 | 0.159 | 0.4293 |
| 6/10/2016 | 0.143 | 0.3861 |
| 6/11/2016 | 0.09 | 0.243 |
| 6/12/2016 | 0 | 0 |
| 6/13/2016 | 0.176 | 0.4752 |
| 6/14/2016 | 0.178 | 0.4806 |
| 6/15/2016 | 0.151 | 0.4077 |
| 6/16/2016 | 0.183 | 0.4941 |
| 6/17/2016 | 0.152 | 0.4104 |
| 6/18/2016 | 0.116 | 0.3132 |
| 6/19/2016 | 0.093 | 0.2511 |
| 6/20/2016 | 0.156 | 0.4212 |
| 6/21/2016 | 0.157 | 0.4239 |
| 6/22/2016 | 0.195 | 0.5265 |
| 6/23/2016 | 0.193 | 0.5211 |
| 6/24/2016 | 0.155 | 0.4185 |
| 6/25/2016 | 0.113 | 0.3051 |
| 6/26/2016 | 0.101 | 0.2727 |
| 6/27/2016 | 0.137 | 0.3699 |
| 6/28/2016 | 0.148 | 0.3996 |
| 6/29/2016 | 0.159 | 0.4293 |
| 6/30/2016 | 0.147 | 0.3969 |
| 7/1/2016 | 0.151 | 0.4077 |
| 7/2/2016 | 0.132 | 0.3564 |
| 7/3/2016 | 0.134 | 0.3618 |
| 7/4/2016 | 0.14 | 0.378 |
| 7/5/2016 | 0.205 | 0.5535 |
| 7/6/2016 | 0.157 | 0.4239 |
| 7/7/2016 | 0.162 | 0.4374 |

| | | |
|---|---|---|
| 7/8/2016 | 0.185 | 0.4995 |
| 7/9/2016 | 0.128 | 0.3456 |
| 7/10/2016 | 0.141 | 0.3807 |
| 7/11/2016 | 0.158 | 0.4266 |
| 7/12/2016 | 0.177 | 0.4779 |
| 7/13/2016 | 0.144 | 0.3888 |
| 7/14/2016 | 0.139 | 0.3753 |
| 7/15/2016 | 0.218 | 0.5886 |
| 7/16/2016 | 0.128 | 0.3456 |
| 7/17/2016 | 0.1 | 0.27 |
| 7/18/2016 | 0.142 | 0.3834 |
| 7/19/2016 | 0.139 | 0.3753 |
| 7/20/2016 | 0.151 | 0.4077 |
| 7/21/2016 | 0.168 | 0.4536 |
| 7/22/2016 | 0.206 | 0.5562 |
| 7/23/2016 | 0.139 | 0.3753 |
| 7/24/2016 | 0.171 | 0.4617 |
| 7/25/2016 | 0.162 | 0.4374 |
| 7/26/2016 | 0.139 | 0.3753 |
| 7/27/2016 | 0.18 | 0.486 |
| 7/28/2016 | 0.14 | 0.378 |
| 7/29/2016 | 0.138 | 0.3726 |
| 7/30/2016 | 0.108 | 0.2916 |
| 7/31/2016 | 0.108 | 0.2916 |
| 8/1/2016 | 0.156 | 0.4212 |
| 8/2/2016 | 0.16 | 0.432 |
| 8/3/2016 | 0.166 | 0.4482 |
| 8/4/2016 | 0.164 | 0.4428 |
| 8/5/2016 | 0.161 | 0.4347 |
| 8/6/2016 | 0.11 | 0.297 |
| 8/7/2016 | 0.11 | 0.297 |
| 8/8/2016 | 0.162 | 0.4374 |
| 8/9/2016 | 0.164 | 0.4428 |
| 8/10/2016 | 0.205 | 0.5535 |
| 8/11/2016 | 0.159 | 0.4293 |
| 8/12/2016 | 0.219 | 0.5913 |
| 8/13/2016 | 0.151 | 0.4077 |
| 8/14/2016 | 0.098 | 0.2646 |
| 8/15/2016 | 0.137 | 0.3699 |
| 8/16/2016 | 0.136 | 0.3672 |
| 8/17/2016 | 0.168 | 0.4536 |
| 8/18/2016 | 0.182 | 0.4914 |

| | | |
|---|---|---|
| 8/19/2016 | 0.118 | 0.3186 |
| 8/20/2016 | 0.27 | 0.729 |
| 8/21/2016 | 0.232 | 0.6264 |

# Technical Memorandum

## Regulatory Assessment


**May 2017**

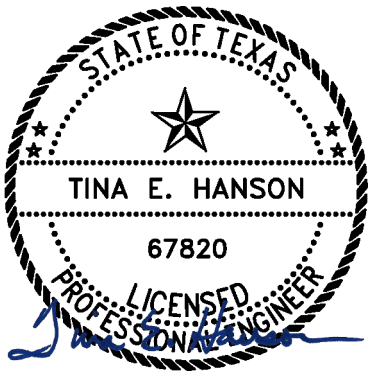
**Prepared by:**


**3010 Gaylord Parkway, Suite 190**
**Frisco, TX 75034**
**TBPE Registration No. F-5713**

**Garver Project No. 16088080**

## Engineer's Certification

I hereby certify that this Regulatory Assessment Technical Memorandum for the Town of Addison Kellway Wastewater Lift Station project was prepared under my direct supervision on May 26, 2017 for the Town of Addison.




Tina E. Hanson, PE
State of Texas PE License No. 67820


Jeffrey L. Sober, PE
State of Texas PE License No. 103772

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## List of Tables

## 1.0 Executive Summary

The Town of Addison (Town) retained Garver to perform an evaluation of its Kellway Lift Station to determine compliance with the current Texas Commission on Environmental Quality's (TCEQ) 30 Texas Administrative Code (TAC) Chapter 217 regulations §217.59- §217.64 pertaining to lift station design parameters. The following sections detail the evaluation metric used in order to meet TCEQ requirements.

## 2.0 Introduction

The Kellway Lift Station was originally constructed in 1996, and services the surrounding area. The lift station includes two 50 hp pumps and a buildout for a future third pump. The pumps are Fairbanks series 5400 Solids-Handling Pumps with a 10.6-inch impeller diameter. Ultimate lift station capacity is 2.62 MGD (firm) when three pumps are in service, with each pump rated for an ultimate capacity of 1.3 MGD. The facility is designed to handle flow events with one pump online and the second utilized as a back-up. Table 2-1 summarizes the basis of design for the Kellway Lift Station.

**Table 2-1: Lift Station Design Standard**

| | Design Standard |
|---|---|
| Number of Pumps in Service | 2 |
| Year Constructed | 1996 |
| Capacity one pump, gpm | 694 |
| Rated Total Dynamic Head (TDH), ft | 92 |
| Type of Pump | 5400 Series Solids Handling Pump |
| Manufacturer | Fairbanks Morse Pump |
| Model | 5423 |
| Volts/Ph/Hz | 230/3/60 |
| Motor HP | 50 |
| Impeller Dia. | 10.6" |
| RPM | 1775 |
| Force Main Length, ft | 352 |
| Parallel Force Main Diameters | 8" & 12" |

## 2.1 Field Review and Condition Assessment

The Garver team performed the field review and staff interviews on July 19, 2016. The field review included photographing equipment and appurtenances, as well as visually observing condition of each item. The staff interview included operator observations regarding system deficiencies. The field review and record drawings were used to help determine the Kellway Lift Station's compliance with TCEQ 217 rules TAC 217 §217.59- §217.64. A detailed view of selected requirements and compliance verification used in the evaluation is provided below in Table 2-2.

**Table 2-2: Texas Administrative Code (TAC) Requirements**

| Parameter | Reference | Requirements Summary | Compliance |
|---|---|---|---|
| **Site Requirements** | | | |
| Site Access | §217.59 (a) | Road surface of minimum width of 12 feet present. | Yes |
| Security | §217.59 (b) | Perimeter fence of minimum height of 6 feet provided.<br>Three strands of barbed wire unless fence is at least 8 feet tall or contains outwardly directed iron bars spaced on 4-inch centers.<br>Above-ground valves must be chained and locked unless fully enclosed in fence. | No<br>(Portion of fence along creek needs three-strand barb wire) |
| Flood Protection | §217.59 (c) | Designed to withstand/operate during a 100-year storm event | Yes |
| Odor Control | §217.59 (d) | An owner shall implement odor control measures necessary to prevent lift station from becoming a nuisance. | Yes |
| **Design Considerations** | | | |
| Pump Controls | §217.60 (a) | Level control system provided | Yes |
| Wet Wells | §217.60 (b) | A wet well must be enclosed.<br>A pump must run continuously during the pump cycle time, which begins when the pump is activated by the pump controls. | Yes |
| Dry Well Access | §217.60 (c) | Ladder/stair provided | Yes |

| Parameter | Reference | Requirements Summary | Compliance |
|---|---|---|---|
| Ventilation | §217.60 (d) | Ventilation (passive or mechanical) provided. | Yes (Not in compliance with Chapter 9 of NFPA 820-2016) |
| Wet Well Slopes | §217.60 (e) | Minimum slope of 10% to a pump intake. | Yes |
| Hoisting Equipment | §217.60 (f) | Must have permanent hoisting equipment or be accessible to portable hoisting equipment. | Yes |
| Valve Vault Drains | §217.60 (g) | Must prevent gas from entering a valve vault. | NA |
| Dry Well Sump Pumps | §217.60 (h) | Must use dual sump pumps with a minimum capacity of 1,000 gallons per hour.<br>Minimum sump depth of 6.0 inches.<br>Sump pump outlet pipe must at least 1.5 inches in diameter with at least two check valves in series. | Yes |
| **Pumps** | | | |
| General Requirements | §217.61 (a) | Pump must have greater than 3 inch diameter suction and discharge openings. | Yes |
| Submersible and Non-Submersible pumps | §217.61 (b) | A non-submersible pump must have inspection and cleanout plates on both the suction and discharge sides of each pumping unit. | Yes |
| Pumping Capacity | §217.61 (c) | At least two pumps present.<br>Firm pumping capacity of a lift station must handle the peak flow. | No |

| Parameter | Reference | Requirements Summary | Compliance |
|---|---|---|---|
| Flow Control | §217.61 (e) | A lift station or a transfer pumping station located at or discharging directly to a wastewater treatment facility must have a peak pump capacity equal to or less than the peak flow, unless equalization is provided.<br>Each lift station or transfer pumping station located at or discharging directly to a wastewater treatment facility with a peak flow that is greater than 300,000 gallons per day must use three or more pumps, unless duplex, automatically controlled, variable capacity pumps are used.<br>Each lift station or transfer pumping station located at or discharging directly to a wastewater treatment facility with a peak flow that is less than or equal to 300,000 gallons per day must use at least two pumps. | NA |
| Self-priming pumps | §217.61 (f) | Must use a suction pipe that produces flow with velocity of at least 3.0 ft/s but no more than 7.0 ft/s | NA |
| Vacuum Priming Pumps | §217.61 (g) | Must produce a suction pipe velocity between 3.0 ft/s and 7.0 ft/s | NA |
| Vertical positioning of pumps | §217.61 (h) | A raw wastewater pump must maintain positive static suction head during normal on-off cycling. | Yes |

| Parameter | Reference | Requirements Summary | Compliance |
|---|---|---|---|
| Individual Grinder Pumps | §217.61 (i) | Not subject to the requirements of the subchapter if it is not a part of an alternative collection system and only serves a single connection to a wastewater collection system. | NA |
| Pump for Low-Flow Lift Station | §217.61 (j) | A pump for a lift station with a peak flow less than 120 gpm must be submersible and include a grinder. | NA |
| **Pipes** | | | |
| Horizontal Pump Suctions | §217.62 (a) | Separate suction pipe that uses an eccentric reducer present per pump.<br>Pipes in a wet well must have a turndown-type flared intake. | Yes |
| Valves | §217.62 (b) | Discharge side must be followed by a full-closing isolation valve and check valve | Yes |
| Pipes | §217.62 (c) | Flanged or flexible connections to allow for removal of pumps and valves without interrupting lift station operations. Pipe suction velocities must be at least 3.0 ft/s, but no more than 7.0 ft/s | No<br>(Low velocities with two pumps in operation. Sufficient flushing velocities during normal operation) |
| **Emergency Provisions** | | | |
| Signage | §217.63 (a) | Sign must dictate name of Waste Water Treatment Facility, 24-hour emergency contact information | Yes |
| | §217.63 (b) | Must prevent the discharge of wastewater from the lift station and at all points in the upstream collection system during electrical power failures. | Yes |
| Alarm | §217.63 (c) | Audiovisual alarm system/SCADA provided | Yes |
| | §217.63 (d) | An alarm system must include self-testing capability at the control panel. | Yes |

| Parameter | Reference | Requirements Summary | Compliance |
|---|---|---|---|
| Back-up Power | §217.63 (i) | Alternate power sources provided to prevent discharge of wastewater. System must operate for a duration at least equal to the longest power outage on record for the past 60 months or at least 20 minutes, whichever is longer. | Yes (Refer to Condition Assessment and SCADA TM for additional recommendations) |
| | §217.63 (j) | Systems for preventing discharge of wastewater at a lift station must be permanent features of the lift station or must be deployable during any electrical power outage. | Yes |
| Spill Containment | §217.63 (k) | Spill containment structures must be able to be cleaned and must have an intruder-resistant fence that meets the requirements in §217.59(b) | NA |
| | §217.63 (l) | A lift station must be fully accessible during a 25-year, 24-hour rainfall event. | Yes |
| Pump Controls | §217.63 (m) | Lift station pump controls must prevent over-pumping and surcharge upon resumption of normal power after a power outage. | Yes |
| **Materials for Force Main Pipes** | | | |
| | §217.64 (a) | Force main pipe material must withstand the pressure generated by instantaneous pump stoppage due to power failure under maximum pumping conditions. | Yes |
| | §217.64 (b) | The use of pipes or fittings rated at a working pressure of less than 150 pounds per square inch is prohibited. | Yes |

| Parameter | Reference | Requirements Summary | Compliance |
|---|---|---|---|
| | §217.64 (c) | Force main pipe materials must be identified in the specifications with the appropriate specification number for both quality control and installation from the American Society for Testing and Materials, American National Standards Institute, or American Water Works Association. | Yes |
| | §217.64 (d) | Pipe material specified for a force main must have an expected life equal to or longer than that of the lift station and must be non-corrosive. | Yes |

## 3.0 Recommendations

The Kellway Lift Station is in compliance for a majority of the TCEQ lift station requirements. However, there are components which currently do not meet code, and will require further evaluation as the system upgrades. The recommended components for upgrade include:

1. The existing perimeter fencing is approximately six feet tall and a portion of fence along the creek is not equipped with three strands of barbed wire. Therefore, to comply with §217.59 (b), it is recommended to raise the perimeter fencing to a minimum height of 8 feet or install three strands of barbed wire to the existing 6 foot fence infrastructure.

2. Current ventilation is not in compliance with §217.60 (d). Although ventilation is installed at the Lift Station, significant improvements need to be made to comply with national standards. Therefore, recommendations are as follows:

    a. A full ventilation system evaluation should be performed to ensure complete compliance with Chapter 9 of NFPA 820-2016 and other sections as applicable.
    b. The drywell should be continuously ventilated at a minimum of 6 air changes per hour. In addition, the ventilation system should be monitored and alarmed in accordance with section 7.5 of NFPA 820-2016.
    c. The exhaust fan control panel or the dry transformer should be relocated to comply with the working spaces requirements of the National Electric Code -- NFPA 70-2014 Table 110.26(A) (1) condition 2.

3. Current pump sizing does not provide full redundancy at anticipated peak flows. In addition, pipe suction velocities with both pumps in operation are not within the allowable range of 3 to 7 feet per second per §217.62 (c). The Capacity and Process Control Optimization TM will further evaluate these deficiencies in the system and make recommendations accordingly.

# Technical Memorandum

## Recommendations and OPCC

**May 2017**

**Prepared by:**

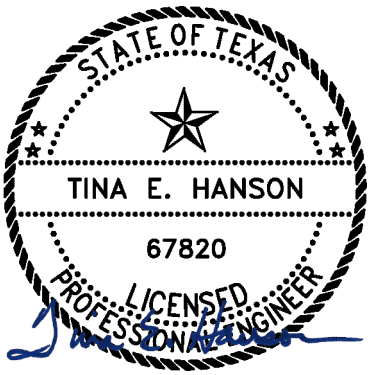
**3010 Gaylord Parkway, Suite 190**
**Frisco, TX 75034**
**TBPE Registration No. F-5713**

**Garver Project No. 16088080**

## Engineer's Certification

I hereby certify that this Recommendations and OPCC Technical Memorandum for the Town of Addison Kellway Wastewater Lift Station project was prepared under my direct supervision on May 26, 2017 for the Town of Addison.

Tina E. Hanson, PE
State of Texas PE License No. 67820




Jeffrey L. Sober, PE
State of Texas PE License No. 103772

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## List of Tables

## 1.0 Introduction

This memorandum documents recommendations for various aspects of the Kellway Lift Station, including SCADA improvements, capacity and process optimization, regulatory issues, and critical risk asset replacements. The provided recommendations will optimize and improve the capacity and operation of the lift station, reduce the risk of lift station failure, and bring the Kellway Lift Station into regulatory compliance.

## 2.0 SCADA Recommendations

Garver conducted field assessments of the site on July 19th, 2016. Following the visits, Garver prepared a technical memorandum documenting the existing methods of control and interface with the Town's SCADA network for the Kellway Lift Station, and identified recommended SCADA upgrades to improve remote monitoring and system operations. Table 2-1 lists the SCADA recommendations detailed in the SCADA Improvements Technical Memorandum.

**Table 2-1: Summary of SCADA Recommendations**

| Recommendation | Description |
|---|---|
| Monitoring and Alarming Improvements | Provide additional monitoring and alarming for critical equipment in the lift station including:<br>a. Standby power generator<br>b. Automatic transfer switch<br>c. Power monitoring |
| Control System Improvements | Redesign the control scheme to reduce or eliminate single points of failure. |
| Power Distribution System Improvements | Improvements include the addition of a new main circuit breaker, along with a complete replacement of the automatic transfer switch and switchboard MSB. |
| Provide Motor Protective Relays | Motor protective relays can provide advanced levels of protection and control, and can also be used for metering, monitoring and reporting purposes. |
| Provide Variable Frequency Drives | One solid state starter or variable frequency should be installed for each motor and the size of each unit should be equal to or greater than the 50 horsepower rating of the motor to enhance control and automation. |
| Employ a Wide-Area-Network Strategy | Provide communication with a fiber optic backbone. |
| Develop SCADA System Master Plan | Evaluate all of the system components and provide recommendations for improvements and/or replacement. The plan should also include a standardized approach to each type of device to ensure continuity across the entire system. |

| Recommendation | Description |
|---|---|
| Arc Flash Hazard Assessment | Perform in accordance to the Standard for Electrical Safety in Workplace as published by the National Fire Protection Agency (NFPA 70E) and label all applicable panels and equipment with the resulting arc flash hazard in accordance with NFPA 70E. |
| Ventilation Improvements | Provide proper ventilation, monitoring, and alarming in accordance with the Standard for Fire Protection in Wastewater Treatment and Collection Facilities as published by the National Fire Protection Agency (NFPA 820) and relocate/replace MSB-3 (F-1 Exhaust Fan Control Panel 7.5 HP). |

## 3.0 Capacity and Process Recommendations

Garver evaluated the existing flow rates, current pump control schemes, alternation, and current pump control setpoints of the Kellway Lift Station, detailed in a separate memorandum. Garver developed recommendations to improve the existing control setpoints and to optimize pump operation. Table 3-1 outlines the capacity and process recommendations listed in the Capacity and Process Control Optimization Technical Memorandum.

**Table 3-1: Summary of Capacity and Process Recommendations**

| Recommendation | Description |
|---|---|
| Replace Impellers for Pumps 1 & 2 | Existing pumps are not operating with the expected capacity and efficiency due to worn impellers. Replace the impellers to increase pump efficiency. |
| Install 3rd Pump | A third pump is required to meet Texas Commission on Environmental Quality requirements and to provide full redundancy. |
| Adopt New Pump Control Settings | Revised pump control settings are recommended, in order to decrease residence time within the wet well and to increase the lifespan of the pumps. |

## 4.0 Regulatory Recommendations

Garver evaluated the Kellway Lift Station facility's compliance with the Texas Administrative Code (TAC) Chapter 217, Rules 59-64 pertaining to lift station design requirements. Garver noted areas where the existing lift station falls out of compliance and developed recommendations to bring Kellway Lift Station into compliance. Table 4-1 lists the regulatory recommendations detailed in the Regulatory Assessment Technical Memorandum.

**Table 4-1: Summary of Regulatory Recommendations**

| Recommendation | Description |
|---|---|
| Upgrade Existing 6' Fence | The existing perimeter fencing is approximately six feet tall and a portion of fence along the creek is not equipped with the three strands of barbed wire needed to comply with §217.59 (b). |
| Perform Full Ventilation System Evaluation | Ensure complete compliance with Chapter 9 of NFPA 820-2016 and other sections as applicable. |
| Monitoring and Alarming Improvements | The ventilation system should be monitored and alarmed in accordance with section 7.5 of NFPA 820-2016. |
| Relocation of Equipment | Relocate the exhaust fan control panel or the dry transformer to comply with the working spaces requirements of NFPA 70-2014 Table 110.26(A) (1) condition 2. |
| Install 3rd pump | Current pump sizing does not provide the full redundancy at anticipated peak flows needed meet Texas Commission on Environmental Quality requirements. |

## 5.0 Business Risk Exposure Recommendations

Garver incorporated the results of the condition assessment and consequence of failure rating for each of the Kellway Lift Station assets into the WE&RF Business Risk Exposure (BRE) tool to prioritize asset replacement. Based on the results of the BRE evaluation, Garver provided recommendations to replace 4 assets identified as Critical Risk assets and 1 asset (Pump No. 1) identified as a High Risk Asset. The recommendations are listed in Table 5-1. Each asset should be fully removed and replaced with identical structures, processes, and equipment.

**Table 5-1: Summary of Business Risk Exposure Recommendations**

| Recommendation | Description |
|---|---|
| Replace Automatic Transfer Switch | The automatic transfer switch should be replaced as it is identified as a Critical Risk Asset. |
| Replace MSB-3 (F-1 Exhaust Fan Control Panel 7.5 HP) | The MSB-3 should be replaced as it is identified as a Critical Risk Asset. |
| Replace Pump No. 1 and 2 | Pump No. 2 should be replaced as it is identified as a Critical Risk Asset. Pumps 1 & 2 were originally installed at the same time and Pump No. 1 (Asset No. 5) is currently in the High Risk Asset range. To ensure that both pumps have comparable operation, Garver recommends that Pump No. 1 also be replaced. |
| Replace Switchboard MSB | The switchboard MSB should be replaced as it is identified as a Critical Risk Asset. |

## 6.0 Summary of Recommendations

Recommendations for improvements to the lift station may be necessary based on several different evaluations. Table 6-1 provides a summary of drivers for each recommendation.

**Table 6-1: Summary of Recommendations and Drivers**

| Recommendation | SCADA TM | Capacity and Process Optimization TM | Regulatory Assessment TM | Condition Assessment and BRE TM |
|---|---|---|---|---|
| Arc Flash Hazard Assessment[3] | ✓ | | | |
| Ventilation Improvements[1] | ✓ | | ✓ | ✓ |
| Monitoring and Alarming Improvements | ✓ | | ✓ | |
| Control System Improvements | ✓ | | | |
| Power Distribution System Improvements[2] | ✓ | | | ✓ |
| Provide Motor Protective Relays | ✓ | | | |
| Provide Variable Frequency Drives | ✓ | | | |
| Employ a Wide-Area-Network Strategy[3] | ✓ | | | |
| Develop SCADA System Master Plan[3] | ✓ | | | |
| Replace Pump No. 2 | | ✓ | | ✓ |
| Replace Pump No. 1 | | ✓ | | |
| Install 3rd Pump | | ✓ | ✓ | |
| Adopt New Pump Control Settings | | ✓ | | |
| Upgrade Existing 6' Fence | | | ✓ | |
| Relocation of Equipment | | | ✓ | |
| Dewatering Container Filter[4] | | | | |

[1]-Includes the MSB-3 Critical Risk Asset
[2]-Recommendation includes the Automatic Transfer Switch and Switchboard MSB Critical Risk Assets
[3]- Indicates a professional service
[4]-City identified recommendation

## 7.0 Opinion of Probable Construction Cost and Suggested Phasing

The Opinion of Probable Construction Cost (OPCC) for the aforementioned recommendations is approximately $1,712,000. As not all of the improvements are required at once, the recommendations can be broken up into three separate phases to aid the Town of Addison prioritize improvements at the Kellway Lift Station. There is the potential to break the work into the following phases:

- Phase 1 - Electrical Improvements
- Phase 2 - Bypass Pumping and Site Work
- Phase 3 - Lift Station Pump Improvements
- Phase 4 - Regulatory Upgrades
- Phase 5 - Communication Improvements
- Phase 6 - Control Systems

### 7.1 Phase 1 – Electrical Improvements

The first phase of recommendations focuses on several Critical Risk Assets and power distribution improvements. Table 7-1 presents the OPCC for Phase 1. The individual item costs include a 20% allowance for appurtenances, 30% contingency, 18% overhead and profit, and an 18% allowance for professional services, excepting the cost of the Arc Flash Hazard Assessment, which is a professional service and includes no contingencies.

**Table 7-1: Phase 1 OPCC-Electrical Improvements**

| Item | Cost |
|---|---|
| Power Distribution Improvement | |
| *Replace Automatic Transfer Switch** | $55,000 |
| *Replace Switchboard MSB** | $65,000 |
| *Replace Main Circuit Breaker with Wiring and Conduit* | $124,000 |
| Replace MSB-3 (F-1 Exhaust Fan Control Panel 7.5 HP)* | $11,000 |
| Arc Flash Hazard Assessment - Engineering | $13,000 |
| **Total:** | $268,000 |

*Denotes a Critical Risk Asset

### 7.2 Phase 2 Bypass Pumping and Site Work

For the Phase 2 recommendations, two alternatives are provided for the bypass pumping. Bypass pumping is required for the regular maintenance of the lift station as well as for the installation of the third pump. The permanent bypass pumping option (Alternative A) involves a permanent wet well connected to the discharge force main with permanent piping. Under Alternative A, a temporary pump will pump from the wet well into the discharge force main. The

temporary bypass pumping option (Alternative B) involves a permanent access vault providing access to the discharge force main. Under Alternative B, a temporary pump will be lowered into the existing manhole upstream of the Kellway Lift Station and temporary piping will connect the pump to a quick connect on the discharge force main in the access vault. Since Alternative A provides permanent improvements that can be used in the future, it is the preferred alternative if funding is available.

Additionally, Phase 2 recommendations include the proposed dewatering container filter and concrete pad. The dewatering container filter will serve to dewater water used to cleanout local sewer lines and will pass the removed water into the Kellway Lift Station. The dewatering container filter and pad were included in Phase 2 as the sitework is similar to that of the bypass pumping and thus will make the items easier to complete together.

Table 7-2 presents the OPCC for the bypass pumping and site work. The individual item costs include a 20% allowance for appurtenances, 30% contingency, 18% overhead and profit, and an 18% allowance for professional services.

**Table 7-2: Phase 2 OPCC-Bypass Pumping and Site Work**

| Item | Cost |
|---|---|
| Bypass Pumping (Alternative A) | $506,000 |
| ~~Bypass Pumping (Alternative B)~~ | ~~$60,000~~ |
| Dewatering Container Filter | $62,000 |
| **Total:** | $567,000 |

## 7.3 Phase 3-Lift Station Pump Improvements

The Phase 3 items focus on capacity issues facing the Kellway Lift Station including worn out pump equipment and the need for an additional pump. Table 7-3 presents the OPCC for the Lift Station Pump Improvements. The individual item costs include a 20% allowance for appurtenances, 30% contingency, 18% overhead and profit, and an 18% allowance for professional services.

**Table 7-3: Phase 3 OPCC-Lift Station Pump Improvements**

| Item | Cost |
|---|---|
| Replace Pump No. 2* | $65,000 |
| Replace Pump No. 1* | $65,000 |
| Install 3rd Pump | $65,000 |
| **Total:** | $195,000 |

*Denotes High or Critical Risk Asset

### 7.4 Phase 4-Regulatory Upgrades

The Phase 4 items focus on recommendations intended to bring the Kellway Lift Station into regulatory compliance. Table 7-4 presents the OPCC for the regulatory upgrades. The individual item costs include a 20% allowance for appurtenances, 30% contingency, 18% overhead and profit, and an 18% allowance for professional services.

**Table 7-4: Phase 4 OPCC-Regulatory Upgrades**

| Item | Cost |
|---|---|
| Ventilation Improvements | $34,000 |
| Alarming Improvements | $78,000 |
| Site Fencing Improvements | $6,000 |
| **Total:** | $118,000 |

### 7.5 Phase 5-Communication Improvements

Phase 5 items focus on improving the communication strategy at the Kellway Lift Station through the development of a SCADA System Master Plan and the use of a Wide-Area Network Strategy. Table 7-5 presents the summary of the OPCC for the communication improvements. The individual item costs represent only the cost for the professional services and include no contingencies.

**Table 7-5: Phase 5 OPCC-Communication Improvements**

| Phase | Cost |
|---|---|
| SCADA System Master Plan | $100,000 |
| Employ Wide Area Network Strategy | TBD |
| **Total*:*** | $100,000 |

[1]To be determined based on SCADA System Master Plan results

### 7.6 Phase 6-Control Systems

The Phase 6 items focus on recommendations to improve the control systems of the Kellway Lift Station. **Error! Reference source not found.** presents the OPCC for the control system upgrades. The individual item costs include a 20% allowance for appurtenances, 30% contingency, 18% overhead and profit, and an 18% allowance for professional services

**Table 7-6: Phase 6 OPCC-Control Systems**

| Phase | Cost |
|---|---|
| Motor Protective Relays | $40,000 |
| Installation of Variable Frequency Drives | $308,000 |
| Control System Improvements | $117,000 |
| **Total:** | $465,000 |

## 7.7 Total Opinion of Probable Construction Costs

Based on the proposed phasing, Table 7-7 presents the summary of the total OPCC for the six recommended phases. A detailed summary of the total OPCC can be found in Table 7-8.

**Table 7-7: Total OPCC Summary**

| Item | Cost |
|---|---|
| **Phase 1-Electrical Improvements** | |
| Power Distribution Improvements | |
| *Replace Automatic Transfer Switch* | $55,000 |
| *Replace Switchboard MSB* | $65,000 |
| *Replace Main Circuit Breaker with Wiring and Conduit* | $124,000 |
| Replace MSB-3 (F-1 Exhaust Fan Control Panel 7.5 HP) | $11,000 |
| Arc Flash Hazard Assessment - Engineering | $13,000 |
| **Phase 1 Total:** | $268,000 |
| **Phase 2-Bypass Pumping and Site Work** | |
| Bypass Pumping (Alternative A) | $506,000 |
| Bypass Pumping (Alternative B) | $60,000 |
| Dewatering Container Filter | $62,000 |
| **Phase 2 Total:** | $567,000 |
| **Phase 3-Lift Station Pump Improvements** | |
| Replace Pump No. 2 | $65,000 |
| Replace Pump No. 1 | $65,000 |
| Install 3rd Pump | $65,000 |
| **Phase 3 Total:** | $195,000 |

| Item | Cost |
|---|---|
| **Phase 4-Regulatory Upgrades** | |
| Ventilation Improvements | $34,000 |
| Alarming Improvements | $78,000 |
| Site Fencing Improvements | $6,000 |
| **Phase 4 Total:** | $118,000 |
| **Phase 5-Communication Improvements** | |
| SCADA System Master Plan | $100,000 |
| Employ Wide Area Network Strategy | TBD |
| **Phase 5 Total:** | $100,000 |
| **Phase 6-Control Systems** | |
| Motor Protective Relays | $40,000 |
| Installation of Variable Frequency Drives | $308,000 |
| Control System Improvements | $117,000 |
| **Phase 6 Total:** | $465,000 |
| **Total OPCC:** | $1,713,000 |

**Table 7-8: Detailed OPCC Summary**

| Item | Qty. | Unit | Unit Cost | Labor/ Material | Total Cost |
|---|---|---|---|---|---|
| **Power Distribution Improvements** | | | | | |
| Replace Automatic Transfer Switch | 1 | EA | $15,000 | $10,000 | $54,304 |
| Replace Switchboard MSB | 1 | EA | $20,000 | $10,000 | $65,164 |
| New 600A Main Circuit Breaker with Installation (Includes Wiring and Conduit) | 1 | EA | $29,500 | $27,500 | $123,812 |
| **Replace MSB-3 (F-1 Exhaust Fan Control Panel 7.5 HP)** | 1 | EA | $4,120 | $1,000 | $11,121 |
| **Replace Pump No. 2** | 1 | EA | $23,000 | $6,900 | $64,947 |
| **Replace Pump No. 1** | 1 | EA | $23,000 | $6,900 | $64,947 |
| **Install 3rd Pump** | 1 | EA | $23,000 | $6,900 | $64,947 |
| **Lugger Style Dewatering Container Filter** | | | | | |

| Item | Qty. | Unit | Unit Cost | Labor/ Material | Total Cost |
|---|---|---|---|---|---|
| Basic Lugger | 1 | EA | $16,550 | | $35,949 |
| Steel Shoot | 1 | EA | $2,400 | | $5,213 |
| Shipping | 1 | LS | $2,450 | | $5,322 |
| **Concrete Container Pad** | | | | | $0 |
| Equipment Pad (6" Thick) | 4 | CY | $300 | $360 | $3,389 |
| Curb (3 sides only) | 50 | LF | $31 | $465 | $4,377 |
| Granular Sub-Base | 11 | CY | $40 | $133 | $1,254 |
| Excavation | 15 | CY | $15 | $68 | $635 |
| **PVC Pipe back to Wet Well** | 30 | LF | $83 | | $5,409 |
| **Bypass Pumping-Permanent Alternative** | | | | | |
| Excavation | 1025 | CY | $18 | $5,535 | $52,097 |
| Granular Sub-base | 4 | CY | $40 | $48 | $452 |
| Backfill | 961 | CY | $20 | $5,766 | $54,273 |
| Metal Shoring | 1653 | SF | $50 | $24,795 | $233,386 |
| Asphalt Pavement | 2 | TN | $122 | $72 | $682 |
| Walls-Wet Well Box | 38 | CY | $600 | $6,840 | $64,382 |
| Base Slab-Wet Well Box | 4 | CY | $600 | $720 | $6,777 |
| Alum Ladder | 31 | VLF | $40 | $372 | $3,501 |
| 18"x18" Stainless Steel Slide Gate | 2 | EA | $7,000 | $4,200 | $39,533 |
| Aluminum Top Hatch, Rated (48"x48") | 1 | EA | $2,420 | $726 | $6,832 |
| 6" Ductile Iron Pipe | 31 | LF | $143 | $1,330 | $12,518 |
| Bypass Pump System | 1 | LS | $3,263 | $979 | $9,213 |
| 10" Gate Valve | 1 | EA | $1,742 | $523 | $4,919 |
| 10" x 10" Tee | 270 | LB | $9 | $729 | $6,862 |
| 6" by 10" Reducer | 90 | LB | $9 | $243 | $2,287 |
| 6" Quick Connect Setup | 1 | EA | $200 | $60 | $565 |
| 6" 90 Bend | 2 | EA | $848 | $509 | $4,789 |
| 15" Temporary Pipe Plug | 1 | EA | $997 | $299 | $2,815 |
| **Bypass Pumping-Temporary Alternative** | | | | | |
| Excavation | 150 | CY | $18 | $810 | $7,624 |
| Granular Sub-base | 2 | CY | $40 | $23 | $215 |
| Backfill | 134 | CY | $20 | $804 | $7,568 |

| Item | Qty. | Unit | Unit Cost | Labor/ Material | Total Cost |
|---|---|---|---|---|---|
| Asphalt Pavement | 3 | TN | $122 | $125 | $1,175 |
| Walls-Access Box | 6 | CY | $600 | $1,080 | $10,166 |
| Base Slab-Access Box | 3 | CY | $600 | $540 | $5,083 |
| Alum Ladder | 8 | VLF | $40 | $96 | $904 |
| Aluminum Top Hatch, Rated (48"x48") | 1 | EA | $3,979 | $1,194 | $11,236 |
| Temporary Flexible Pipe (6") (100' length) | 1 | EA | $2,237 | $671 | $6,317 |
| Temporary Sump Pump | 1 | LS | $3,263 | $979 | $9,213 |
| 6" Quick Connect Setup | 1 | EA | $200 | $60 | $565 |
| **Ventilation Improvements** | | | | | |
| Ventilation System Evaluation | 44 | HR | $135 | $1,000 | $15,075 |
| Hazardous Area Designations | 16 | HR | $135 | $100 | $4,909 |
| SCADA system alarm improvements | 24 | HR | $135 | $3,000 | $13,554 |
| **Alarming Improvements** | | | | | |
| SCADA system alarm improvements | 1 | LS | $5,000 | $1,500 | $14,119 |
| Standby Power Generator Improvements | 1 | LS | $2,500 | $750 | $7,059 |
| Automatic Transfer Switch Connections | 1 | LS | $1,000 | $300 | $2,824 |
| Power Monitoring | 1 | LS | $5,000 | $1,500 | $14,119 |
| Power Monitoring Networking | 1 | LS | $1,500 | $450 | $4,236 |
| Conduit, wiring, terminations | 1 | LS | $2,500 | $750 | $7,059 |
| PLC Programming revisions (Application Engineering) | 1 | LS | $10,000 | $3,000 | $28,238 |
| **Site Fencing Improvements*** | 1 | LS | $2,791 | | $6,061 |
| **Motor Protective Relays** | | | | | |
| New Motor Protective Relay | 2 | EA | $2,500 | $2,500 | $16,291 |
| Control Panel Revisions | 1 | LS | $1,000 | $2,000 | $6,516 |
| Relay programming, startup, commissioning* | 1 | LS | $3,000 | | $6,516 |
| PLC Programming revisions (Application Engineering)* | 1 | LS | $5,000 | | $10,861 |
| **Installation of Variable Frequency Drives** | | | | | |
| Variable Frequency Drives | 2 | EA | $35,000 | $5,000 | $162,911 |

| Item | Qty. | Unit | Unit Cost | Labor/ Material | Total Cost |
|---|---|---|---|---|---|
| Control Panel Revisions | 1 | LS | $1,000 | $2,000 | $6,516 |
| VFD programming, startup, commissioning | 1 | EA | $0 | $4,000 | $8,689 |
| PLC Programming revisions (Application Engineering)* | 1 | LS | $15,000 | | $32,582 |
| New Wiring | 1 | LS | $20,000 | $15,000 | $76,025 |
| New Conduit | 1 | LS | $5,000 | $5,000 | $21,721 |
| **SCADA System Master Plan*** | 1 | LS | $100,000 | | $100,000 |
| **Arc Flash Hazard Assessment - Engineering*** | | | | | |
| Develop Site Data | 1 | LS | $4,240 | | $4,240 |
| Complete Electrical Studies | 1 | LS | $2,800 | | $2,800 |
| Develop Report, Prepare Labels | 1 | LS | $2,260 | | $2,260 |
| Print Labels | 1 | LS | $2,000 | | $2,000 |
| Project Closeout, apply labels | 1 | LS | $2,000 | | $2,000 |
| **Control System Improvements*** | | | | | |
| Control System Improvements | 1 | LS | $10,000 | | $21,721 |
| Control Panel Modifications | 1 | LS | $10,000 | | $21,721 |
| Redundant Controlling Devices (Floats) | 1 | LS | $1,500 | | $3,258 |
| Redundant Controlling Devices (Spare Level Transmitter) | 1 | LS | $1,500 | | $3,258 |
| Spare PLC processor | 1 | LS | $7,500 | | $16,291 |
| Spare I/O Cards | 1 | LS | $2,000 | | $4,344 |
| Spare Radio | 1 | LS | $1,000 | | $2,172 |
| Conduit, wiring, terminations | 1 | LS | $5,000 | | $10,861 |
| PLC Programming revisions (Application Engineering) | 1 | LS | $15,000 | | $32,582 |
| **Employ a Wide Area Network Strategy** | 1 | LS | | | TBD |
| | | | | Total OPCC[1]: | $1,712,066 |

*Unit cost for item includes all labor and material costs
[1]Total OPCC is determined using the cost for Alternative A-Permanent Bypass Pumping

# Technical Memorandum

## Capital Improvements Plan


**May 2017**

**Prepared by:**

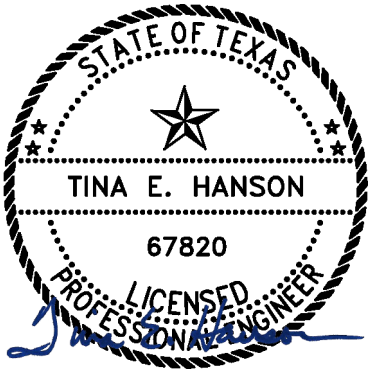

**3010 Gaylord Parkway, Suite 190**
**Frisco, TX 75034**
**TBPE Registration No. F-5713**

**Garver Project No. 16088080**

## Engineer's Certification

I hereby certify that Capital Improvements Technical Memorandum for the Town of Addison Kellway Wastewater Lift Station project was prepared under my direct supervision on May 26, 2017 for the Town of Addison.

Tina E. Hanson, PE
State of Texas PE License No. 67820




Jeffrey L. Sober, PE
State of Texas PE License No. 103772

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# 1.0 Executive Summary

This Capital Improvements Plan (CIP) Technical Memorandum for the Kellway Lift Station addresses the identified needs detailed in the Recommendations and OPCC Technical Memorandum. The CIP projects are grouped according to discipline, location, and City budget to allow for easy implementation of the recommended improvements. While there is some flexibility in the recommended order of improvements, projects involving Critical Risk Assets should be prioritized followed by projects designed to meet regulatory requirements.

## 1.1 Identification and Ranking

The primary trigger for each of the projects is identified in the Project Identification Forms detailed in this technical memorandum. The primary trigger can be one of up to 4 triggers including regulatory, capacity, City-identified, or BRE Critical Risk Asset. Projects dealing with BRE Critical Risk Assets or projects designed to meet regulatory requirements are given priority.

## 1.2 Cost Development

Cost estimates were prepared for each of the individual projects, based on industry standards and the 2017 bidding environment. These costs are budget-level estimates, and should be re-evaluated as each project nears the trigger date. Each project has the following costs associated with the total forecasted project costs:

### 1.2.1 Opinion of Probable Construction Cost (OPCC)

The OPCC is the budget-level estimate of the Contractor's bid price once the project has been designed and is ready for the bid phase to begin. It represents a combination of the estimated total construction costs, engineering and a 30% contingency.

### 1.2.2 Engineering

Engineering includes the estimates of professional services needed to bid each project, including survey, geotechnical, deed research (as needed), preliminary, and final design of all improvements. This cost represents 15% of the OPCC. Construction engineering is not included since those services are assumed to be provided by the City staff.

### 1.2.3 Forecasted Project Costs

Forecasted project costs are the Opinion of Construction Costs (OPCC) with a 3% escalation for inflation to the project initiation month and year.

## 1.3 Cost and Schedule Summary

A proposed spending schedule is shown in Figure 1-1. This spending schedule and associated project trigger dates should be updated as the City budget is further refined. Table 1-1 shows the proposed trigger dates and project completion dates for each of the project groups.

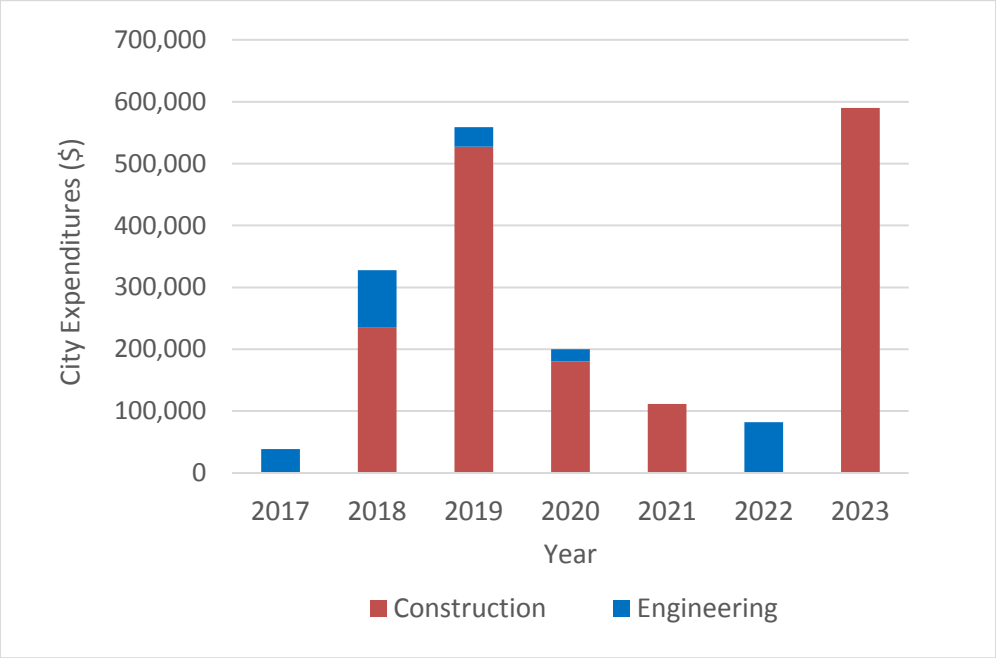


**Figure 1-1: Proposed Spending Schedule**

**Table 1-1: Proposed Project Completion Schedule**

| Project Group | Description | Begin Date | Engineering/ Design (Months) | Bid/ Construction (Months) | End Date |
|---|---|---|---|---|---|
| Group I | Electrical Improvements | May-17 | 9 | 12 | Feb-19 |
| Group II | Bypass Pumping and Site Work | Jul-18 | 9 | 12 | Apr-20 |
| Group III | Lift Station Pump Improvements | Jan-19 | 9 | 12 | Oct-20 |
| Group IV | Regulatory Upgrades | Jan-20 | 9 | 12 | Oct-21 |
| Group V | Communication Improvements | Jul-21 | 14 | 12 | Sep-23 |
| Group VI | Control Systems | Jan-22 | 9 | 12 | Oct-23 |

## Group I: Electrical Improvements

### Improvements Description

Power Distribution Improvements

- Replace the Automatic Transfer Switch
- Replace the Switchboard MSB
- Replace Main Circuit Breaker along with wiring and conduit to lower the incident energy for the downstream equipment and provide additional overcurrent protection for the station

Replace the MSB-3 (Exhaust Fan Control Panel)

- Replace the MSB-3 (Exhaust Fan Control Panel)
- To comply with working spaces requirements of the National Electric Code, the MSB-3 should be relocated to provide the required clear distance.

Perform Arc Flash Hazard Assessment

- To ensure the safety of employees working on or near electrical equipment, an arc flash hazard assessment should be performed in accordance with the Standard for Electrical Safety in the Workplace as published by the National Fire Protection Agency (NFPA 70E).
- All applicable panels and equipment should be labeled with the resulting arc flash hazard in accordance with NFPA 70E

| **Project Identification** | |
|---|---|
| Number | 1 |
| Location | Kellway Lift Station |
| Flexibility | Low |
| **Schedule** | |
| Primary Trigger | BRE Critical Risk Assets |
| Secondary Trigger | City Identified |
| Trigger Date | May 2017 |
| Project Complete | February 2019 |
| **Project Implementation (Months)** | |
| Engineering/Design | 9 |
| Bid/Construction | 12 |
| Total Project Duration | 21 |

| Cost ($ Millions) | Construction | Engineering | OPCC |
|---|---|---|---|
| 2017 Costs | $0.23 | $0.04 | **$0.27** |
| 2018 Forecasted | $0.24 | $0.04 | **$0.28** |
| 2019 Forecasted | $0.25 | $0.04 | **$0.29** |
| 2020 Forecasted | $0.26 | $0.04 | **$0.30** |
| 2021 Forecasted | $0.27 | $0.04 | **$0.31** |
| 2022 Forecasted | $0.27 | $0.04 | **$0.32** |

### Justification

The electrical improvements in Group 1 are key to reducing the risk of failure for the Kellway Lift Station. The Automatic Transfer Switch, the Switchboard MSB, and the MSB-3 are all Critical Risk Assets according to the BRE tool, and thus their operation is critical to the functioning of the Kellway Lift station. Additionally, the Arc Flash Hazard Assessment and the replacement of the Main Circuit Breaker are crucial to maintain safe and efficient operation of the lift station's electrical components.

### Unintended Consequences

None identified.

### Special Considerations

None identified.

### Potential Alternatives

None identified.

| Group I Improvements | Cost |
|---|---|
| Power Distribution Improvements | |
| *Replace Automatic Transfer Switch* | $ 55,000 |
| *Replace Switchboard MSB* | $ 65,000 |
| *Replace Main Circuit Breaker with Wiring and Conduit* | $ 124,000 |
| Replace MSB-3 (F-1 Exhaust Fan Control Panel 7.5 HP) | $ 11,000 |
| Arc Flash Hazard Assessment - Engineering | $ 13,000 |
| ***2017 Group I Total OPCC:*** | **$ 268,000** |


**Figure 1-2: Existing MSB-3 (Exhaust Fan Control Panel)**

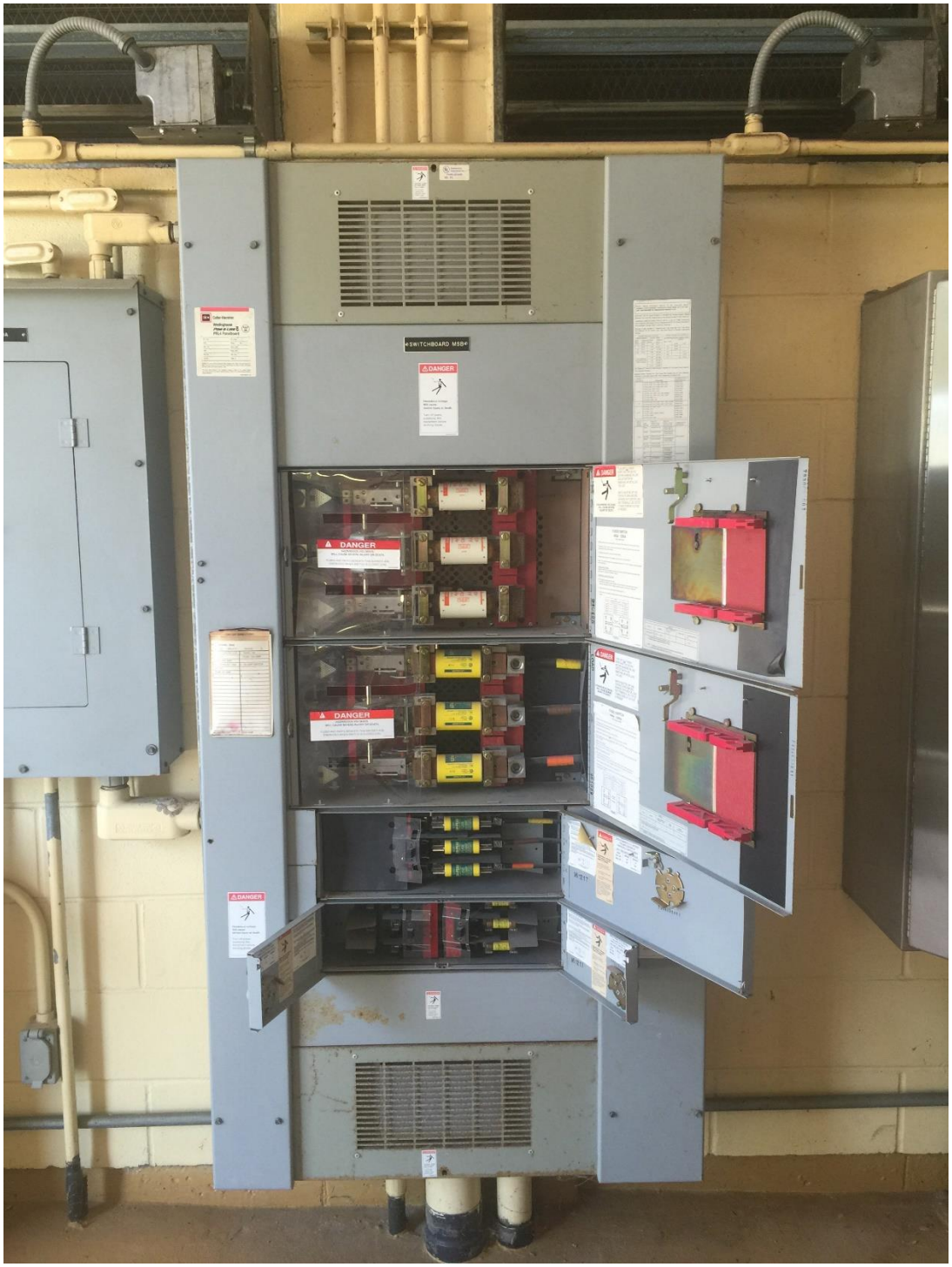


**Figure 1-3: Existing Switchboard MSB**


**Figure 1-4: Existing Automatic Transfer Switch**

## Group II: Bypass Pumping and Site Work

### Improvements Description

Bypass Pumping

- Construct a permanent wet well upstream of the Kellway Lift Station and install permanent piping from wet well to the discharge force main
- Provide connections for temporary pump attachment.

Dewatering Container Filter

- Purchase Lugger Style Dewatering Container Filter from Flo Trend
- Construct a drainage pad with a drain connected to the wet well of the lift station

### Justification

Bypass pumping is required to perform maintenance or repairs on the existing lift station equipment or structure. The dewatering container is warranted as it is needed to provide the City of Addison with a way to dewater wastewater after cleaning sewer mains.

### Unintended Consequences

None identified.

### Special Considerations

The bypass pumping system is required before any work on the wet well pumps or structure can be performed.

### Potential Alternatives

Instead of creating a permanent bypass pumping system, another alternative is to make use of the existing manhole upstream of the Kellway Lift Station. By installing an access vault at the discharge force main connection, a temporary pump could be lowered into the existing manhole and pump the flow directly to the discharge force main at the access vault.

| Project Identification | |
|---|---|
| Number | 2 |
| Location | Kellway Lift Station |
| Flexibility | Low |
| **Schedule** | |
| Primary Trigger | City Identified |
| Secondary Trigger | City Identified |
| Trigger Date | July 2018 |
| Project Complete | April 2020 |
| **Project Implementation (Months)** | |
| Engineering/Design | 9 |
| Bid/Construction | 12 |
| Total Project Duration | 21 |

| Cost ($ Millions) | Construction | Engineering | OPCC |
|---|---|---|---|
| 2017 Costs | $0.48 | $0.09 | $0.57 |
| 2018 Forecasted | $0.51 | $0.09 | $0.60 |
| 2019 Forecasted | $0.53 | $0.09 | $0.62 |
| 2020 Forecasted | $0.54 | $0.09 | $0.64 |
| 2021 Forecasted | $0.56 | $0.10 | $0.65 |
| 2022 Forecasted | $0.57 | $0.10 | $0.67 |

| Group II Improvements | Cost |
|---|---|
| Bypass Pumping (Alternative A) | $506,000 |
| ~~Bypass Pumping (Alternative B)~~ | ~~$60,000~~ |
| Dewatering Container Filter | $62,000 |
| ***2017 Group II Total OPCC:*** | **$ 567,000** |

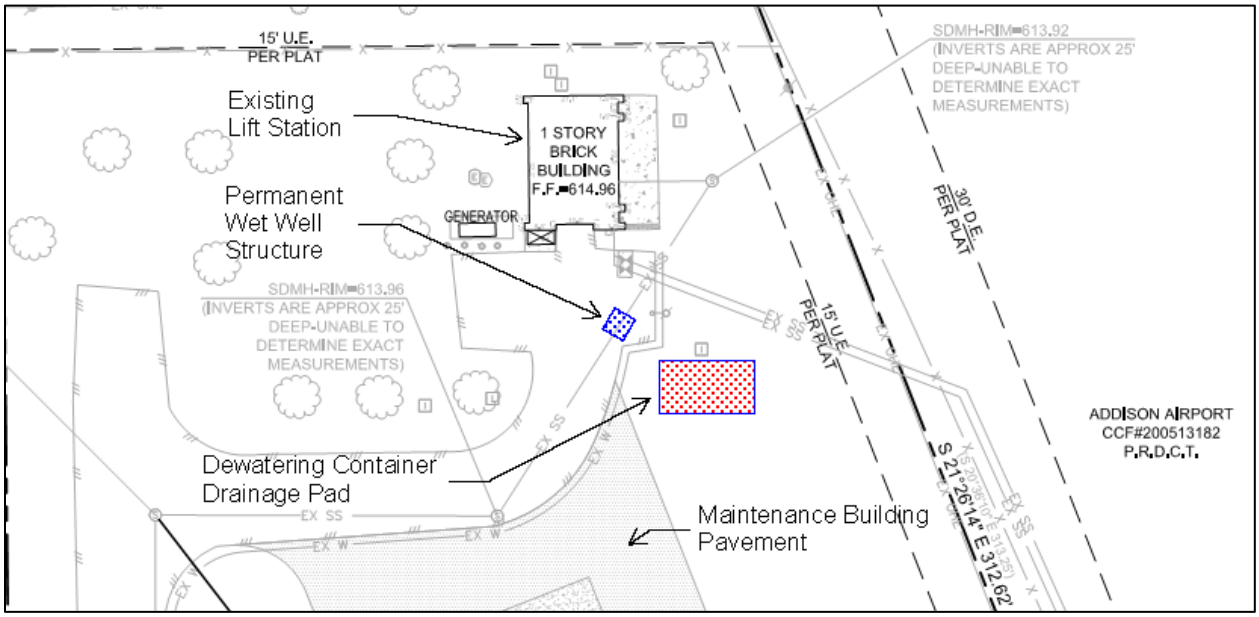


**Figure 1-5: Proposed Location for Bypass Pumping and Dewatering Container Drainage Pad**

## Group III: Lift Station Pump Improvements

### Improvements Description

- Replace Pump No. 1 and Pump No. 2
- Install a third pump identical to Pumps No. 1 and 2 at the existing connection for the additional pump

### Justification

Pump No. 2 is identified as a Critical Risk Asset, according to the BRE tool and should be replaced. Pump No. 1 is the same age as Pump No. 2 and is identified as a High Risk Asset by the BRE tool. To maintain similar pump performance between Pump Nos. 1 and 2, both should be replaced at the same time. The installation of a third pump is required as the combined capacity of Pump Nos. 1 and 2 is not sufficient to meet either the anticipated flows or the redundancy requirements by TAC regulations.

### Unintended Consequences

None identified.

### Special Considerations

Pump Nos. 1 and 2 should be replaced before the installation of the third pump.

### Potential Alternatives

None identified.

| **Project Identification** | |
|---|---|
| Number | 3 |
| Location | Kellway Lift Station |
| Flexibility | Low |
| **Schedule** | |
| Primary Trigger | BRE Critical Risk Assets |
| Secondary Trigger | Regulatory Requirements |
| Trigger Date | January 2019 |
| Project Complete | October 2020 |
| **Project Implementation (Months)** | |
| Engineering/Design | 9 |
| Bid/Construction | 12 |
| Total Project Duration | 21 |

| Cost ($ Millions) | Construction | Engineering | OPCC |
|---|---|---|---|
| 2017 Costs | $0.17 | $0.03 | $0.19 |
| 2018 Forecasted | $0.18 | $0.03 | $0.21 |
| 2019 Forecasted | $0.18 | $0.03 | $0.21 |
| 2020 Forecasted | $0.19 | $0.03 | $0.22 |
| 2021 Forecasted | $0.19 | $0.03 | $0.22 |
| 2022 Forecasted | $0.20 | $0.03 | $0.23 |

| Group III Improvements | Cost |
|---|---|
| Replace Pump No. 2 | $65,000 |
| Replace Pump No. 1 | $65,000 |
| Install 3rd Pump | $65,000 |
| ***Group III Total OPCC:*** | **$195,000** |

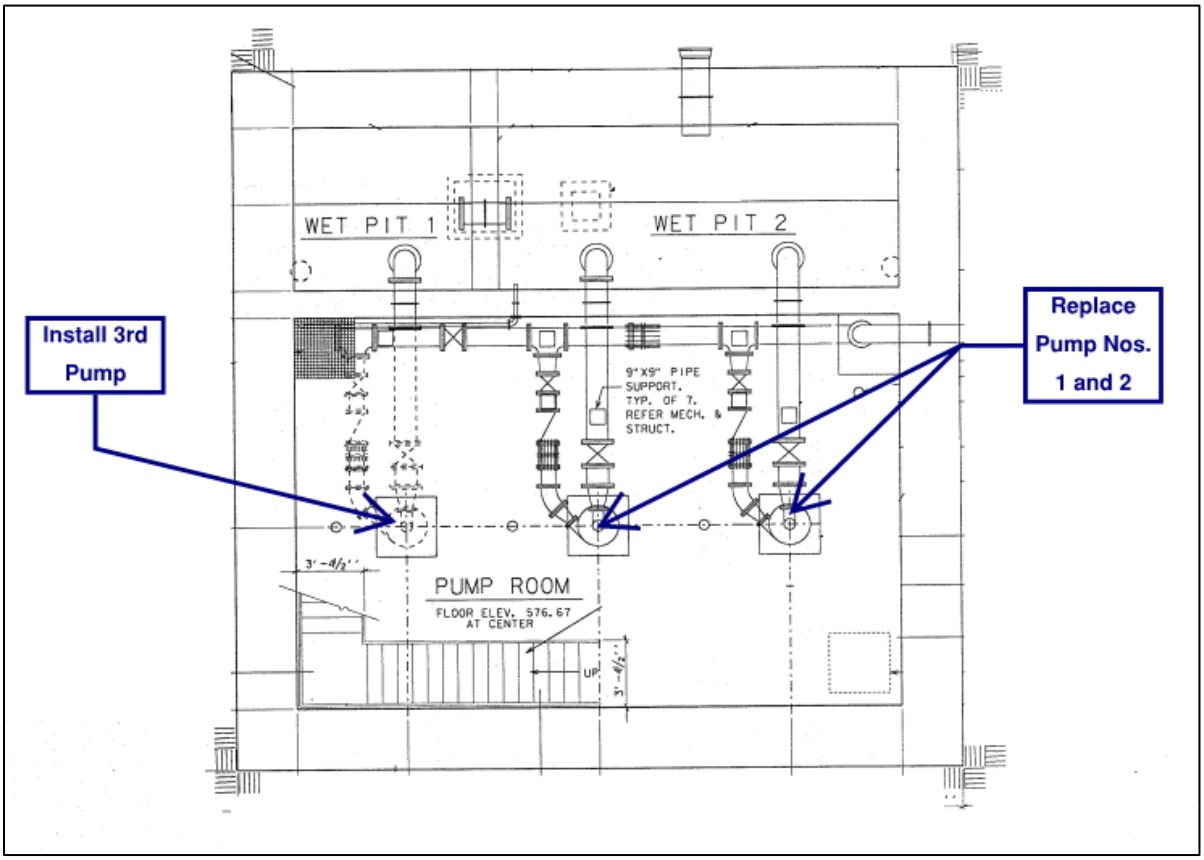


**Figure 1-6: Location for Pump Replacement and Installation**

## Group IV: Regulatory Upgrades

### Improvements Description

Monitoring/Alarming Improvements

- Provide additional monitoring and alarming for critical equipment including the standby power generator, the automatic transfer switch, and the power monitoring.

Regulatory Improvements

- Perform a full ventilation system evaluation to ensure compliance with the National Fire Protection Agency and improve ventilation monitoring and alarming
- Install three strands of barbed wire to the existing 6 foot perimeter fencing

### Justification

Monitoring/alarming improvements are justified as the monitoring of critical components of the Kellway Lift Station's equipment will reduce preventable service outages and increase the lift station's reliability. The regulatory improvements are required as both the ventilation system and the perimeter fencing do not meet the regulatory requirements set by the Texas Administrative Code.

### Unintended Consequences

None identified.

### Special Considerations

None identified.

### Potential Alternatives

Instead of attaching 3 strands of barbed wire to the existing 6 foot fence, the regulation could also be fulfilled by installing a new 8 foot fence around the perimeter of the property.

| **Project Identification** | |
|---|---|
| Number | 4 |
| Location | Kellway Lift Station |
| Flexibility | Low |
| **Schedule** | |
| Primary Trigger | Regulatory Requirements |
| Secondary Trigger | City Identified Needs |
| Trigger Date | January 2020 |
| Project Complete | October 2021 |
| **Project Implementation (Months)** | |
| Engineering/Design | 9 |
| Bid/Construction | 12 |
| Total Project Duration | 21 |

| Cost ($ Millions) | Construction | Engineering | OPCC |
|---|---|---|---|
| 2017 Costs | $0.10 | $0.02 | $0.12 |
| 2018 Forecasted | $0.11 | $0.02 | $0.12 |
| 2019 Forecasted | $0.11 | $0.02 | $0.13 |
| 2020 Forecasted | $0.11 | $0.02 | $0.13 |
| 2021 Forecasted | $0.12 | $0.02 | $0.14 |
| 2022 Forecasted | $0.12 | $0.02 | $0.14 |

| Group IV Improvements | Cost |
|---|---|
| Ventilation Improvements | $34,000 |
| Alarming Improvements | $78,000 |
| Site Fencing Improvements | $6,000 |
| ***Group IV Total OPCC:*** | $118,000 |

## Group V: Communication Improvements

### Improvements Description

SCADA System Master Plan

- Develop and periodically update the SCADA System Master Plan
- This SCADA System Master Plan will evaluate all of the system components and provide recommendations for improvements and/or replacement.
- Evaluation should include an in-depth review of the hardware, software, network, and communication systems of each individual component of the system.
- The plan should also include a standardized approach to each type of device to ensure continuity across the entire system.

Wide Area Network Strategy Implementation

- Develop a Wide-Area-Network (WAN) Strategy for communication with a fiber optic backbone

### Justification

A SCADA System Master Plan and the WAN implementation will give the operators of the Kellway Lift Station better remote control of the equipment and will facilitate data collection and analysis, as well as communication between systems.

### Unintended Consequences

None identified.

### Special Considerations

None identified.

### Potential Alternatives

None identified.

| Project Identification | |
|---|---|
| Number | 5 |
| Location | Kellway Lift Station |
| Flexibility | Medium |
| **Schedule** | |
| Primary Trigger | City Identified Needs |
| Secondary Trigger | - |
| Trigger Date | July 2021 |
| Project Complete | September 2023 |
| **Project Implementation (Months)** | |
| Engineering/Design | 14 |
| Bid/Construction | 12 |
| Total Project Duration | 26 |

| Cost ($ Millions) | Construction | Engineering | OPCC |
|---|---|---|---|
| 2017 Costs | $0.10 | - | $0.10 |
| 2018 Forecasted | $0.11 | - | $0.11 |
| 2019 Forecasted | $0.11 | - | $0.11 |
| 2020 Forecasted | $0.11 | - | $0.11 |
| 2021 Forecasted | $0.12 | - | $0.12 |
| 2022 Forecasted | $0.12 | - | $0.12 |

| Group IV Improvements | Cost |
|---|---|
| SCADA System Master Plan | $100,000 |
| Employ Wide Area Network Strategy | TBD[1] |
| ***Group V Total OPCC:*** | **$100,000** |

[1]To be determined based on SCADA System Master Plan results

## Group VI: Control Systems

### Improvements Description

Motor Protective Relays

- Provide motor protective relays for each motor in the Kellway Lift station

Variable Frequency Drives

- Install one variable frequency drive for each motor. The size of each unit should be equal to or greater than the 50 horsepower rating of each motor

Control System Improvements

- Redesign the control scheme
- Provide non-electric methods of control for backup purposes
- Provide redundant controlling devices and a wet well level transmitter
- Provide a spare pre-programmed PLC processing unit, spare I/O cards, and a spare radio

### Justification

Motor protective relays provide protection and additional monitoring capabilities for the Kellway Lift Station. Motor protective relays can also be used for metering, monitoring and reporting purposes, including motor start reports, motor start trending, load profile monitoring, and motor operating statistics. Variable Frequency Drives will enhance the control and automation of the Kellway Lift Station. The control system should be redesigned so as to eliminate the single points of failure at the Kellway Lift Station.

### Unintended Consequences

None identified.

### Special Considerations

None identified.

### Potential Alternatives

None identified.

| **Project Identification** | |
|---|---|
| Number | 6 |
| Location | Kellway Lift Station |
| Flexibility | High |
| **Schedule** | |
| Primary Trigger | City Identified Needs |
| Secondary Trigger | - |
| Trigger Date | January 2022 |
| Project Complete | October 2023 |
| **Project Implementation (Months)** | |
| Engineering/Design | 14 |
| Bid/Construction | 12 |
| Total Project Duration | 26 |

| Cost ($ Millions) | Construction | Engineering | OPCC |
|---|---|---|---|
| 2017 Costs | $0.39 | $0.07 | $0.46 |
| 2018 Forecasted | $0.42 | $0.07 | $0.49 |
| 2019 Forecasted | $0.43 | $0.08 | $0.51 |
| 2020 Forecasted | $0.44 | $0.08 | $0.52 |
| 2021 Forecasted | $0.46 | $0.08 | $0.54 |
| 2022 Forecasted | $0.47 | $0.08 | $0.55 |

| Group VI Improvements | Cost |
|---|---|
| Motor Protective Relays | $40,000 |
| Installation of Variable Frequency Drives | $308,000 |
| Control System Improvements | $117,000 |
| ***Group VI Total OPCC:*** | **$465,000** |

# Appendix A

Example Condition Assessment Form

# Addison Facilities

**Project #16088080**

# Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** | **Discipline: BLD PRS STR EIC MEC** | **Date:** |
| **Fund: (Level 1) / Location (Level 2)**<br><br>610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)**<br>**Good Fair Poor** |
| **Manufacturer:** | | **Model Number:** |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| | **Condition** | |
| | **Capacity** | |
| | **Reliability** | |
| | **Availability** | |
| | **Maintainability** | |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

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# Appendix B

## Structural (STR) Condition Assessment Forms

# Addison Facilities
## Project #16088080
# Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:**<br>Kipp A. Martin | **Discipline:** BLD<br>PRS **STR** EIC<br>MEC | **Date:** July 19, 2016 |
| **Fund: (Level 1) / Location (Level 2)**<br><br>610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)**<br>Roof - 2 |
| **Asset Type: (Level 4)/Size (Level 5)**<br>Control Room Roof | | **Equipment Number: (Level 6)** |
| **Installation Date or Approximate Age:**<br>19 years old | | **Visual Condition Rating: (Circle one) (Overall)**<br>**Good** Fair Poor |
| **Manufacturer:** | | **Model Number:** |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| Structural roof is 1.5" Type B steel deck on steel joists. All are in good condition. Steel joists support a monorail with a 1 ton capacity electric chain hoist. Metal roofing is standing seam type (panel and batten with concealed fasteners) and is in good condition. All trim and flashing is in place and no damage was observed. There are no gutters or downspouts. | **Condition** | 3 |
| | **Capacity** | 3 |
| | **Reliability** | 3 |
| | **Availability** | 3 |
| | **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

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Control Room Roof - Interior View

Control Room Roof - Exterior East Side View

# Addison Facilities
## Project #16088080
# Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:**<br>**Kipp A. Martin** | **Discipline: BLD**<br>**PRS <u>STR</u> EIC**<br>**MEC** | **Date: July 19, 2016** |
| **Fund: (Level 1) / Location (Level 2)**<br><br>610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)**<br>Ground - 1 |
| **Asset Type: (Level 4)/Size (Level 5)**<br>Control Room Structure | | **Equipment Number: (Level 6)** |
| **Installation Date or Approximate Age:**<br>19 years old | | **Visual Condition Rating: (Circle one) (Overall)**<br>**<u>Good</u>** Fair Poor |
| **Manufacturer:** | | **Model Number:** |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| Exterior masonry is in very good condition. Minor cracking observed in south wall between personnel door and roll up door, and also in north wall interior at roof near west wall. No other cracking was observed. | **Condition** | 3 |
| | **Capacity** | 3 |
| | **Reliability** | 3 |
| | **Availability** | 3 |
| | **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

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Control Room Structure - South Elevation

Control Room Structure - East Elevation

Control Room Structure - North Elevation

Control Room Structure - West Elevation

# Addison Facilities
## Project #16088080
# Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** Kipp A. Martin | **Discipline:** BLD PRS **STR** EIC MEC | **Date:** July 19, 2016 |
| **Fund: (Level 1) / Location (Level 2)**<br>610/KLS | | **Building Level: (Level 3 Wet well-WW, Pump Pit-0, Ground-1, Roof-2)**<br>Pump Pit - 0 |
| **Asset Type: (Level 4)/Size (Level 5)**<br>Pump Room Structure | | **Equipment Number: (Level 6)** |
| **Installation Date or Approximate Age:**<br>19 years old | | **Visual Condition Rating: (Circle one) (Overall)**<br>**Good** Fair Poor |
| **Manufacturer:** | | **Model Number:** |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

**Condition Comments/Notes:**
The pump room walls, bottom slab, and top slab are all in very good condition. A small crack was observed beneath the influent line for the south most pump (Pump No. 1). A small amount of groundwater intrusion was visible at this crack. The pipe and valve supports are all in very good condition. The stairs are constructed from galvanized steel stringers and galvanized steel grating and are in good condition. The supports for the large ventilation duct are in good condition, as is the duct itself. The sump contains some water, but appears to also be in good condition.

| **Rank 1 to 10** | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 3 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

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Pump Room Structure - Looking South

Pump Room Structure - Looking North

# Addison Facilities
## Project #16088080
# Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** Kipp A. Martin | **Discipline:** BLD PRS **STR** EIC MEC | **Date:** July 19, 2016 |
| **Fund: (Level 1) / Location (Level 2)**<br>610/KLS | | **Building Level: (Level 3 Wet well-WW, Pump Pit-0, Ground-1, Roof-2)**<br>Wet well - WW |
| **Asset Type: (Level 4)/Size (Level 5)**<br>Wet well | | **Equipment Number: (Level 6)** |
| **Installation Date or Approximate Age:**<br>19 years old | | **Visual Condition Rating: (Circle one) (Overall)**<br>**Good** Fair Poor |
| **Manufacturer:** | | **Model Number:** |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| Wet well condition could only be accessed visually from the exterior hatch. Lighting was such that only a small portion of the wet well could be observed. What was observed is in very good condition with no signs of $H_2S$ corrosion or other damage. The hatch, exhaust fan, and vents are all in good condition. | **Condition** | 3 |
| | **Capacity** | 3 |
| | **Reliability** | 3 |
| | **Availability** | 3 |
| | **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Wet Well

# Appendix C

## Process and Mechanical (PRS/MEC) Condition Assessment Forms

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 1 |
| **Asset Type: (Level 4)/Size (Level 5)** AD- Automatic Damper | | **Equipment Number: (Level 6)** 1, 2, 3, (located on west side of L.S. Bldg) |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 70X54 | | **Horsepower/Voltage/Speed:** |

**Client Comments/Notes:**

Dampers are interlocked with Exhaust Fans

NW Damper - interlocked w F-2 (Plan Control Room)
Middle & SW Damper - interlocked w F-1 (Dry Pit)

**Condition Comments/Notes:**

| | Rank 1 to 10 |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 3 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

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Automatic Damper 1

Automatic Damper 2

Automatic Damper 3

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 1 |
| **Asset Type: (Level 4)/Size (Level 5)** EF - Control Room Wall Exhaust Fan (F-2) | | **Equipment Number: (Level 6)** 2 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 1,480 CFM | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| | **Condition** | 3 |
| | **Capacity** | 3 |
| | **Reliability** | 5 |
| | **Availability** | 3 |
| | **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Control Room Wall Exhaust Fan (F-2)

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 |
| **Asset Type: (Level 4)/Size (Level 5)** GV - 10-inch discharge heater gate value | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unkown | | **Model Number:** |
| **Size/Capacity:** 10-inch | | **Horsepower/Voltage/Speed:** N/A |

**Client Comments/Notes:**

Valve required for installation of 3rd Pump

**Condition Comments/Notes:**

All isolation values should be periodically operated to verify seating & operation

| Rank 1 to 10 | |
|---|---|
| **Condition** | 1 |
| **Capacity** | 1 |
| **Reliability** | 1 |
| **Availability** | 1 |
| **Maintainability** | 1 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access, entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Discharge Header Gate Valve (10")

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | |
|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) |
| **Date:** 7/19/16 | |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** @ 1 (Fan located in line ductwork at pump room level) |
| **Asset Type: (Level 4)/Size (Level 5)** EF - Dry Pit Exhaust Fan(F-1) | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Centri Master | **Model Number:** Serial # NVA 925301 |
| **Size/Capacity:** 14,385 CFM | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | |

**Condition Comments/Notes:**

Fan should be interlocked with light switch to dry pit area.

Fan should be capable of 6 air changes/hour.

Fan appears undersized.

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 5 |
| **Availability** | 3 |
| **Maintainability** | 3 |

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| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habital issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access, entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Dry Pit Exhaust Fan (F-1)

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 1 |
| **Asset Type: (Level 4)/Size (Level 5)** UH- Unit Heater | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 1,300 cfm, 15KW | | **Horsepower/Voltage/Speed:** |

**Client Comments/Notes:**

**Condition Comments/Notes:**

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 3 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| | Social/community/ organizational | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Econcomic/Financial | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic Impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Environmental | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Unit Heater

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| T.E. Hanson | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| EWH - Water Heater | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** |
| Unknown | | Good (Fair) Poor |
| **Manufacturer:** | | **Model Number:** |
| Unknown | | |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 40 Gallon | | 208V / 4.5KW |

**Client Comments/Notes:**

**Condition Comments/Notes:**

| Rank 1 to 10 | |
|---|---|
| Condition | 1 |
| Capacity | 1 |
| Reliability | 1 |
| Availability | 1 |
| Maintainability | 1 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


EWH-Water Heater

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 1 |
| **Asset Type: (Level 4)/Size (Level 5)** EF - Toilet Room Exhaust Fan (EF-4) | | **Equipment Number: (Level 6)** 4 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 100 CFM | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| | **Condition** | 5 |
| | **Capacity** | 3 |
| | **Reliability** | 5 |
| | **Availability** | 3 |
| | **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Exhaust Fan (F-4)

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR (EIC) MEC | Date: |
|---|---|---|
| T.E. Hanson | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | WW - Wetwell |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| FS - Mercury Float Switch | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** |
| Unknown | | Unknown |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| N/A | | |

**Client Comments/Notes:**

**Condition Comments/Notes:**

Not visible for inspection.

High level alarm & backup to Ultrasonic.

| Rank 1 to 10 | |
|---|---|
| Condition | 3 |
| Capacity | 3 |
| Reliability | 3 |
| Availability | 3 |
| Maintainability | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Mercury Float Switch

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 1 |
| **Asset Type: (Level 4)/Size (Level 5)** MLOU - Motorized louvers | | **Equipment Number: (Level 6)** 1, 2, 3, 4, 5, 6 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** N/A | | **Model Number:** |
| **Size/Capacity:** 70 X 54 | | **Horsepower/Voltage/Speed:** N/A |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| | **Condition** | 1 |
| | **Capacity** | 1 |
| | **Reliability** | 1 |
| | **Availability** | 1 |
| | **Maintainability** | 1 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Louver 6

Louver 5

Louver 4

Louver 3

Louver 2

Louver 1

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T. E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 |
| **Asset Type: (Level 4)/Size (Level 5)** CK - 8" Pump Discharge Check Valve | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 8-inch | | **Horsepower/Voltage/Speed:** N/A |

**Client Comments/Notes:**

**Condition Comments/Notes:**

Need to periodically Check valve seating

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 1 |
| **Reliability** | 3 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Pump 1 Discharge Check Valve (8")

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR (ELC) (MEC) | Date: |
|---|---|---|
| T.E. Hanson | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 0 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| GV - 8" Pump Discharge Isolation Gate Valve | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** |
| Unknown | | |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 8-inch | | N/A |

**Client Comments/Notes:**

Valve needed to maintain/repair pump.

**Condition Comments/Notes:**

All isolation valves should be operated periodically to verify seating & operation

| Rank 1 to 10 | |
|---|---|
| Condition | 3 |
| Capacity | 3 |
| Reliability | 5 |
| Availability | 3 |
| Maintainability | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| Loss of Service | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| Safety | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| Agency's Image | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| Financial impact | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| Economic impact | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| Spill, flood | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| Odor | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| Permit compliance | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| Score | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Pump 1 Discharge Isolation Gate Valve (8")

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 |
| **Asset Type: (Level 4)/Size (Level 5)** GV - 12" Pump Suction Isolation Gate Valve | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 12-inch | | **Horsepower/Voltage/Speed:** N/A |

**Client Comments/Notes:**

Valve needed to maintain/repair pump.

**Condition Comments/Notes:**

All isolation values should be operated periodically to verify seating & operation

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 5 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Pump 1 Suction Isolation Gate Valve (12")

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC (MEC) | Date: |
|---|---|---|
| TEHanson | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | O – Pump Dry Pit |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| P – Pump | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** |
| Fairbanks Morse | | K4E1-07513-0 |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 1.0 MGD (aprox. rated) | | 50/480/1800rpm |

**Client Comments/Notes:**

Motors rebuilt in 2013 or 2014. (estimated).

**Condition Comments/Notes:**

Pump impellers worn. Pump not operating at rated capacity.

| | Rank 1 to 10 |
|---|---|
| Condition | 5 |
| Capacity | 9 |
| Reliability | 7 |
| Availability | 5 |
| Maintainability | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Pump 1

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/10 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 |
| **Asset Type: (Level 4)/Size (Level 5)** CK - 8" Pump Discharge Check Valve | | **Equipment Number: (Level 6)** 2 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 8-inch | | **Horsepower/Voltage/Speed:** N/A |

**Client Comments/Notes:**

**Condition Comments/Notes:**

Need to periodically check valve seating

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 1 |
| **Reliability** | 3 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Pump 2 Discharge Check Valve (8")

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR ~~ELC~~ MEC | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 |
| **Asset Type: (Level 4)/Size (Level 5)** GV - 8" Pump Discharge Isolation Gate Valve | | **Equipment Number: (Level 6)** 2 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** Unknown |
| **Size/Capacity:** 8-inch | | **Horsepower/Voltage/Speed:** NA |

**Client Comments/Notes:**

Valve needed to maintain/repair pump

**Condition Comments/Notes:**

All isolation valves should be periodically operated to verify Seating & operation

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 5 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| | Social/community/ organizational | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Econcomic/Financial | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic Impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Environmental | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Pump 2 Discharge Isolation Gate Valve (8")

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 |
| **Asset Type: (Level 4)/Size (Level 5)** GV-12" Pump Suction Isolation Gate Valve | | **Equipment Number: (Level 6)** 2 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 12-inch | | **Horsepower/Voltage/Speed:** N/A |

**Client Comments/Notes:**

Valve needed to maintain/repair pump.

**Condition Comments/Notes:**

All isolation valves should be operated periodically to verify seating & operation

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 5 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| | Social/community/ organizational | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Econcomic/Financial | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic Impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Environmental | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Pump 2 Suction Isolation Gate Valve (12")

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T. E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 - Pump Dry Pit |
| **Asset Type: (Level 4)/Size (Level 5)** P - Pump | | **Equipment Number: (Level 6)** 2 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Fairbanks Morse | | **Model Number:** K4E1-077513-1 |
| **Size/Capacity:** 1.0 MGD (aprox. rated) | | **Horsepower/Voltage/Speed:** 50/480/1800 rpm |

**Client Comments/Notes:**

Pump & motor rebuilt in 2013/2014.

Upstream I&I contributes to rapid flow increases during wet weather.

**Condition Comments/Notes:**

Pump impeller worn.

Pump not operating at rated capacity.

Packing continually leaking & requires continuous adjustment.

| | Rank 1 to 10 |
|---|---|
| Condition | 7 |
| Capacity | 9 |
| Reliability | 9 |
| Availability | 7 |
| Maintainability | 7 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Pump 2

Pump 2

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T. E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0- Pump Dry Pit |
| **Asset Type: (Level 4)/Size (Level 5)** P- Pump (sump pump) | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** Unknown |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** 1 1/2 HP / 120V |

**Client Comments/Notes:**

**Condition Comments/Notes:**

Sump Pump Float switch used for high water alarm in dry pit.

| | Rank 1 to 10 |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 3 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Sump Pumps 1 and 2

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 - Pump Dry Pit |
| **Asset Type: (Level 4)/Size (Level 5)** P - Pump (Sump pump) | | **Equipment Number: (Level 6)** 2 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** Unknown |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** 1½hp / 120V |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| | **Condition** | 3 |
| | **Capacity** | 3 |
| | **Reliability** | 3 |
| | **Availability** | 3 |
| | **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Sump Pumps 1 and 2

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| T.E. Hanson | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 0 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| CK - Sump Pump Discharge Check Valve | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good Fair Poor |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** |
| Unknown | | |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 1 ½" | | N/A |

**Client Comments/Notes:**

**Condition Comments/Notes:**

| | Rank 1 to 10 |
|---|---|
| Condition | 3 |
| Capacity | 1 |
| Reliability | 5 |
| Availability | 5 |
| Maintainability | 5 |

| | Social/community/ organizational | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Econcomic/Financial | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Environmental | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access, extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 0 |
| **Asset Type: (Level 4)/Size (Level 5)** GV - Pump Pump Discharge Gate Valve | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 1 ½" | | **Horsepower/Voltage/Speed:** NA |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| | **Condition** | 1 |
| | **Capacity** | 1 |
| | **Reliability** | 1 |
| | **Availability** | 1 |
| | **Maintainability** | 1 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

# Addison Facilities

**Project #16088080**

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T. E. Hanson | **Discipline:** BLD PRS STR (EIC) MEC | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** WW - Wetwell |
| **Asset Type: (Level 4)/Size (Level 5)** ULI-Ultrasonic level Senso | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** Unknown |
| **Size/Capacity:** N/A | | **Horsepower/Voltage/Speed:** |

**Client Comments/Notes:**

**Condition Comments/Notes:**

Not visible for inspection.

Primary pump level indicator.

| Rank 1 to 10 | |
|---|---|
| **Condition** | 3 |
| **Capacity** | 3 |
| **Reliability** | 3 |
| **Availability** | 3 |
| **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Ultrasonic Level Sensor

# Addison Facilities
**Project #16088080**
## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** T.E. Hanson | **Discipline:** BLD PRS STR EIC (MEC) | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 1 |
| **Asset Type: (Level 4)/Size (Level 5)** EF- Wet Well Exhaust Fan (F-3) | | **Equipment Number: (Level 6)** 3 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Unknown | | **Model Number:** |
| **Size/Capacity:** 760 cfm | | **Horsepower/Voltage/Speed:** |
| **Client Comments/Notes:** | | |

| **Condition Comments/Notes:** | **Rank 1 to 10** | |
|---|---|---|
| | **Condition** | 5 |
| | **Capacity** | 5 |
| | **Reliability** | 7 |
| | **Availability** | 3 |
| | **Maintainability** | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Wet Well Exhaust Fan (F-3)

# Appendix D

Electrical (EIC) Condition Assessment Forms

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| SHZ | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| F-1 Disconnect | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good Fair Poor |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** |
| Siemens | | |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| enclosed switch | | |

**Client Comments/Notes:**

**Condition Comments/Notes:**

Need to confirm clearance requirement. May need to be relocated. Enclosure has slight blemishing

| Rank 1 to 10 | |
|---|---|
| Condition | 6 |
| Capacity | 3 |
| Reliability | 3 |
| Availability | 2 |
| Maintainability | 2 |

IMG_2717

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Exhaust Fan F-1 Disconnect

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| SH2 | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| SCADA panel/Telemetry Panel | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** | | **Model Number:** |
| Motorola PLC | | N/A |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| N/A | | N/A |

**Client Comments/Notes:**

SCADA/control panel. Backup to SCADA system, with level control settings. Upone boot. Have one ayear checkout on SCADA. Prime Controls on anaintence contract, can support. No backup to level transmitter. Level, communications, readings all alarm well. Minimumal alarms from generator, transfer switch.

**Condition Comments/Notes:**

Motorola PLC. Installed 10/29/2013 (Prime Controls)
CPU ACE3600
mixed I/O (2) ☒ one spare,
MDS radio, MDS4710
milltronics multiranger Plus
Recent upgrades, improvements. Good to fair condition. Additional monitoring, backups could be added to enhance the system.

| Rank 1 to 10 | |
|---|---|
| Condition | 6 |
| Capacity | 5 |
| Reliability | 4 |
| Availability | 3 |
| Maintainability | 3 |

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Telemetry Panel Motorola PLC

Telemetry Panel Motorola PLC and MDS Radio


Telemetry Panel Level Transmitter


Telemetry Panel - Exterior Door Panel

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: SH2 | Discipline: BLD PRS STR EIC MEC | Date: 7/19/16 |
|---|---|---|
| Fund: (Level 1) / Location (Level 2)<br>610/KLS | | Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)<br>1 |
| Asset Type: (Level 4)/Size (Level 5)<br>Panel MCCA | | Equipment Number: (Level 6)<br>1 |
| Installation Date or Approximate Age:<br>1996 | | Visual Condition Rating: (Circle one) (Overall)<br>Good (Fair) Poor |
| Manufacturer:<br>NOT NOTED | | Model Number:<br>N/A |
| Size/Capacity:<br>N/A | | Horsepower/Voltage/Speed:<br>480 volts |

**Client Comments/Notes:**

Pump Controller MCCA, All lights, buttons, control features work. No pump #3, no mixer.
Has alternating relay. signals come milltronics level transmitter.

**Condition Comments/Notes:**

One contactor has humming noise
Allen-Bradley 509-DOD-A1K Size 3, 100A CB
Has 3-phase monitor. - no problem. Trips control circuit, self resetting.
NEMA 1 starter for mixer. Surge suppressors (2) installed on panel, Light on top.
Stainless steel enclosure. main legs only.
Controls on interior swing out panel. Stainless steel enclosure, 50hp pumps, consider VFD's or soft starters.

| Rank 1 to 10 | |
|---|---|
| Condition | 6 |
| Capacity | 4 |
| Reliability | 5 |
| Availability | 4 |
| Maintainability | 5 |

IMG_2638 & IMG_2661, IMG_2749

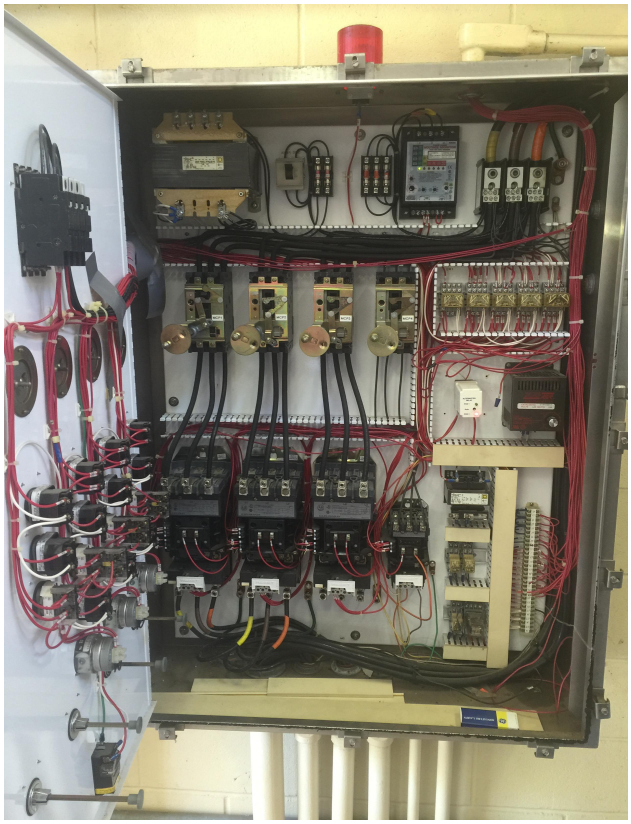
| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Subsrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic Impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER



Panel MCCA - Interior


Panel MCCA - Interior Swingout Door with Controls


Panel MCCA

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| SHZ | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| Generator | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good Fair Poor |
| 1998 | | |
| **Manufacturer:** | | **Model Number:** model 4UA9 |
| Detroit Diesel | | 200DSE, serial # 0636277 |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 200kw, 250KVA, pf. .8 | | |

**Client Comments/Notes:**

Generator - has seperate maintainence contract. Operated for 24 hours on half a tank of fuel. Alarms main power out whenever exercised. First week of month. One power failure only. Small steps to access control panel.

**Condition Comments/Notes:**

Spectrum Detroit Diesel. Has main c/b. Enclosure good condition, no visible signs of leakage. Concrete pad looks good. Load bank installed (small) ~100kw. Fair condition. sub-base fuel tank. Slight rust on edges of door panels. Serviced by Worldwide Power Products - last date 2-15-16. Exhaust components (outside) showing signs of corrosion. Small panelboard (painted) installed on outside of enclosure. Generator not tested during site visit.

IMG_2825, 2854, 2865, 2868

| Rank 1 to 10 | |
|---|---|
| Condition | 5 |
| Capacity | 3 |
| Reliability | 3 |
| Availability | 2 |
| Maintainability | 3 |

GARVER

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Standby Power Generator

Standby Power Generator

Standby Power Generator and Transformer

Standby Power Generator

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR (EIC) MEC | Date: |
|---|---|---|
| SHZ | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| service transformer, electric meter | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| 1996 (assumed) | | |
| **Manufacturer:** | | **Model Number:** |
| N/A | | N/A |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 150 KVA | | N/A |

**Client Comments/Notes:**

Only way to interrupt power to station is to pull fuses (primary) on pole. Transformer is utility owned.

**Condition Comments/Notes:**

Oncor meter # 115 184 337. meter mounted on side of transformer. Meter enclosure in good condition.

Transformer enclosure in fair condition, slight weathering on top of enclosure. Utility owned. Transformer pad in good condition. Transformer doors open towards generator, clearance could be an issue. ~~Transformer~~ Distance to building louvers could be an issue. Has standby power for lift station.

| Rank 1 to 10 | |
|---|---|
| Condition | 4 |
| Capacity | 3 |
| Reliability | 3 |
| Availability | 2 |
| Maintainability | 1 |

IMG_2864

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Service Transformer and Meter

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| SHZ | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| Emergency Generator Disconnect | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** | | **Model Number:** |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |

**Client Comments/Notes:**

Originally installed for potable generator use per plans, now connected to permanent generator. Lugs not torqued, disconnect not tested.

**Condition Comments/Notes:**

Non-fused disconnect switch, installed on exterior wall. Enclosure showing signs of corrosion. Handle is corroded.

| Rank 1 to 10 | |
|---|---|
| Condition | 7 |
| Capacity | 3 |
| Reliability | 2 |
| Availability | 2 |
| Maintainability | 2 |

IM6_2572

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Emergency Generator Disconnect

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| | | |
|---|---|---|
| **Name:** SH2 | **Discipline:** BLD PRS STR (EIC) MEC | **Date:** 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** 610/KLS | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** 1 |
| **Asset Type: (Level 4)/Size (Level 5)** Lighting Panel | | **Equipment Number: (Level 6)** 1 |
| **Installation Date or Approximate Age:** 1996 | | **Visual Condition Rating: (Circle one) (Overall)** Good (Fair) Poor |
| **Manufacturer:** Cutler-Hammer | | **Model Number:** PRL-1 Box Cat: 4S2036 Job No. 1638LH7354 |
| **Size/Capacity:** 208/120, 100A | | **Horsepower/Voltage/Speed:** |

**Client Comments/Notes:**

Panel ~~KLG~~ LA

**Condition Comments/Notes:**

100A, 3P main breaker, 24 circuit panelboard.
Two spare circuits.
NEMA-1 enclosure, has gaskets for cover.
Very light signs of corrosion on enclosure, otherwise good condition.

Panel ~~KLG~~ LA - fair

| Rank 1 to 10 | |
|---|---|
| Condition | 3 |
| Capacity | 3 |
| Reliability | 3 |
| Availability | 3 |
| Maintainability | 3 |

IMG_2624

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic Impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Panelboard LA

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: SHZ | Discipline: BLD PRS STR (EIC) MEC | Date: 7/19/16 |
|---|---|---|
| Fund: (Level 1) / Location (Level 2)<br>610/KLS | | Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)<br>1 |
| Asset Type: (Level 4)/Size (Level 5)<br>Dry type transformer | | Equipment Number: (Level 6) |
| Installation Date or Approximate Age:<br>1996 | | Visual Condition Rating: (Circle one) (Overall)<br>(Good) Fair Poor |
| Manufacturer:<br>Cutler-Hammer | | Model Number: |
| Size/Capacity:<br>30KVA | | Horsepower/Voltage/Speed:<br>480/277 x 208/120 Y |
| Client Comments/Notes:<br>N/A | | |

| Condition Comments/Notes: | Rank 1 to 10 | |
|---|---|---|
| Good condition.<br>Clearance concerns with exhaust fan panel. | Condition | 3 |
| | Capacity | 3 |
| | Reliability | 2 |
| | Availability | 2 |
| | Maintainability | 2 |

IMG_2628

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic Impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Dry Type Transformer, Panel HA, Panel LA and Exhaust Fan Panel

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| SHZ | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| Exhaust Fan Control Panel | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good Fair Poor |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** |
| Cutler-Hammer | | HPDA 19 570-021 |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| Size 1 contactor, 15A circuit breaker | | 480/277 |

**Client Comments/Notes:**

H-O-A - leave in auto. switch on wall controls lights + fan. open overhead door, to work on. During winter, close it up. small fan controls all louvers. Large fan, no louvers.

**Condition Comments/Notes:**

Exhaust fan ~~F1~~ F-1 Contactor.
Interior has signs of corrosion/heat.
Appears to have interior components removed.
Stainless enclosure. Open hole in bottom.
Use 277 control power from panel HA. Proper clearance is an issue.
Entire ventilation system should be reviewed for compliance with NFPA 820.

| Rank 1 to 10 | |
|---|---|
| Condition | 10 |
| Capacity | 8 |
| Reliability | 6 |
| Availability | 9 |
| Maintainability | 9 |

IMG_2612

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substrantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic Impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Exhaust Fan Control Panel

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| SMZ | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| Panel MA | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good Fair Poor |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** Box Cat. GWPB2036 PRL-2 Job#: 1638LH7354 Neut. Cat. 515803602 |
| Cutler-Hammer | | |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 100A, 3P, 4W | | 480/277 |

**Client Comments/Notes:**

Panel MA - no issues.

**Condition Comments/Notes:**

100A main circuit breaker. ~~Circuit~~ Several circuits are OH. NEMA 3R. Appears to have a neutral, but fused switchboard does not. 36 circuit panelboard. Powers 3phase loads (transformer, overhead door, unit heater, hoist) and single phase loads (lights, fan control circuit)

Panel MA - Good condition.

| Rank 1 to 10 | |
|---|---|
| Condition | 4 |
| Capacity | 3 |
| Reliability | 2 |
| Availability | 3 |
| Maintainability | 2 |

IMG_2597 or IMG_2598

| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substrtantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

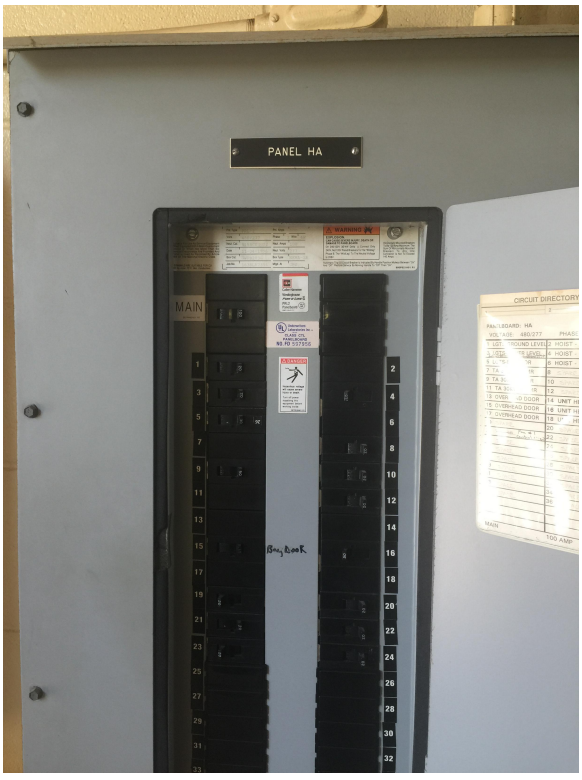
| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial Impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER

Panel HA




Panel HA

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR (EIC) MEC | Date: |
|---|---|---|
| SH2 | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| switchboard MSB | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good Fair (Poor) |
| 1996 | | |
| **Manufacturer:** | | **Model Number:** PRL-4 BoxCut BX3673 |
| Cutler-Hammer | | Job# 1638-LH-7354 Neut.Cat. XXXX |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 3phase, 4wire, 400 amps | | 480/277 |

**Client Comments/Notes:**

Fuses have not been changed.

**Condition Comments/Notes:**

Fused switch construction. Fuses match.
main: 400A fuse, 400A bus rating
Pump control panel: 250A fuses
Panel MA: 100A
Exhaust Fan: 20A
Enclosure showing signs of rust. Dated.
No arc flash label. Recommend consideration of replacement with circuit breaker style panelboard construction (traditional)

| Rank 1 to 10 | |
|---|---|
| Condition | 8 |
| Capacity | 7 |
| Reliability | 5 |
| Availability | 8 |
| Maintainability | 6 |

IM6-2578

GARVER

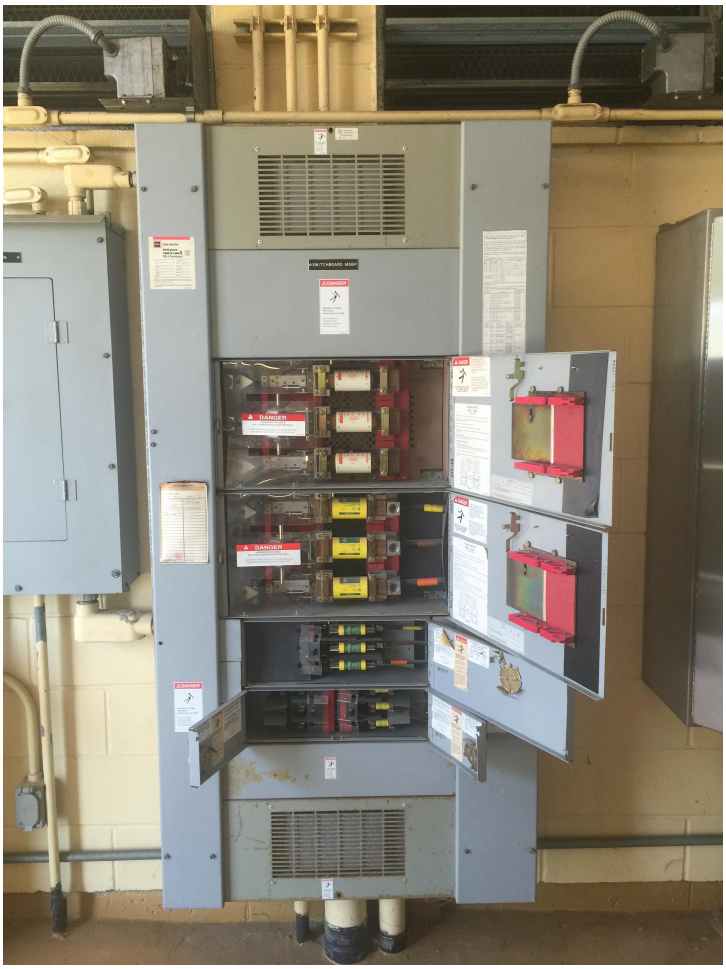
| Social/community/ organizational | | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Econcomic/Financial | | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate Increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| Environmental | | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; entensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER




Fused Switchboard MSB

# Addison Facilities

Project #16088080

## Facility Observation Form: LS/PS

| Name: | Discipline: BLD PRS STR EIC MEC | Date: |
|---|---|---|
| SHZ | | 7/19/16 |
| **Fund: (Level 1) / Location (Level 2)** | | **Building Level: (Level 3 Wetwell-WW, Pump Pit-0, Ground-1, Roof-2)** |
| 610/KLS | | 1 |
| **Asset Type: (Level 4)/Size (Level 5)** | | **Equipment Number: (Level 6)** |
| Automatic Transfer Switch | | 1 |
| **Installation Date or Approximate Age:** | | **Visual Condition Rating: (Circle one) (Overall)** Good Fair Poor |
| 1996 (assumed) | | |
| **Manufacturer:** | | **Model Number:** Cat #: ATUISPB30600XS4 GO # KYT81404 |
| Cutler-Hammer | | |
| **Size/Capacity:** | | **Horsepower/Voltage/Speed:** |
| 3 pole, 3phase, 600A, 480V, 4W | | N/A |

**Client Comments/Notes:**

ATS has issues, problems. Display not functioning. Cutler Hammer declined to work on switch. No service on breakers. No disconnect between transformer + ATS. Need a way to cycle power. Cutler Hammer recommended switch replacement.

**Condition Comments/Notes:**

Enclosure in fair condition, likely small salvage value for switch.
No Arc flash. Recommend replacement.
Two CH breakers SPB 65, adjustable type, digitrip type breakers, 1200 A frame, drawout style.
~~Into~~ No arc flash label. Need new breaker (main) ahead of transfer switch. Service entrance rated type of switch.

| Rank 1 to 10 | |
|---|---|
| Condition | 10 |
| Capacity | 10 |
| Reliability | 9 |
| Availability | 10 |
| Maintainability | 10 |

IMG_2680

| | Social/community/ organizational | | | | | |
|---|---|---|---|---|---|---|
| **Loss of Service** | Can be out of service indefinitely | Cannot be down a month | Cannot be down a week | Cannot be down a day | Cannot be down 8 hours | Cannot be down one hour |
| **Safety** | No impact | Minor inconvenience | Minor injury | Moderate injury and some sickness | Major injury, sickness, some death | Substantial death, widespread injury and sickness |
| **Agency's Image** | No media or no consequence | Neutral coverage | Adverse media | Widely adverse media | Continual; political opposition | Nationally adverse media |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Econcomic/Financial | | | | | |
|---|---|---|---|---|---|---|
| **Financial impact** | Low cost | Moderate cost | High cost | High cost; diverts $ | Painful change of priorities | Likely to trigger rate increase, staff changes |
| **Economic impact** | Insignificant | <$50k | <$300k | <$750K | <$1.5M | >$1.5 million |
| | 1 | 3 | 5 | 7 | 9 | 10 |

| | Environmental | | | | | |
|---|---|---|---|---|---|---|
| **Spill, flood** | Short duration, small quantity onsite | Some basement backups | Moderate basement backups, some offsite spillage | Many inconvenienced; moderate health and habitat issues | Severe health and habitat issues; some mandatory vacation of premises | Large areas vacated and closed to public access; extensive specialized containement cleanup required |
| **Odor** | No complaints | A few compliants adjacent to station | Moderate complaints adjacent to station | Extensive complaints adjacent to station; lingering area odor | Extensive area-wide complaints | Odor at dangerous levels at spill site; evacuation of premises required |
| **Permit compliance** | No consequence | Minor violation - reporting only | Regulatory sanction possible | Regulatory sanction likely; Damage reversible less than one year | Extensive regulatory sanction virtually assured; damage reversible in one to five years | Severe sanctions; damage reversible in five years or more |
| **Score** | 1 | 3 | 5 | 7 | 9 | 10 |

| Primary Failure Modes | Definition | Tactical Aspects | Management Strategy |
|---|---|---|---|
| Capacity | Volume of demand exceeds design capacity | Growth, system expansion | (Re)Design |
| Level of Service | Functional requirements exceed design capacity | Codes & permits: NPDES, CSOs, OSHA, noise, odor, life safety, service, etc. | (Re)Design, O&M, Optimization |
| Mortality | Consumption of asset reduces performance below acceptable level | due to age, usage (including operator error), acts of nature | O & M, optimization, renewal |
| Efficiency | Operation costs exceed that of feasible alternatives | Pay-back period | Replace |

GARVER


Automatic Transfer Switch

# Appendix E

WERF BRE Tool Complete Asset List

| No. | Asset ID | Asset Name | Likelihood of Failure | Consequence of Failure | Core Risk Score |
|---|---|---|---|---|---|
| 1 | 610-KLS-1-PNL--1 | Automatic Transfer Switch | 9.8 | 6.4 | 62.7 |
| 2 | 610-KLS-0-MSB--3 | MSB-3 (F-1 Exhaust Fan Control Panel, 7.5 HP) | 8.6 | 6.5 | 55.6 |
| 3 | 610-KLS-0-P-5-2 | Pump No. 2 | 7.7 | 7.1 | 54.7 |
| 4 | 610-KLS-1-MSB--1 | Switchboard MSB | 6.9 | 6.4 | 43.8 |
| 5 | 610-KLS-0-P-5-1 | Pump No. 1 | 5.6 | 7.1 | 39.8 |
| 6 | 610-KLS-0-MSB--1 | MSB-1 (pump controller MCCA) | 5.0 | 7.1 | 35.5 |
| 7 | 610-KLS-1-PNL--1 | SCADA panel/telementry control panel | 4.4 | 7.5 | 32.8 |
| 8 | 610-KLS-1-EF--1 | Fan F-1 (14,385 CFM) | 3.4 | 7.4 | 25.2 |
| 9 | 610-KLS-WW-STRUCT-- | Wetwell Structure | 3.0 | 6.9 | 20.7 |
| 10 | 610-KLS-WW-ULI--1 | Ultrasonic Level Sensor | 3.0 | 6.8 | 20.3 |
| 11 | 610-KLS-1-EF--3 | Fan F-3 (760 CFM) | 4.7 | 4.1 | 19.0 |
| 12 | 610-KLS-1---1 | Service Transformer, electric meter | 2.8 | 6.4 | 17.6 |
| 13 | 610-KLS-0-FS--1 | Float Switch | 3.0 | 5.7 | 17.1 |
| 14 | 610-KLS-0-STRUCT-- | Pump Room Structure | 3.0 | 5.6 | 16.8 |
| 15 | 610-KLS-WW-FS--1 | Mercury Float | 3.0 | 5.4 | 16.2 |
| 16 | 610-KLS-1-AD-54-1 | 70/54 Automatic Damper Interlock with Fan F-2 (control room fan) | 3.0 | 5.1 | 15.2 |
| 17 | 610-KLS-1-AD-54-2 | 70/54 Automatic Damper Interlock with Fan F-1 (pump room fan) | 3.0 | 5.1 | 15.2 |
| 18 | 610-KLS-1-AD-54-3 | 70/54 Automatic Damper Interlock with Fan F-1 (pump room fan) | 3.0 | 5.1 | 15.2 |
| 19 | 610-KLS-1-SDISC--1 | Exhaust Fan F-1 Disconnect | 3.6 | 3.5 | 12.2 |

| No. | Asset ID | Asset Name | Likelihood of Failure | Consequence of Failure | Core Risk Score |
|---|---|---|---|---|---|
| 20 | 610-KLS-0-P-1.5-1 | 1/2 HP Submersible Sump Pump No. 1 | 3.0 | 3.6 | 10.8 |
| 21 | 610-KLS-0-P-1.5-2 | 1/2 HP Submersible Sump Pump No. 2 | 3.0 | 3.6 | 10.8 |
| 22 | 610-KLS-1-PNL-1-2 | Panel HA | 2.9 | 3.7 | 10.7 |
| 23 | 610-KLS-1-STRUCT-- | Control Room Structure | 3.0 | 3.5 | 10.5 |
| 24 | 610-KLS-0-CK-1.5-1 | 1 1/2" Sump Pump Check Valve | 3.8 | 2.8 | 10.5 |
| 25 | 610-KLS-1-PNL-30-1 | Transformer (TA) 30 KVA (dry type) | 2.5 | 3.7 | 9.1 |
| 26 | 610-KLS-0-CK-8-1 | 8" Check Valve | 2.7 | 3.4 | 9.0 |
| 27 | 610-KLS-0-CK-8-2 | 8" Check Valve | 2.7 | 3.4 | 9.0 |
| 28 | 610-KLS-1-EF--2 | Fan F-2 (1,480 CFM) | 3.4 | 2.3 | 7.8 |
| 29 | 610-KLS-2-STRUCT-- | Control Room Roof | 3.0 | 2.3 | 6.9 |
| 30 | 610-KLS-1-UH--1 | Unit Heater No. 1 (UH-1) | 3.0 | 2.3 | 6.9 |
| 31 | 610-KLS-1-EF--4 | Fan F-4 (100 CFM) | 4.0 | 1.7 | 6.8 |
| 32 | 610-KLS-1-GEN--1 | Standby Power Generator | 3.5 | 2.0 | 6.7 |
| 33 | 610-KLS-1-PNL-1-3 | Panel LA (Lighting Panel) | 3.0 | 2.1 | 6.2 |
| 34 | 610-KLS-0-GV-8-1 | 8" Gate Valve | 3.4 | 1.7 | 5.8 |
| 35 | 610-KLS-0-GV-8-2 | 8" Gate Valve | 3.4 | 1.7 | 5.8 |
| 36 | 610-KLS-0-GV-12-1 | 12" Gate Valve | 3.4 | 1.7 | 5.8 |
| 37 | 610-KLS-0-GV-12-2 | 12" Gate Valve | 3.4 | 1.7 | 5.8 |
| 38 | 610-KLS-1---1 | Emergency Generator Disconnect | 3.7 | 1.0 | 3.7 |
| 39 | 610-KLS-0-GV-1.5-1 | 1 1/2" Sump Pump Gate Valve | 1.0 | 2.1 | 2.1 |
| 40 | 610-KLS-1-MLOU--1 | Motorized Louvers | 1.0 | 1.7 | 1.7 |
| 41 | 610-KLS-1-MLOU--2 | Motorized Louvers | 1.0 | 1.7 | 1.7 |
| 42 | 610-KLS-1-MLOU--3 | Motorized Louvers | 1.0 | 1.7 | 1.7 |
| 43 | 610-KLS-1-MLOU--4 | Motorized Louvers | 1.0 | 1.7 | 1.7 |
| 44 | 610-KLS-1-MLOU--5 | Motorized Louvers | 1.0 | 1.7 | 1.7 |
| 45 | 610-KLS-1-MLOU--6 | Motorized Louvers | 1.0 | 1.7 | 1.7 |

| No. | Asset ID | Asset Name | Likelihood of Failure | Consequence of Failure | Core Risk Score |
|---|---|---|---|---|---|
| 46 | 610-KLS-0-GV-10-1 | 10" Gate Valve | 1.0 | 1.6 | 1.6 |
| 47 | 610-KLS-1-EWH--1 | Water Heater (EWH-1) | 1.0 | 1.0 | 1.0 |