CITY OF
ALBUQUERQUE,
NEW MEXICO

# STORMWATER PUMP STATION NO. 38 CENTRAL UNDERPASS

# OPERATIONS MANUAL

Prepared for:

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ENGINEERS | ARCHITECTS | PLANNERS

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The technical material and data contained in the Operations Manual were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

## DISCLAIMER

All information pertaining to the stormwater pump station equipment and mode of operation is based on information relevant at the time this manual was prepared. Information will be subject to change as equipment is upgraded and replaced in the future. We recommend the Owner update the information contained in this manual as improvements occur so this manual can continue to serve as a useful tool to the Operations Staff.


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All questions about the meaning or intent of these documents shall be submitted only to the Engineer of Record, stated above, in writing.

**OPERATIONS MANUAL**
**FOR THE**
**CITY OF ALBUQUERQUE**
**STORMWATER PUMP STATION NO. 38 CENTRAL UNDERPASS**

## LIST OF TABLES

## LIST OF FIGURES



## APPENDICES

## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AABC | Associated Air Balance Council |
| ABCWUA | Albuquerque Bernalillo County Water Utility Authority |
| AC/hr | Air Changes per hour |
| AMCA | Air Moving and Conditioning Association |
| ANSI-HI | American National Standard Institute / Hydraulic Institute |
| ASHRAE | American Society of Heating, Refrigeration, and Air Conditioning Engineers |
| AWWA | American Water Works Association |
| CB | circuit breaker |
| cfs | cubic feet per second |
| COA | City of Albuquerque |
| DB | dry bulb |
| DIP | ductile iron pipe |
| DMD | Department of Municipal Development |
| DS | disconnect switch |
| ft | feet |
| FVNR | full-voltage non-reversing |
| gpm | gallons per minute |
| HMI | human-machine interface |
| HP | horsepower |
| HVAC | Heating, Ventilation, and Air Conditioning |
| IEEE | Institute of Electrical and Electronics Engineers |
| LOTO | Lockout / Tagout |
| LSCP | lift station control panel |
| MCB | main circuit breaker |
| NEMA | National Electrical Manufacturers Association |
| NFPA | National Fire Protection Association |
| O&M | Operation and Maintenance |
| OHSB | Occupational Health and Safety Bureau |
| OSHA | Occupational Safety and Health Administration |
| P&ID | process and instrumentation diagram |
| PLC | programmable logic controller |
| PNM | Public Service Company of New Mexico |
| PPE | personal protective equipment |
| rpm | revolutions per minute |
| RTU | Remote Terminal Unit |
| SCADA | supervisory control and data acquisition |
| SDD | Storm Drain Design |
| SMACNA | Sheet Metal and Air Conditioning Contractors National Association |
| SMP | Standard Maintenance Procedure |

## LIST OF ACRONYMS AND ABBREVIATIONS (continued)

| | |
|---|---|
| SOJP | Standard Operation Job Procedure |
| SWPS | Stormwater Pump Station |
| SWRP | Southside Water Reclamation Plant |
| TDH | total dynamic head |
| UL | Underwriters Laboratories |
| V | Volts |
| WB | wet bulb |
| WUA | Water Utility Authority |
| WWTP | Wastewater Treatment Plant |

# 1.0 INTRODUCTION

This Operations Manual refers exclusively to the existing stormwater pump station (SWPS) facilities for Pump Station No. 38, Central Avenue Pump Station. Formerly known as "Pump Station No. 27", updated to reflect the numbering in the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) supervisory control and data acquisition (SCADA) and Asset Management systems. See City of Albuquerque (COA) Project No. 691882. Refer to Section 1.3 for a description of existing facilities. The intent of this manual is to inform the operator of how each component operates and to serve as a reference for performing particular tasks. The intent of this manual is achieved by addressing three areas of operation: 1) Operations and Maintenance (O&M) Overview; 2) Standard Operating Job Procedure (SOJP); and 3) Standard Maintenance Procedure (SMP). This manual is written with the assumption that the operator reading it has more than just a basic understanding of storm drainage systems and SWP in general and is not intended to be used as an educational publication.

## 1.1 Guide to the Manual

### 1.1.1 Section Organization

The information presented in this manual for the three areas of operation is organized into nine major sections. Each section includes specific information that pertains to the section title. Although each section contains valuable information necessary for efficient, orderly, and safe operations of the facilities, certain sections cover the technical operations of the facility and contain detailed instructions on how the pump station should be operated.

There is some variation, but most of the sections listed above are broken down into subsections under the following headings:

- Overview
- Equipment Description
- Design Criteria
- Instrumentation and Alarms

- Normal Operation
- Safety:  Information Unique to the System or Process.

### 1.1.2 Section Headings

The text of this manual is prepared using a sequence numbering system for all of the headings and components (figure numbers, table numbers, and page numbers).  The first number denotes the start of a section.  The second number denotes the start of a subsection.  The third number denotes the headings or the component of each subsection.  Some sections that appear in this manual may have a fourth division.  For example, 4.1.4 refers to the normal operations for the mechanical barscreen in Section 4.0 – Pump Station System.

This section would be located under Section 4.0 – Pump Station System, Subsection 4.1 – Mechanical Bar Screen, Heading 4.1.4 – Normal Operation.

Tables, page numbers, and figures are presented using a similar numbering system.  The first number indicates the section where the figure, table, or page can be found.  The second number is separated from the first number by a dash and indicates the order of the figures, table, or page in the appropriate section.

To minimize repetition, many systems are cross-referenced throughout the text to show the interrelationship between the various units.  Where possible, discussions concerning identical or similar equipment installed at different locations are kept as similar as possible to provide the personnel with a routine, which can be used at all of the involved locations.

## 1.2 City-Wide Stormwater Pumping System Description

The COA stormwater pump stations are located mostly in low areas of the Valley, with three stations, Station Nos. 31, 35, and 36, designed to discharge into the North Diversion Channel, and are used to collect and pump stormwater runoff and prevent or mitigate the impact of flooding; three stations, Station Nos. 30, 44, and 47, are located outside of the City limits in unincorporated

Bernalillo County. A map of all 16 pump stations is presented in Figure 1-1. Please note Station No. 42 Paseo Del Norte has been decommissioned, but is shown in Figure 1-1.

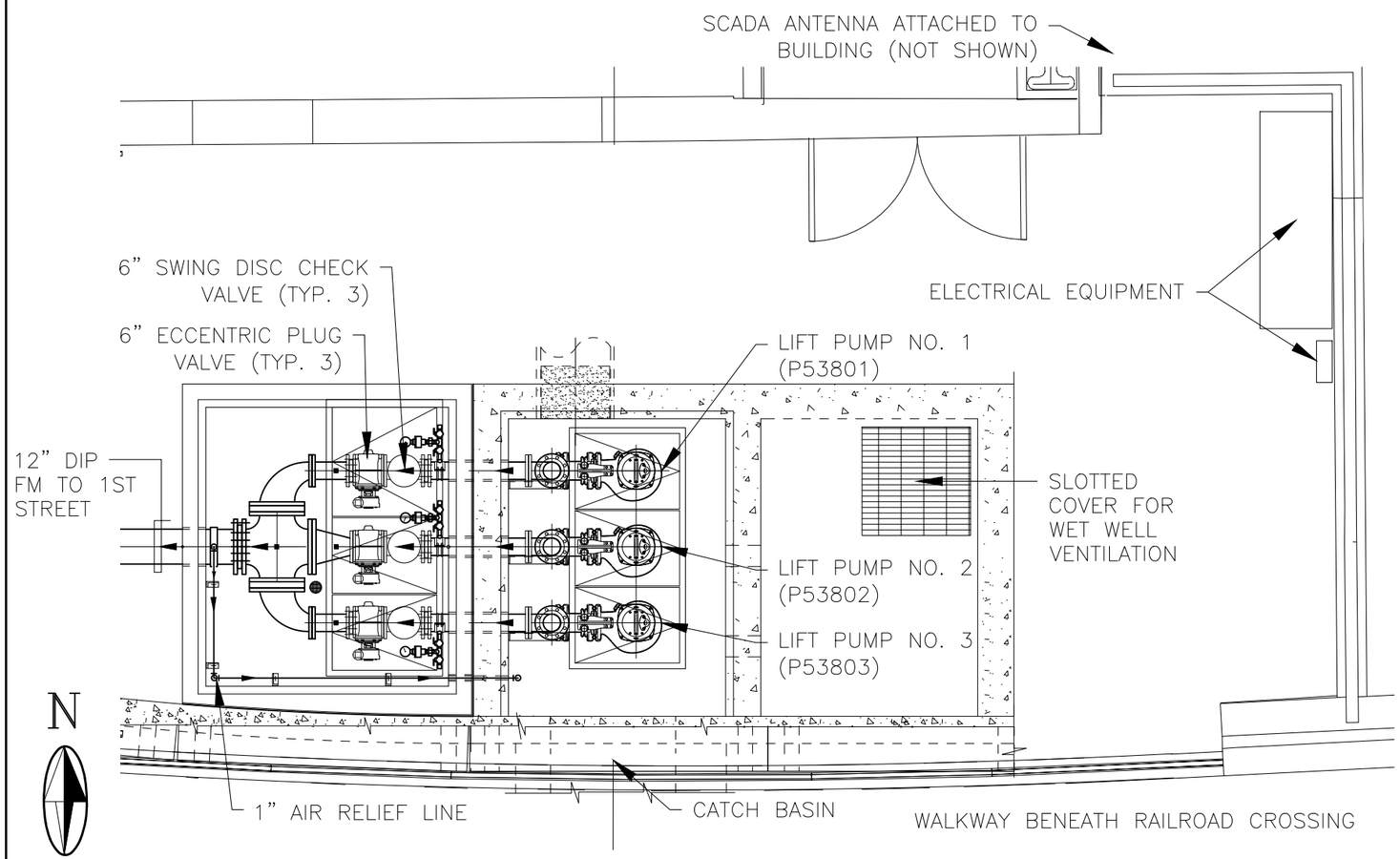
The stormwater pump stations are owned by the COA and are administered by the Albuquerque Department of Municipal Development (DMD), Engineering Division, Storm Drain Design (SDD). Through an agreement between the City and the ABCWUA, the ABCWUA Field Operations Department, Line Maintenance / Lift Station Section operate and maintain the stormwater pump stations, along with their other duties to operate and maintain the wastewater vacuum and lift stations.


**FIGURE 1-1**
**STORMWATER PUMP STATIONS MAP**
(Source: COA, DMD, SDD)

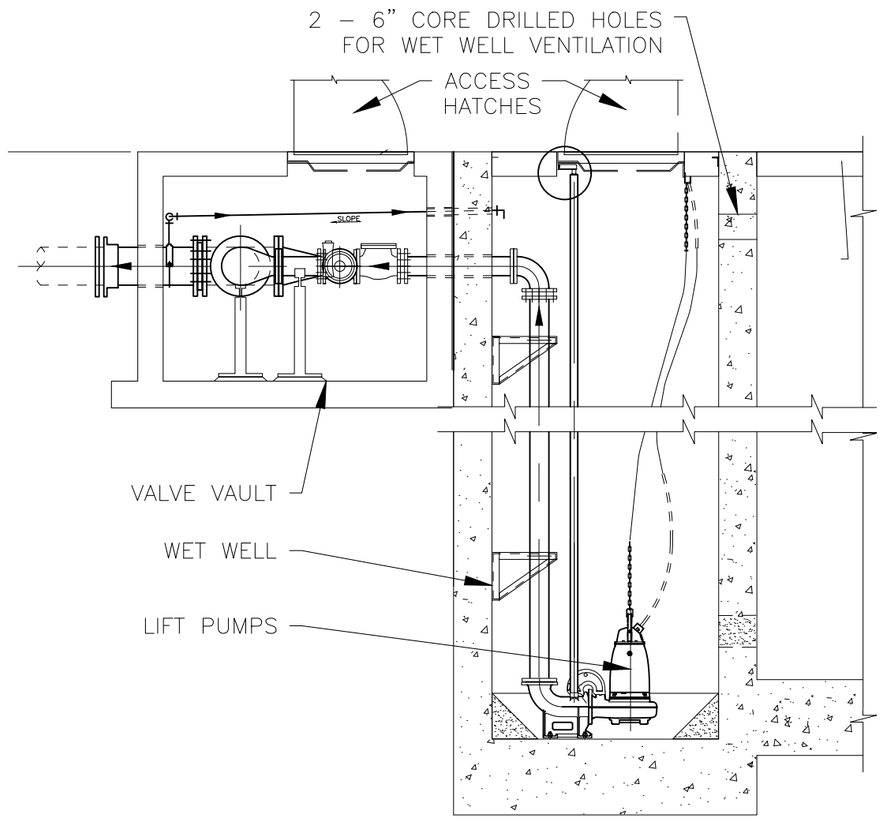
## 1.3 General Description of Stormwater Pump Station (SWPS) No. 38, Central Underpass

SWPS No. 38 Central Avenue is located between 1st Street and Broadway Boulevard (Innovate ABQ and 1St Street and Central), as shown in Figure 1-1. This station was originally constructed at the same time as the adjacent overpass for the railroad and was decommissioned in the 1980s when SWPS No. 43 (Urban) was constructed. A 78-inch underground stormwater conveyance and storage pipe was constructed that hydraulically connected the SWPS No. 38 wet well to the SWPS No. 43 wet well. Development plans for the 1st Street and Central intersection identified that storm flow would no longer be able to flow away from the Central underpass area through the 78-inch diameter gravity discharge pipe, which was to be removed from service to construct the foundations for the One Central development. This required that SWPS No. 38 be equipped with pumps and a force main prior to construction of the development's foundations.

Grated drop inlets located in Central Avenue beneath the railroad overpass capture stormwater to prevent flooding of the underpass roadway. Collector pipes convey stormwater to a catch basin located under the north sidewalk of Central Avenue west of the railroad bridge. Stormwater passes through a 3.5 foot wide opening out of the catch basin into the adjacent wet well of SWPS No. 38. Water is pumped out of the wet well by submersible Flygt pumps at a combined flow rate of 5.0 cubic feet per second (cfs) (2,270 gallons per minute or gpm), into a 12-inch ductile iron pipe (DIP) cross and out of the station through a 12-inch force main and into an existing 24-inch storm drain, which ultimately drains into the 48-inch storm drain located in Copper Avenue west of 1st Street. A site plan of the pump station is provided in Figure 1-2.




CENTRAL PUMP STATION – SITE PLAN




CENTRAL PUMP STATION – SECTION

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City of Albuquerque Stormwater Pump Stations

**Pump Station No. 38 Central Avenue Site Plan**

**Figure 1-2**

## 2.0 STANDARDS

This section provides a brief description of the standards applicable to this pump station and identifies the governing regulations which dictate the level of standards recommended for design and installation.

### 2.1 Water Resource Standards

The stormwater pumps are recommended to be designed and installed to meet the following standards by the American National Standard Institute / Hydraulic Institute (ANSI-HI):

- ANSI/HI 1.3 Rotodynamic (Centrifugal) Pumps for Design and Application
- ANSI/HI 2.3 Rotodynamic (Vertical) Pumps for Design and Application
- ANSI/HI 9.6.4 Rotodynamic Pumps for Vibration Measurement and Allowable Values
- ANSI/HI 9.8 Intake Design for Rotodynamic Pumps
- ANSI/HI 14.6 Rotodynamic Pumps for Hydraulic Performance Acceptance Tests

### 2.2 Electrical Standards

The electrical systems are recommended to be designed and installed to meet the following standards: 2018 National Fire Protection Association (NFPA) – National Fire Code; NFPA 70 – National Electrical Code; NFPA 70B – Recommended Practices for Electrical Equipment Maintenance; NFPA 70E – Standard for Electrical Safety in the Workplace; NFPA 110 – Standard for Emergency and Standby Power Systems; and New Mexico Electrical Code (14.10.4.) Title 14 – Housing and Construction, Chapter 10.

Also, the electrical design is to comply with the recommended practices of the following organizations:

- NEMA – National Electrical Manufacturer's Association
- UL – Underwriters Laboratories
- IEEE – Institute of Electrical and Electronics Engineers

## 2.3 Heating, Ventilation, and Air Conditioning (HVAC) Standards

The HVAC systems are recommended to be designed and installed to meet the following standards: 2018 International Building Code; 2018 Uniform Mechanical Code; 2018 International Energy Conservation Code; and the National Fire Code. Special attention is focused on 2016 NFPA 820, Recommended Practice for Fire Protection in Wastewater Treatment Plants (WWTPs).

Also, the HVAC design and installation is to comply with the recommended practices of the following organizations:

- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
  - ASHRAE Standard 62.1-2010 Ventilation for Acceptable Indoor Air Quality
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- Air Moving and Conditioning Association (AMCA)
- Associated Air Balance Council (AABC)

## 2.4 Heating, Ventilation, and Air Conditioning (HVAC) Standard Description

2018 Uniform Mechanical Code – The Uniform Mechanical Code provides requirements for the installation and maintenance of heating, ventilating, cooling, and refrigeration systems.

2018 International Energy Conservation Code – The International Energy Conservation Code is a model code that regulates the minimum energy conservation requirements for all aspects of energy use in facilities heating and ventilating systems.

2016 National Fire Protection Association (NFPA) 820, Recommended Practice for Fire Protection in Wastewater Treatment Plants – This standard establishes the minimum requirements for protection against fire and explosion hazards in WWTPs or collections systems such as storm sewers.

American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) – ASHRAE is the world's foremost technical society in the fields of heating, ventilation, air conditioning, and refrigeration.

Sheet Metal and Air Conditioning Contractors National Association (SMACNA) – SMACNA standards address all facets of the sheet metal industry, from duct construction and installation to air pollution control, and from energy recovery to roofing.

Air Moving and Conditioning Association (AMCA) – The Air Moving and Control Association is a non-profit association of air system equipment manufacturers – primarily fans, louvers, dampers, and air curtains used in commercial or industrial buildings.

Associated Air Balance Council (AABC) – The AABC establishes industry standards for the field measurement and documentation of HVAC systems.

ASHRAE Standard 62.1-2010 Ventilation for Acceptable Indoor Air Quality – ASHRAE 62.1 standard specifies the minimum ventilation rates and measures intended to provide indoor air quality that is acceptable to human occupants.

# 3.0 DESIGN CRITERIA

This section provides a brief description of the criteria applicable to this pump station.

## 3.1 Water Resources Design Criteria

### 3.1.1 Inlet Pipe Capacity and Local Storage Volume

Two grated drop inlets located on either side of Central Avenue on the west approach to the railroad underpass depression capture stormwater to prevent flooding of the underpass. Two, 24-inch storm drains convey runoff to a manhole located just south of the pump station in Central Avenue. A 24-inch collector pipe is connected from that manhole to a catch basin located under the north sidewalk of Central Avenue to the west of the railroad bridge. Stormwater passes through a 2-foot 4-inch by 3-foot 11-inch opening out of the catch basin into the adjacent wet well of SWPS No. 38. The floor of the wet well is approximately 2 feet, 8.5 inches below the bottom of the catch basin opening.

The catch basin dimensions are approximately 6 feet wide by 3 feet, 11 inches tall by 7 feet, 6 inches long. The wet well has the dimensions 6 feet wide by 8 feet, 5 inches long by 15 feet, 9.5 inches deep. The operating volume of the station if the water level is at the top of the catch basin and has flooded the inlet storm pipes is approximately 2,700 gallons.

Assuming the inlets are flooded such that stormwater is just below the grates in the drop inlets and the lift station operating water level is approximately at the top of the catch basin, then the 24-inch inlet pipe has an estimated capacity of 22.6 cfs.

### 3.1.2 Lift Pumps and Piping

Three, 15 horsepower (HP) Flygt NP3153-436.095 FM explosion-proof rated submersible pumps with 436 Hard-Iron™ impellers are installed at the bottom of the wet well. The pumps have a

duplex duty operating point of 5.05 cfs (2,270 gpm) at 31 feet (ft) total dynamic head (TDH) and a simplex operating point of 2.68 cfs (1,190 gpm) at 29.0 ft TDH. Two pumps will operate simultaneously while the third remains on standby to provide 50% redundancy at the peak flow design. The system capacity curves are provided in Appendix C.

Each pump has its own discharge line and water from each pump flows through a 6-inch riser pipe and then sequentially through a Surgebuster swing disc check valve and a Val-Matic Cam-Centric plug valve. All three lines combine together at a 12-inch DIP cross. The check valves, plug valves and cross are all located in a valve vault adjacent to the wet well. A 1-inch air relief line is installed on the force main that allows venting of air and discharge of water during operation back into the wet well. The combined flow exits the vault via a 12-inch DIP force main and is discharged into an existing manhole in 1st Street just north of its intersection with Central Avenue. The 24-inch storm drain leaving the manhole drains into 48-inch storm drain located in Copper Avenue west of 1st Street.

The pumps are installed in Flygt's "P" configuration, which indicates that the pumps have a vertical discharge riser, no intake piping, and are submerged under normal operating conditions.

## 3.2 Electrical Design Criteria

### 3.2.1 Electrical Service

The station power is fed 480 Volts (V), 3-Phase from existing Public Service Company of New Mexico (PNM) 480V service at Urban Roadway Pump Station No. 43 via disconnect switch (DS) adjacent to the Lift Station Control Panel (LSCP).

### 3.2.2 Electrical Low Voltage

Low voltage power is distributed from the DS to the 480V distribution panelboard located in the LSCP. The dry-type transformer mounted on the side of the LSCP and fed from the 480V distribution panelboard supplies 240V for the 120V/240V distribution panelboard inside of the LSCP.

### 3.2.3 Controls

The lift pumps are controlled by a Motorola ACE3600 Remote Terminal Unit (RTU) located in the LSCP control panel. The RTU receives level inputs from level float switches suspended in the wet well. Controlling and indicating devices are located on the door of the LSCP including Hand-Off-Auto selector switches, pump start buttons, CAS and LSCP reset buttons, pump running pilot lights, time elapsed meters, and Operator Interface Panel.

## 3.3 Heating, Ventilation, and Air Conditioning (HVAC) Design Criteria

### 3.3.1 Outdoor Design

Outdoor design conditions are as follows:

- Outside Summer: 96°F dry bulb (DB)/60°F wet bulb (WB)
- Outside Winter: 16°F DB

### 3.3.2 Indoor Design

Indoor design conditions vary, depending on the occupancies of the areas served. Table 3-1 lists the indoor design conditions, as well as the code required ventilation rates. The ventilation rates for spaces are as required by NFPA 820 or ASHRAE 62.1. These rates are expressed in air changes per hour (AC/hr). This corresponds to the flow of fresh, outdoor air that is required to be supplied to the spaces.

**TABLE 3-1**
**INDOOR HVAC DESIGN CRITERIA**

| FACILITY | AREA | INDOOR DESIGN TEMPERATURE (°F) | | VENTILATION RATE | |
|---|---|---|---|---|---|
| | | MIN. | MAX. | (OUTDOOR AIR) (AC/Hr) | SOURCE/REASON |
| Central Avenue – Pump Station No. 38 | Dry Pit | Ambient | Ambient | Not Required | NFPA 820 |
| | Wet Well | | | | |
| | Valve Vault | | | | |

# 4.0 PUMP STATION SYSTEM

This section provides a brief description of the different components of the SWPS shown in Figure 1-2, including an overview of each process, equipment description, instrumentations and alarms, and safety information unique to the system or process. This section is supplemented with photos and diagrams of the processes at this pump station. The process and instrumentation diagram (P&ID) for the station is shown in Section 7.0.

## 4.1 Lift Pumps and Valves

### 4.1.1 Overview

When stormwater level in the wet well rises and trips the float level switches, the three lift pumps cycle on and off in a lead / lag / lag / alternate sequence according to the level in the wet well (Figure 4-1). The lift pumps run at constant speed.

### 4.1.2 Equipment Description

Stormwater is pumped by any combination of the three submersible lift pumps. The pumps are Flygt Model NP3153-436.095 FM, rated at 15 HP at 1755 revolutions per minute (rpm) and with a discharge of 1,200 gpm at 29 ft of TDH. The pumps are installed in Flygt's "P" configuration, which indicates that the pumps have a vertical discharge riser, no intake piping, and are submerged under normal operating conditions. The riser pipe for each pump is connected to a 6-inch Val-Matic Surgebuster® flap swing check valve and to a 6-inch Val-Matic Cam-centric® standard port plug valves with 2-inch American Water Works Association (AWWA) operating nut.

The lift pumps at this station are tagged with Water Utility Authority (WUA) Asset Management Program Equipment Tags. The tag numbers are listed below in Table 4-1 and shown on Figure 38-1 in Section 7.0 to provide clarity.

**FIGURE 4-1**
**LIFT PUMPS**

**TABLE 4-1**
**EQUIPMENT INFORMATION**

| Equipment No. | Asset Info | Classification Type | Classification |
|---|---|---|---|
| CV53801 | Station | Lift Pump No. 1 ball check valve (North) | Check Valve |
| CV53802 | | Lift Pump No. 2 ball check valve (Middle) | |
| CV53803 | | Lift Pump No. 3 ball check valve (South) | |
| V53801 | | Lift Pump No. 1 ball check valve (North) | Plug Valve |
| V53802 | | Lift Pump No. 2 ball check valve (Middle) | |
| V53803 | | Lift Pump No. 3 ball check valve (South) | |
| P53801 | | Lift Pump No. 1 (North) | Pump |
| P53802 | | Lift Pump No. 2 (Middle) | |
| P53803 | | Lift Pump No. 3 (South) | |

### 4.1.3 Instrumentations and Alarms

The wet well level signal is connected to the LSCP.

Alarms connected to telemetry include:

- Lift Pump 1, 2, and 3 Run (Lead Start, Lag Start, Lag-Lag Start)
- Lift Pumps STOP
- Wet Well High Level

### 4.1.4 Normal Operation

The lift pump start is initiated by a Flygt ENM-10 float-level sensor. The pumps divert water from the wet well and discharge through a 12-inch force main to a 24-inch gravity storm drain and ultimately to a 48-inch storm drain. The pumps will continue to discharge until the wet well level drops below the float level switches.

Valve positions during normal operation are as follows:

IN SERVICE – Check Valve No. 1 CV53801
IN SERVICE – Check Valve No. 2 CV53802
IN SERVICE – Check Valve No. 3 CV53803
OPEN – Plug Valve No. 1 V53801
OPEN – Plug Valve No. 2 V53802
OPEN – Plug Valve No. 3 V53803
OPEN – Force Main Air Blow-Off Valve

### 4.1.5 Safety: Information Unique to the System or Process

Refer to Section 9.0 for general safety guidelines.

# 5.0 ELECTRICAL SYSTEM

This section provides a brief description of the Electrical System at this pump station. Refer to Figure 5-1 for Pump Station No. 38 Central Avenue Electrical One-Line Diagram, Figure 5-2 for Storm Water Pump Station No. 38 Electrical Site Plan, and Figure 5-3 for Storm Water Pump Station No. 38 P&ID.

## 5.1 Electrical Service

### 5.1.1 Overview

The pump station receives 480V 3-Phase power from the existing the PNM 480V service at Urban Roadway Pump Station No. 43.

### 5.1.2 Equipment Description

The service DS is a 100A fused switch mounted on steel strut next to the LSCP. The DS output is connected to the main circuit breaker (MCB) in the 480V distribution panelboard located inside of the LSCP. The 480V distribution panelboard feeds the 120V/240V distribution panelboard via the 480V-120V/240V transformer mounted to the side of the LSCP. The 480V distribution panelboard also houses a sub-feed circuit breaker (CB) for connection of a standby generator. The sub-feed CB is interlocked with the MCB to avoid paralleling the generator with the utility.

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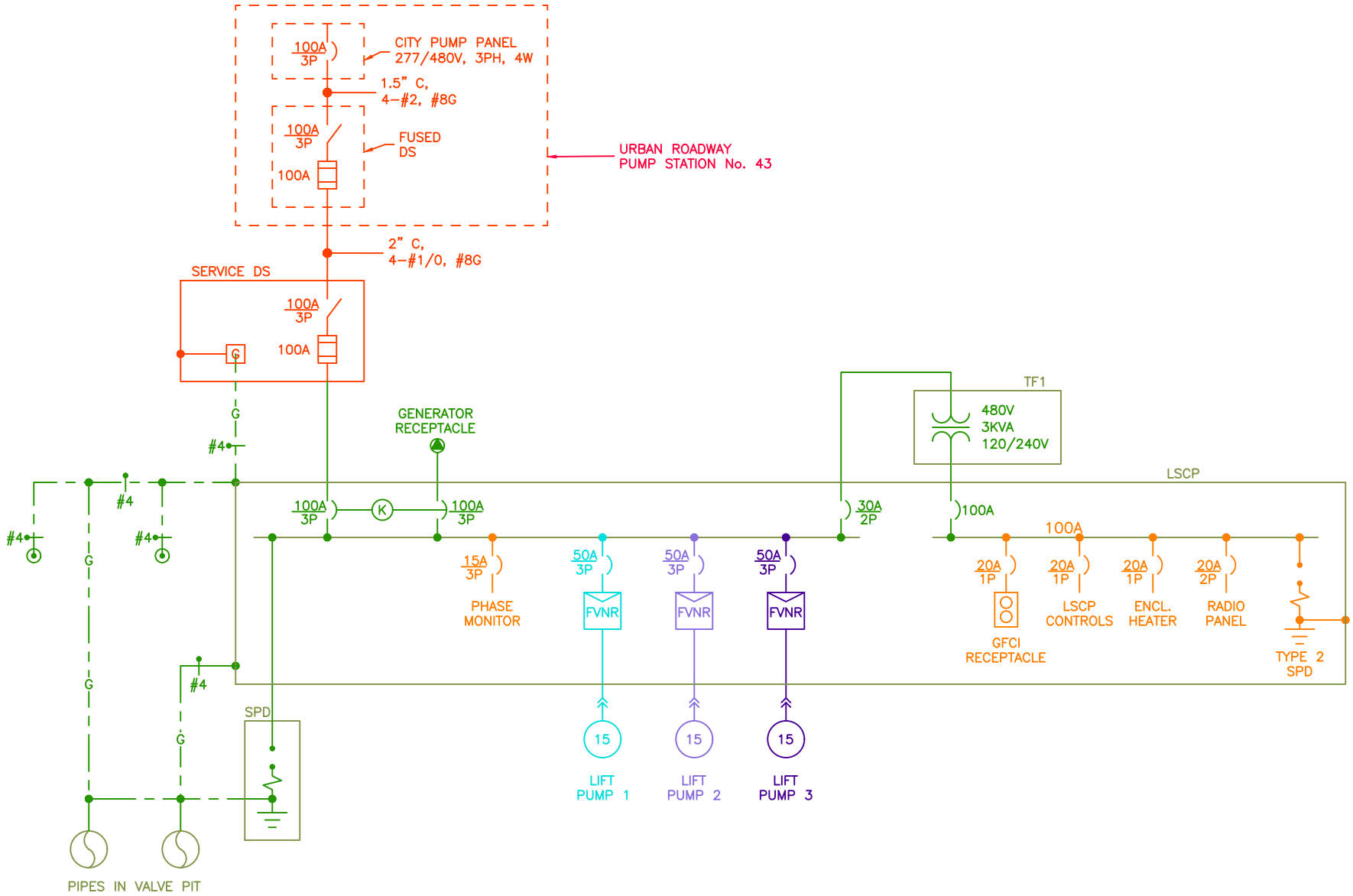


City Of Albuquerque Stormwater Pump Stations

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# Pump Station No. 38 Central Avenue Electrical One-Line Diagram

## Figure 5-1

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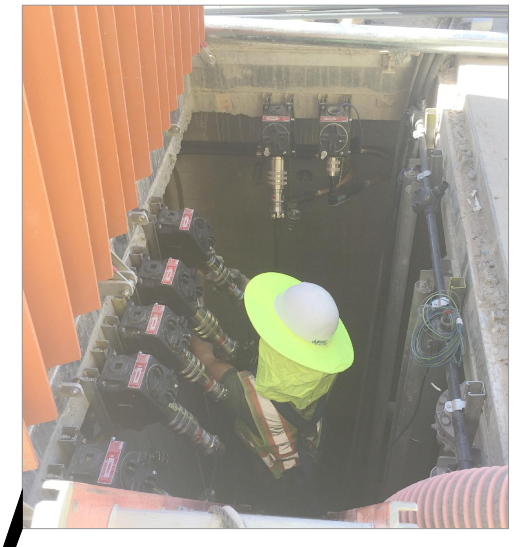
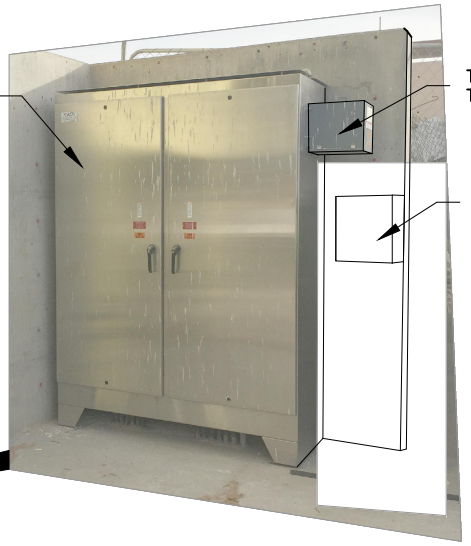
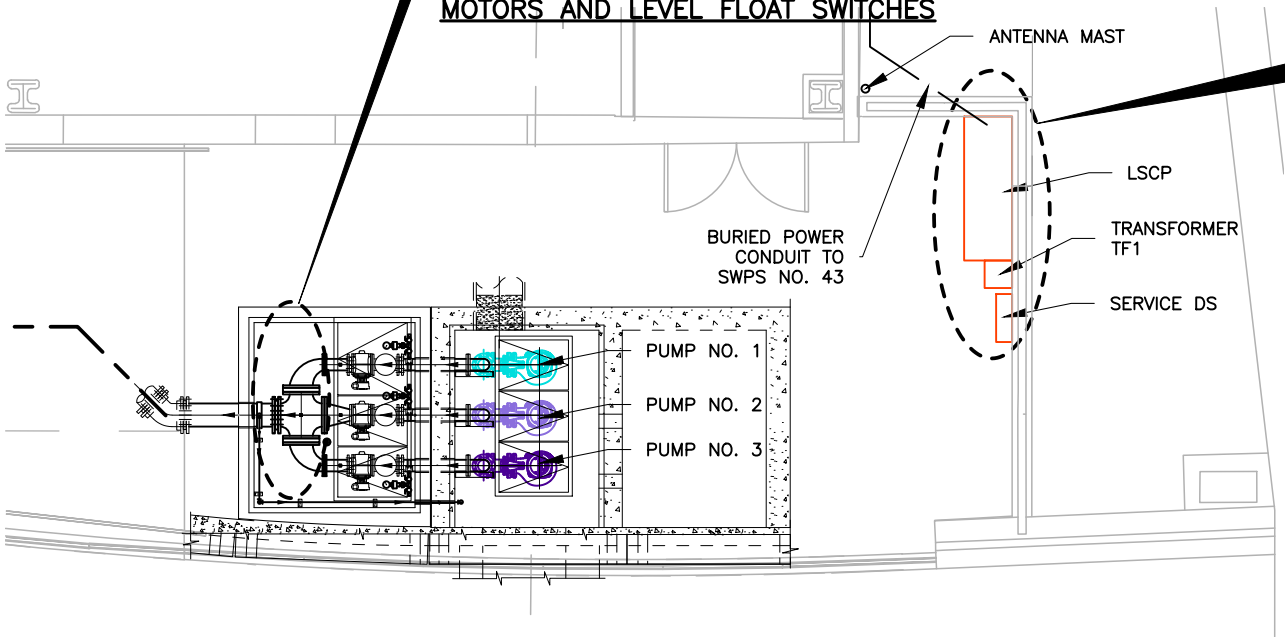


VIEW ON DISCONNECTS FOR PUMP MOTORS AND LEVEL FLOAT SWITCHES




VIEW ON CONTROL PANEL AND POWER EQUIPMENT




City Of Albuquerque Stormwater Pump Stations

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# Storm Water Pump Station No. 38 Electrical Site Plan
# Figure 5-2

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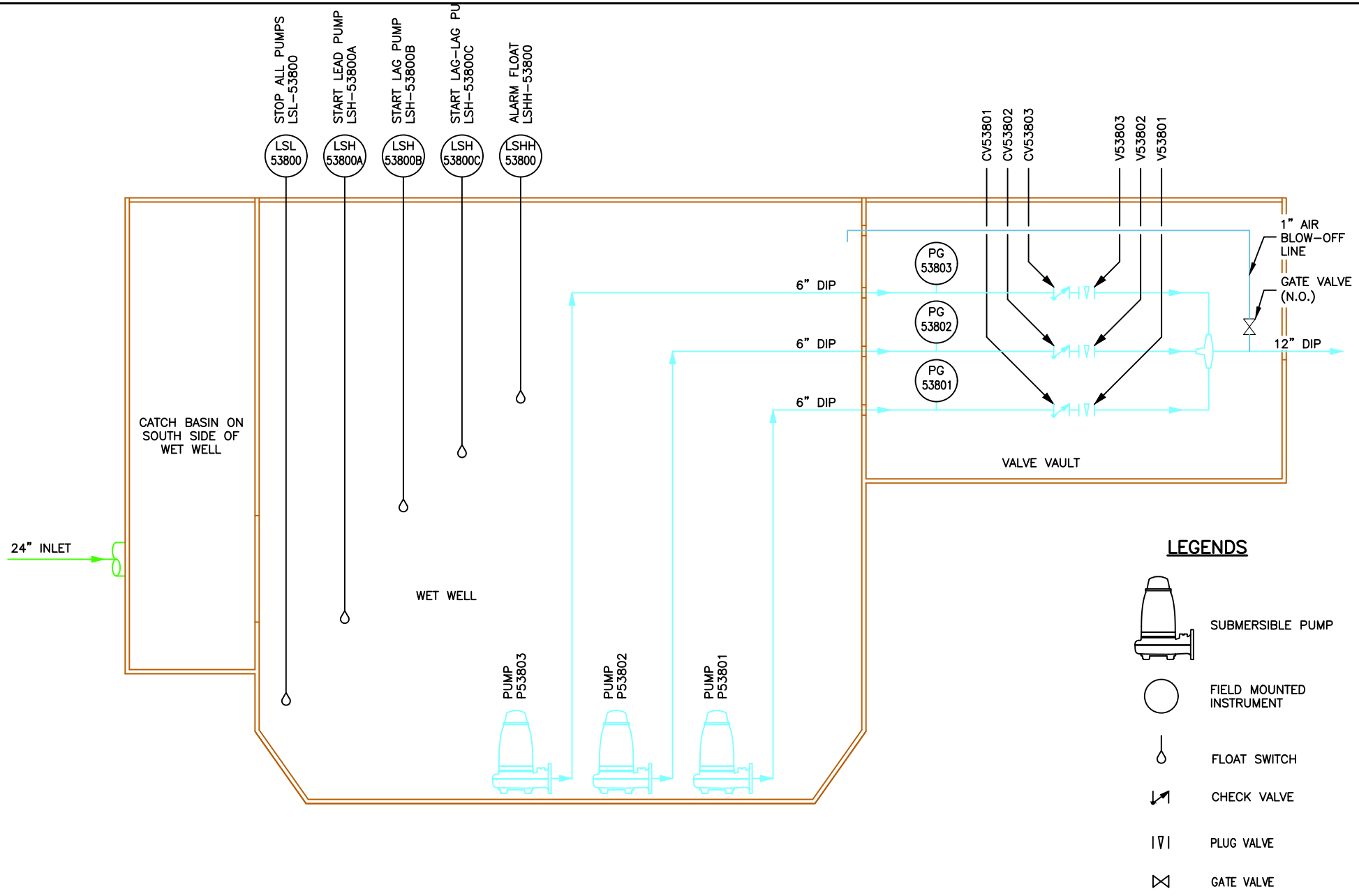


City Of Albuquerque Stormwater Pump Stations

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# Storm Water Pump Station No. 38 P&ID

## Figure 5-3

### 5.1.3 Controls

The LSCP is a programmable logic controller (PLC) type control panel manufactured by Yukon & Associates. The LSCP is equipped with Motorola ACE3600 RTU system consisting of radio, backup battery, and PLC. The Motorola ACE3600 RTU is used to provide automatic operation of the lift station and for communication with the ABCWUA's SCADA system. The LSCP is equipped with a human-machine interface (HMI) for controlling station operations and displaying station status and alarm messages. The wet well is equipped with five level float switches suspended in the wet well and connected to the LSCP for control.

### 5.1.4 Normal Operation

The LSCP detects the wet well level from the float switches. When the lead pump is stopped, the LSCP alternates the lead pump to lag pump. Level switches are provided for the following:

- Start Lead Pump
- Start Lag Pump
- Start Lag-Lag Pump
- Stop All Pumps
- Alarm

### 5.1.5 Safety: Information Unique to the System or Process

The wet well is a confined space. Entry is allowed only by trained personnel who are properly equipped.

## 5.2 Lift Pumps

### 5.2.1 Overview

The lift pumps are submersible style installed inside the wet well.

### 5.2.2 Equipment Description

The lift pumps are 15 HP submersible type pumps that operate at 480V. The pumps are controlled by the LSCP based on the water level signals from float switches installed in the wet well.

### 5.2.3 Controls

The pump motor has internal temperature and moisture detection switches. The internal switches are connected to the monitoring MiniCAS relays especially designed to simultaneously supervise the pump motor thermal switch and pump leakage detector. Monitoring relays provide protection for the most common threats against submersible pumps: high temperature and leakage. In case of alarm, the pump is stopped and an alarm signal is sent to PLC.

### 5.2.4 Normal Operation

The PLC in the LSCP receives the wet well level signals from the level switches installed in the wet well. When the level rises to the start lead pump level, the LSCP starts the lead pump. If the level continues to rise, and reaches the start lag pump level, the LSCP starts the lag pump. The lag-lag pump follows the same operational cycle. The LSCP stops the lag pump when pumping has lowered the wet well level and the lag pump float switch opens. The LSCP stops the lead pump when the lowest level float switch opens. The pumps are started by full-voltage non-reversing (FVNR) solid state starters.

### 5.2.5 Safety: Information Unique to the System or Process

A ladder is required for access into the wet well. The lift pumps are controlled remotely, so they may start unexpectedly. Disconnect the lockout and tag out the source of power at the LSCP before servicing the pumps.

## 5.3 Lift Station Control Panel (LSCP)

### 5.3.1 Overview

The PLC in the LSCP receives the wet well level signals. The PLC controls the lift pump start / stop command in accordance with the wet well level and the lead selections made by the operator at HMI. The PLC is connected to the radio transmitter to broadcast alarms to the WWTP via SCADA.

### 5.3.2 Equipment Description

The LSCP is a PLC type control panel. The LSCP has a front panel mounted HMI, control devices, and indicators to indicate the station operations.

### 5.3.3 Controls

The lead pump is selected using the HMI. Hand-Off-Auto selector switches are used to set "Hand" or "Auto" mode for each pump. The panel front mounted pilot lights indicate lift pumps running state.

### 5.3.4 Normal Operation

In Auto mode, operation level signals are applied to the PLC in the LSCP. When the prescribed wet well level is reached, a signal from the wet well float switches activates PLC input to start the lead pump. As the wet well level rises, the lag pump is started. The lag-lag pump is started if the level continues to rise. Proper pump operation and valve position is verified by monitoring the amperage supplied to each pump motor and the limit switches installed on the check valves.

### 5.3.5 Safety: Information Unique to the System or Process

The control panel has voltage from more than one source. Disconnect all sources before servicing. The LSCP is energized at 480V. It shall be accessed only by electricians who are trained in the operation and are equipped with proper protective gear.

## 6.0 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) SYSTEMS OPERATION

There is no HVAC system at Pump Station No. 38 Central Underpass. The station consists of a manhole wet well with a natural convection ventilation pipe, and an outdoor control cabinet. There are no occupied indoor spaces.

## 7.0 STANDARD OPERATING JOB PROCEDURE (SOJP)

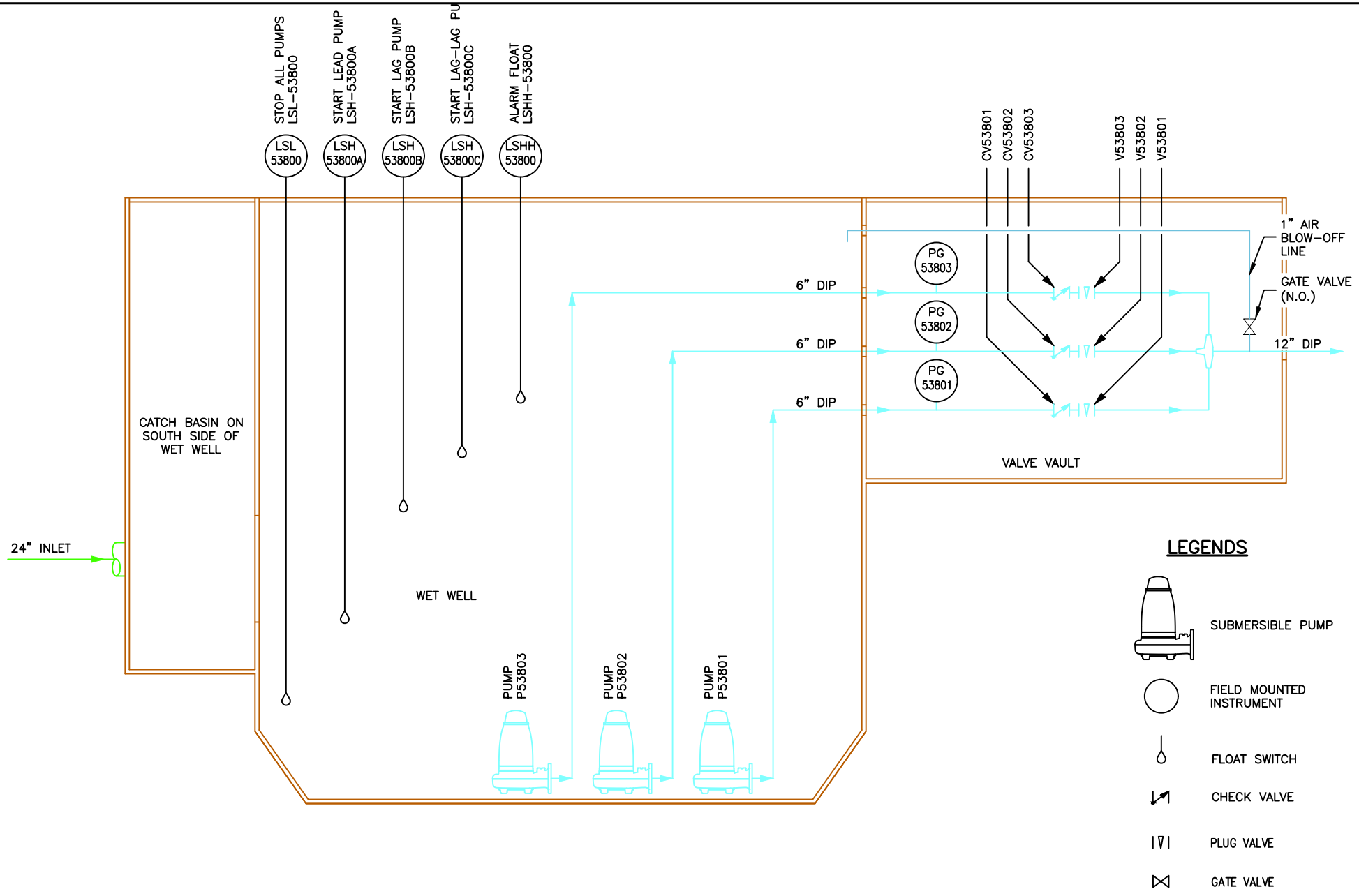
This section includes SOJPs for the system and equipment for Pump Station No. 38 Central Underpass. The SOJPs provide the detailed instructions for testing each component necessary to ensure that during the summer storm season of July 1st through September 30th, the facilities will be prepared to operate. SOJPs are utility by the ABCWUA and are used as the primary means for testing the equipment within their system. If a facility appears to have an issue, the SOJP testing shall bring the issue to light and a means to address the issue promptly and correctly.

## 7.1 List of Standard Operating Job Procedure (SOJP)

Below is a list of the SOJPs developed for Pump Station No. 38 Central Underpass and are included in this section.

- SOJP_3800_SU _ Central Underpass Pump Station
- SOJP_3800_N _ Central Underpass Pump Station
- SOJP_3800_SD _ Central Underpass Pump Station

LAST MODIFIED: Jun 03, 2020 - 12:04pm BY USER: dbelka
DWG. LOCATION: I:\ALBUQUER\ABQ131-24 SWPS 27 CA\Ops Manual\Figures\
DWG. NAME: Figure 38-1.dwg



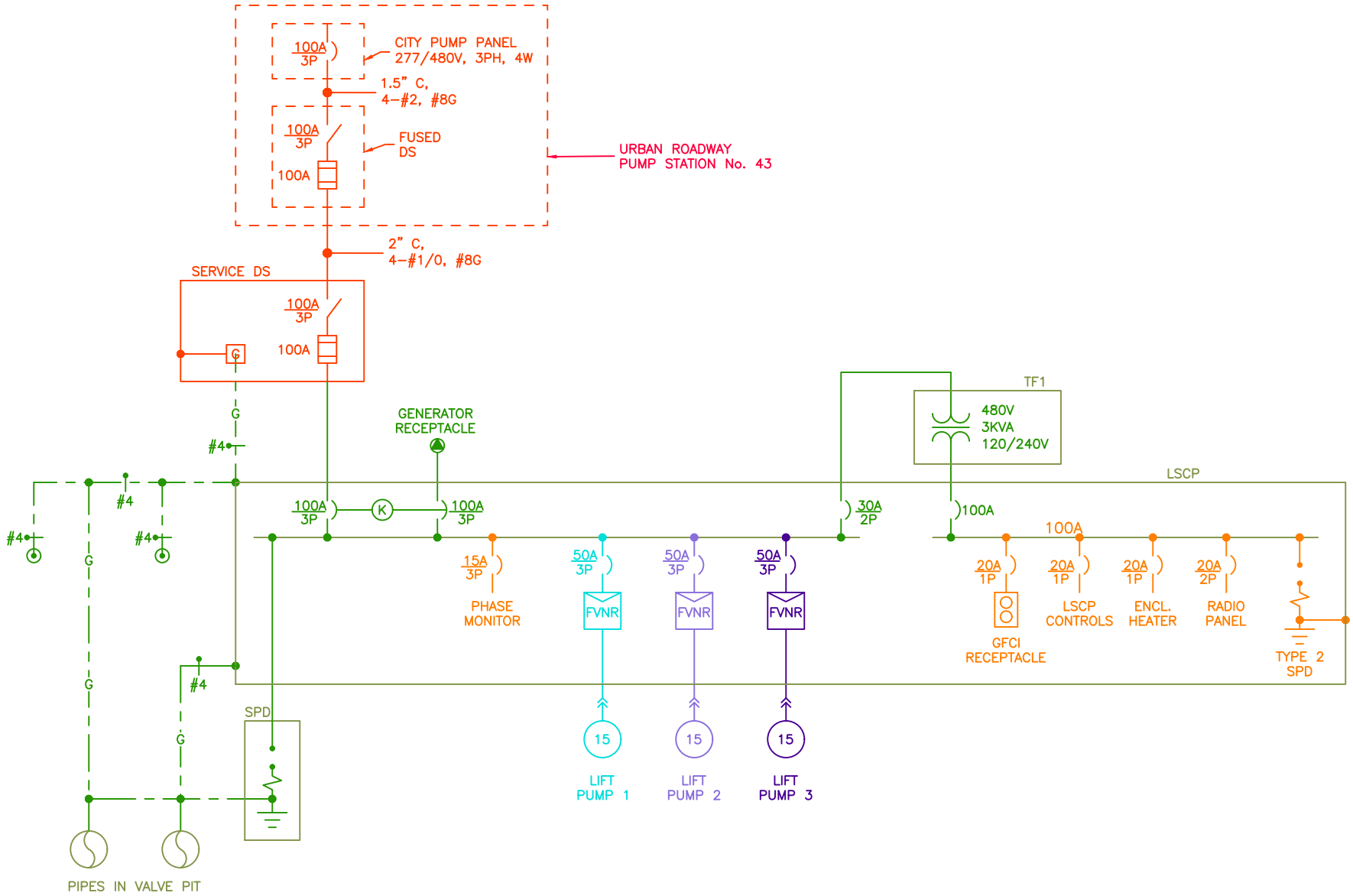

City Of Albuquerque Stormwater Pump Stations

MOLZENCORBIN

# Storm Water Pump Station No. 38 P&ID

## Figure 38-1

LAST MODIFIED: Jan 27, 2020 - 9:51am BY USER: dbelka
DWG. LOCATION: I:\ALBUQUER\ABQ131-24 SWPS 27 CA\Ops Manual\Figures\
DWG. NAME: Figure 38-2.dwg



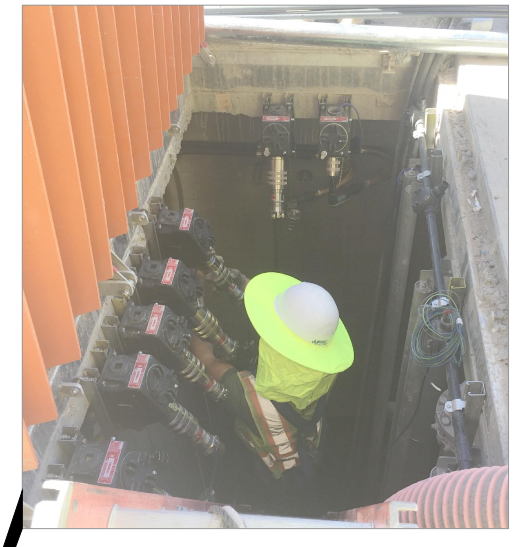

City Of Albuquerque Stormwater Pump Stations

MOLZENCORBIN

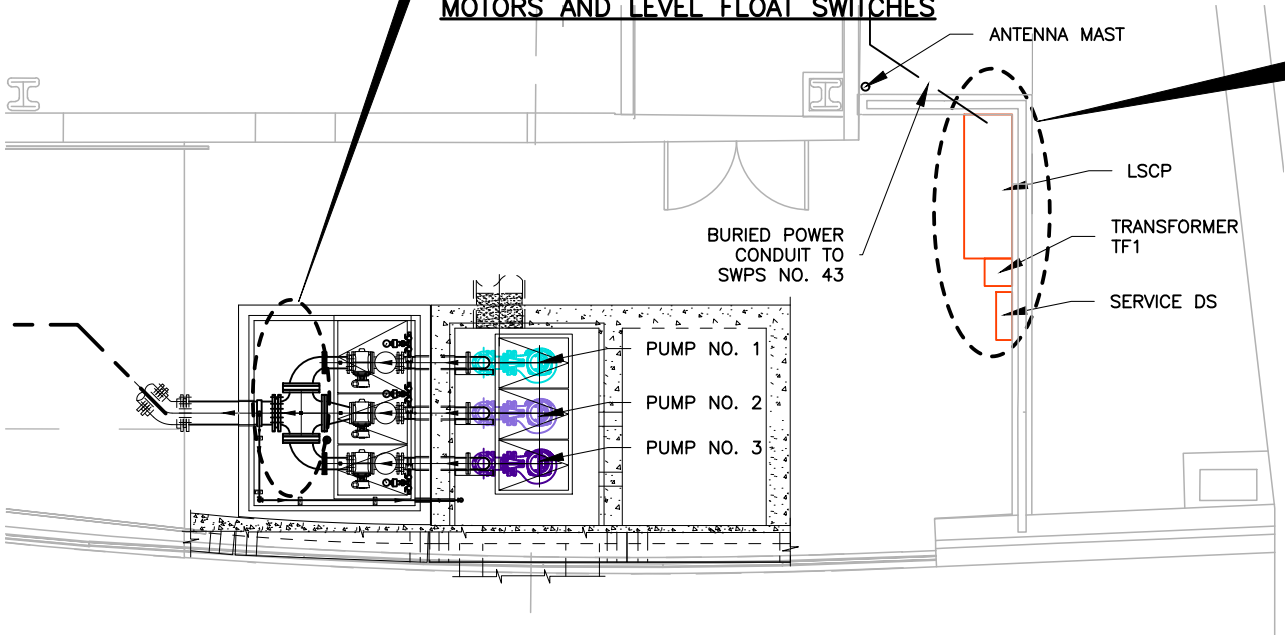
# Pump Station No. 38 Central Avenue Electrical One-Line Diagram

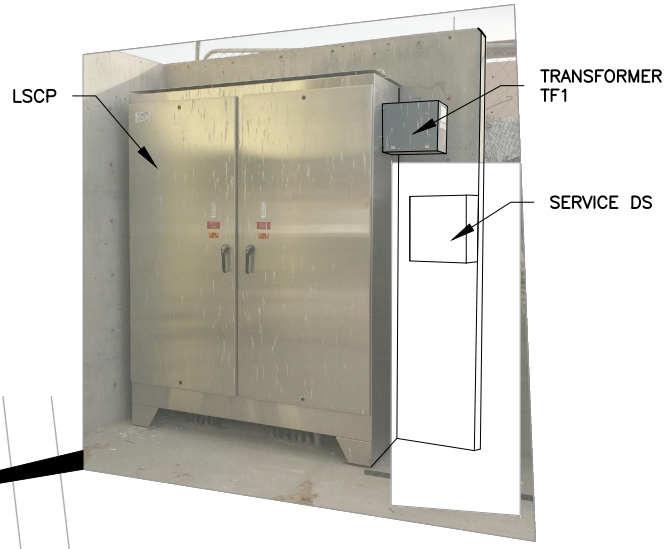
# Figure 38-2

LAST MODIFIED: Jan 27, 2020 - 9:50am BY USER: dbelka
DWG. LOCATION: I:\ALBUQUER\ABQ131-24 SWPS 27 CA\Ops Manual\Figures\
DWG. NAME: Figure 5-2.dwg



VIEW ON DISCONNECTS FOR PUMP MOTORS AND LEVEL FLOAT SWITCHES




VIEW ON CONTROL PANEL AND POWER EQUIPMENT

City Of Albuquerque Stormwater Pump Stations

MOLZENCORBIN

# Storm Water Pump Station No. 38 Electrical Site Plan

## Figure 38-3

**REF (Filename):** SOJP_3800_SU_ CENTRAL UNDERPASS PUMP STATION.doc
**Revision Date:** 1/30/2020
**Revised By:** Molzen Corbin
**Approved by**:

# SOJP NO.: 3800-SU-CENTRAL UNDERPASS PUMP STATION

# TITLE: CENTRAL UNDERPASS PUMP STATION – START-UP

**Tools:** Personal Protection Equipment: Hard hat, safety boots and safety glasses.

**Hazards:** Slip and fall and electrical shock.

**Caution**: See Section 9 Safety of the Stormwater Pump Station No. 38 Central Underpass Operations Manual

**SYSTEM SCHEMATICS**

Figure 38-1 Pump Station No. 38 Central Underpass P&ID
Figure 38-2 Pump Station No. 38 Central Underpass Electrical One-Line Diagram
Figure 38-3 Pump Station No. 38 Central Underpass Electrical Site Plan

## CENTRAL UNDERPASS PUMP STATION

### SYSTEM START-UP

**PROCEDURE**

**Station Entry/Exit and Alarm Deactivation Procedure**

Entry

1. Call Plant Control: Identify yourself with a Call Number: Example #202 and advise of your entry.
2. No code entry is needed.

Exit

1. To exit site: Make sure all the doors are secure and exit.
2. Call Plant control to advise of your departure.

**Before Normal Operation, the following is required:**

1. Position or verify that the pump station valves are as follows:
   IN SERVICE – Lift Pump No. 1 Check Valve **CV53801**
   IN SERVICE – Lift Pump No. 2 Check Valve **CV53802**
   IN SERVICE – Lift Pump No. 3 Check Valve **CV53803**
   OPEN – Lift Pump No. 1 Isolation Plug Valve **V53801**
   OPEN – Lift Pump No. 2 Isolation Plug Valve **V53802**
   OPEN – Lift Pump No. 3 Isolation Plug Valve **V53803**
   OPEN – Force main air relief valve

CLOSED – All valves should be open.

2. Test the pumps starting with water in the wet well at a level at least 3 feet above the wet well floor. Water may be diverted into the storm drains from a fire hydrant.
3. Check that the station service disconnect switch is closed **(ON)**.

**Test the Lift Pump.**

4. Check 480V Distribution Panel inside LSCP if the following circuit breakers are **ON** position:
   - Main circuit breaker
   - Pump circuit breaker
   - Circuit breaker on primary side of TR1

   Note: If a disconnect switch (other than a 120V) for the equipment to be started is not in the **ON** position, notify the shift supervisor, enter the event in the operator log, and generate a work order for a maintenance repair dispatch to have the switch(es) placed in the **ON** position.
5. Check 120/240V Distribution Panel if the following circuit breakers are in **ON** position:
   - Main circuit breaker
   - LSCP Controls circuit breaker

**Test the Lift Pumps in HAND (Typical for all pumps).**

6. Place the lift pump HAND-OFF-AUTO (H-O-A) switch on the Lift Station Control Panel (LSCP) into **HAND** position.

   Note: Verify there is sufficient wet well level before starting a lift pump.
7. Press **START** button.
8. If Phase Monitor and MiniCAS relay don't sensor the alarming situation the pump should start.
9. To stop pump place **H-O-A** switch into **OFF** position.

**Test the Lift Pumps in AUTO.**

10. The lift pumps in Auto mode are operated by PLC in LSCP.
11. Select a lag lift pump from HMI screen on the LSCP.
12. Place the lead and lag **H-O-A** switches on the LSCP into **AUTO** positon.
13. Check if lead pump starts when water level reaches the **Start Lead Pump** float switch.
14. Check if lag pump starts when the water level reaches the **Start Lag Pump** float switch.
15. Check is system gets alarmed when water level reaches the **Alarm** float switch.
16. Check if pumps stop when water level drops below the **Stop All Pumps** float switch.
17. Record each motor current.

Albuquerque Bernalillo County
Water Utility Authority

**REF (Filename):** SOJP_3800_N_ CENTRAL UNDERPASS PUMP STATION .docx
**Revision Date:** 1/30/2020
**Revised By:** Molzen Corbin
**Approved by:**

# SOJP NO.: 3800-N-CENTRAL UNDERPASS PUMP STATION

## TITLE: CENTRAL UNDERPASS PUMP STATION - NORMAL OPERATION

**Tools:** Personal Protection Equipment: Hard hat, safety boots, and safety glasses.

**Hazards:** Slip and fall and electrical shock

**Caution:** See Section 9 Safety of the Stormwater Pump Station No. 38 Central Underpass Operations Manual

### SYSTEM SCHEMATICS

Figure 38-1 Pump Station No. 38 Central Underpass P&ID
Figure 38-2 Pump Station No. 38 Central Underpass Electrical One-Line Diagram
Figure 38-3 Pump Station No. 38 Central Underpass Electrical Site Plan

## CENTRAL UNDERPASS PUMP STATION

## NORMAL OPERATION

### GENERAL

Stormwater will be conveyed into the wet well through a 24-inch ductile iron pipe (DIP). The pump station has a two (2) duty- one (1) standby configuration for the three (3) submersible lift pumps activated by float switches. The total capacities are approximately:

- One duty pump – 1,190 gpm at 29.0 feet of TDH
- Two duty pumps – 2,380 gpm at 31.0 feet of TDH

### NORMAL OPERATION CONDITIONS

During normal operation, the HAND-OFF-AUTO (HOA) switches for the lift pumps will be in **AUTO** and will start and stop automatically based on the signals from level float switches.

LEAD, LAG, STANDBY assignments:

The lead lift pump is selected automatically by the Lift Station Control Panel.

The float levels are set manually by adjusting the cable length in the wet well. The lead, lag, and standby switches are assigned in the Station Level Control Panel programming.

### NORMAL OPERATING PROCEDURES

#### Station Entry/Exit and Alarm Deactivation Procedure

Entry

1. Call Plant Control: Identify yourself with a Call Number: Example #202 and advise of your entry.
2. No PLC at this station. No code entry is needed.

Exit

1. To exit site: Make sure all the doors are secure and exit.
2. Call Plant control to advise of your departure.

**After initial Start-Up, Normal Operation is as follows:**

1. Check for abnormal conditions when entering facility – flooding, broken equipment, electrical fires, etc.
2. Check the pump station and equipment status at the control panel.
3. Check and record the AC voltage at the LSCP.
4. During lift pump operation, check and record the motor current.

Albuquerque Bernalillo County
Water Utility Authority

**REF (Filename):** SOJP_3800_SD_ CENTRAL UNDERPASS PUMP STATION.docx
**Revision Date:** 1/30/2020
**Revised By:** Molzen Corbin
**Approved by:**

# SOJP NO.: 3800-SD–CENTRAL UNDERPASS PUMP STATION

## TITLE: CENTRAL UNDERPASS PUMP STATION-SHUTDOWN

**Tools:** Personal Protection Equipment: Hard hat, safety boots and safety glasses.

**Hazards:** Slip and fall and electrical shock.

**Caution:** See Section 9 Safety of the Stormwater Pump Station No. 38 Central Underpass Operations Manual

**SYSTEM SCHEMATICS**

Figure 38-1 Pump Station No. 38 Central Underpass P&ID
Figure 38-2 Pump Station No. 38 Central Underpass Electrical One-Line Diagram
Figure 38-3 Pump Station No. 38 Central Underpass Electrical Site Plan

## CENTRAL UNDERPASS PUMP STATION

## SYSTEM SHUTDOWN

## PROCEDURE

**Station Entry/Exit and Alarm Deactivation Procedure**

Entry

1. Call Plant Control: Identify yourself with a Call Number: Example #202 and advise of your entry.
2. No PLC at this station. No code entry is needed.

Exit

1. To exit site: Make sure all the doors are secure and exit.
2. Call Plant control to advise of your departure.

**Lift Pump Shutdown**

Shutdown is required for maintenance or for replacement. Shutdown of the selected lift pump is as follows:

1. Disconnect, lock out, and tag power source before servicing. Failure to disconnect power source can result in fire, shock, or serious injury. Follow ABCWUA LOTO (lock out, tag out). Refer to Appendix E.
2. Select the **OFF** position for the selected pump with the HAND-OFF-AUTO (HOA) switch on the door of the Lift Station Control Panel.
3. Verify the H-O-A for the remaining lift pump is in the **AUTO** position.

# 8.0 STANDARD MAINTENANCE PROCEDURES

Standard Maintenance Procedures are developed to provide a list of tasks to be performed at a specified frequency to increase the overall life and performance of the lift station equipment. These procedures provide the recommended maintenance to be performed at the pump station with input from facilities staff and / or manufacturer's instructions.

## 8.1 Water Resource Equipment

### 8.1.1 Lift Pumps

Maintenance is to be performed only by qualified personnel who are familiar with this type of equipment. The local sales and service representative for Flygt Pumps is James, Cooke, & Hobson, Inc. located in Albuquerque, New Mexico. For further instruction, reference the manufacturer's O&M manual. Refer to Appendix C for manufacturer's general information.

The submersible lift pumps are mounted on guide rails and can be lifted by a boom truck parked adjacent to the wet well hatch. Each of the pumps is equipped with a switch-rated receptacle so that it can be removed from the wet well without disconnecting the cable from the pump.

### 8.1.2 Valves

Annually exercise the resilient seated plug valves on the station force main and verify operation of the check valves.

## 8.2 Electrical Equipment

### 8.2.1 Lift Station Control Panel (LSCP)

The LSCP operates the lift pumps to maintain the level in the wet well.

Maintenance: Always disconnect, lock and tag power source before servicing.

Ongoing Maintenance:

- Visual inspection.
- Keep the surrounding area clean.

Annual Maintenance:

- Visual inspection.
- Vacuum interior of the control panel.
- Check / tighten all connections.
- Operate all switches.
- Test all pilot indicators.
- Plug or cover all unused openings.
- Manually operate level switches and check control relative to rising signal.
- Verify transmission of alarm signals to Southside Water Reclamation Plant (SWRP).

5-Year Maintenance:

- Conduct annual maintenance.
- Infrared scan.

## 9.0 SAFETY

This section presents general information on safety procedure to help prevent accidents. Consequently, to reduce the danger, anyone engaged in the operation of a SWPS must be familiar with safety practices that pertain specifically to the profession. Once recognized, the inherent hazards can be readily corrected or at least guarded against by proper warnings and safety procedures. The overall dangers of accidents are much the same whether in valve vaults, pumping stations, or other facilities. These hazards can usually be classified under one of the following categories:

- Physical injuries
- Body infections
- Dangers from explosive or noxious gases or vapors and oxygen deficiency.

Safety regulations such as New Mexico Occupational Health and Safety Bureau (OHSB) and Occupational Safety and Health Administration (OSHA) should be followed. More information can be found at:

- https://www.osha.gov/law-regs.html and
- https://www.osha.gov/dcsp/osp/stateprogs/new_mexico.html.

## 9.1 General Safety Guidelines

1. Observe all written and verbal safety rules and be aware of the particular hazards surrounding your job.

2. Do not start a task until you have received and fully understand the instructions.

3. Immediately correct or report to your supervisor any hazardous conditions, unsafe equipment, or unsafe working practice.

4. Report all injuries or accidents to your supervisor.

5. Do not run. Watch for and avoid slippery or congested areas.

6. Do not ride on or operate any moving equipment unless it is part of your job and you have been instructed in its use.

7. When operating moving equipment, observe all traffic signs, speed limits, and parking regulations.

8. Do not wear loose clothing or carry rags in your pockets. Cloth may become caught in equipment and cause personal injury.

9. Use personal protective equipment (PPE) such as goggles, hard hats, gloves, and respirators, whenever warranted or required by the tasks.

10. Do not operate any equipment unless all safety guards and safety devices designed for that equipment are in place, except as permitted in written maintenance or emergency operation procedures.

11. Lock out equipment before cleaning debris from moving parts. Follow ABCWUA Lockout / Tagout (LOTO) Procedures before working on any equipment. Refer to Appendix E.

12. If it is necessary to remove safety devices, handrails, manhole covers, or related items, warn fellow employees.

13. Keep all tools in good repair and ensure that you use tools appropriate to the work being performed.

14. Do not pass under or work beneath fellow employees unless a task requires doing so. Never enter a wet well, tank, or basin until all precautions have been taken to ensure safety.

15. Practice good housekeeping. Immediately clean up any grease, oil, or hydraulic fluid that may have spilled or leaked from the equipment. Do not use gasoline to clean up oil and grease. Keep all passageways, aisles, stairs, and exits clear of tools, equipment, and other materials.

16. Do not consider a job finished until you have made conditions as safe as possible for the next person.

17. Work in pairs when feasible, especially if the work being done has high risk of injury or requires assistance.

## 9.2 Electrical Hazards

1. Do not ground yourself in water or on pipes or drains. Avoid them when working near any electricity.

2. Allow only authorized people to work on electrical equipment and repairs.

3. Keep all electrical controls accessible and well-marked.

4. Keep rubber mats on the floor in front of electrical panels; keep edges trimmed so they do not become a tripping hazard.

5. Keep wires from becoming a tripping hazard.

6. Work in pairs around electrical equipment.

7. Place "MAN ON LINE" signs on electrical disconnects, and lock the disconnects when working on electrical equipment which another person can turn on.

8. Never use metal ladders around electrical equipment.

9. Handle breaker wires as though they were “live” wires.

10. When there is a question about any electrical hazard, ask before you expose yourself to it.

11. Do not use any part of your body to test a circuit.

12. Ground all electrical tools.

13. When working around electrical equipment, as with any other hazardous work, always remain aware of the potential hazard.

## 9.3 Mechanical Equipment Hazards

The exposed moving parts of some pieces of equipment pose a safety hazard to personnel working around the equipment. Installing stationary guards where necessary can prevent accidental injury related to these parts. These guards, which would shield the moving part without interfering with its operation, should be considered for belts, wheels, chains, shafts, and any couplings between a piece of equipment and its drive motor or two moving parts of a piece of equipment. Protective guards are sometimes furnished in the form of screens, plates, hollow shells, or tubes by the manufacturer and installed when the equipment is put into service. The designated personnel should inspect V-belts, drive chains, horizontal or vertical drive shafts, and all exposed moving parts.

Guards should be kept in good condition and replaced if necessary. Bent or improperly fitting guards could rub and interfere with the movement of a belt, shaft, wheel, etc. Before a guard is replaced, the related piece of equipment should be shut off and the power disconnected.

In addition, certain pieces of equipment may pose noise problems. High noise levels could cause serious injury to personnel coming into close contact with the equipment. Some form of ear protection, such as headsets, should be provided for personnel working near the unit. However, before any corrective measure is taken, the personnel should make certain the high noise level is not the result of a malfunction in the unit. At no time should unauthorized personnel be allowed to come near a piece of machinery that poses a safety threat. Whether guards are installed or not, this protective measure should always be observed.

## 9.4 Explosion and Fire Hazards

1. Install fire extinguishers where a fire hazard exists, and mark the location of the extinguishers with properly placed signs.

2. Post "NO SMOKING" signs where a potential fire hazard exists.

3. Instruct plant employees in fire prevention and what action to take in case of a fire.

4. Label all portable containers of flammable materials to indicate their contents.

5. Mark storage locations for flammable materials with signs reading "FLAMMABLE MATERIAL".

6. Store flammable combustible liquids in tanks or closed containers.

7. Clean up leaks or spills of flammable materials immediately and dispose of them promptly.

8. Inspect fire extinguishers monthly, keep them charged, and test them at least once every 5 years.

## 9.5 Biological Hazards

1. All cuts, skin abrasions, scratches, and similar injuries should be treated promptly. It is recommended that all cuts and scratches, no matter how small, be treated immediately with a povidone-iodine solution and watched closely for any signs of redness, tenderness, swelling, or infection. If any of these signs appear, the individual should see a physician.

2. A doctor should be called for all but minor injuries.

3. Treatment facility personnel should be familiar with first aid treatment.

4. Avoid putting fingers in nose, mouth, or eyes while working.

5. Thoroughly clean hands when convenient and always before eating, smoking, or leaving work. Fingernails should be kept short to aid cleanliness.

6. Wear proper shoes and clothing on site, especially when working in the pump station wet well, to protect from injury (ex., needles, razors, broken glass, etc.).

7. Wear leather gloves to protect hands from nicks, scratches, etc.

8. Wear rubber gloves when direct contact with wastewater is a possibility.

## 9.6 Oxygen Deficiency and Noxious Gas Hazards

1. Test atmosphere before entering any confined space, in conformance with ABCWUA confined space entry procedures. Refer to Appendix F.

2. In closed spaces, allow no smoking or open flames, and guard against sparks.

3. Use only safety explosion-proof lighting equipment or mirrors.

4. Always ventilate all manholes, tanks, etc. (enclosed areas), before entering.

5. Test the atmosphere for explosive and toxic gases and oxygen deficiency, as required by the New Mexico OHSB. If the atmosphere is normal, a worker may enter with a safety harness attached and two men available at the top. The atmosphere must be continually monitored.

6. If gas or oxygen deficiency is found, the atmosphere should be ventilated with pure air by natural or artificial means. Use of a portable blower is the most practical method of artificial ventilation. Gas tests should then be repeated and atmosphere cleared as normal before workers enter. Adequate ventilation must be maintained during work, and tests frequently repeated.

7. If gas or oxygen deficiency is present and it is not practical or possible to ventilate adequately before workers enter (such as in the saving of life), a hose mask or self-contained breathing apparatus should be worn and extreme care taken to avoid all sources of ignition if flammable gas is present. Use explosion-proof safety lights (not ordinary flashlights), wear rubber boots or non-sparking shoes, use non-sparking tools, etc.

**Note:** Work in a flammable gas atmosphere is extremely hazardous and should never be attempted except by those thoroughly familiar with the dangers and fully equipped with the proper protection safety equipment, and then only if it is impossible to provide a safe atmosphere within the time limitation of the emergency.

## 9.7 Safety Equipment

Safety Helmets provide head protection from falling or flying objects and from limited electric shock.

Hearing Protection (e.g., earplugs or earmuff) is required in areas of high noise levels.

Goggles prevent eye injury where there is a reasonable probability of injury.

Protective Creams protect the skin from sunburn, oils, greases, paints, and dust.

Gloves of the appropriate material prevent injuries while handling pipe, tools, chemicals, solvents, and similar materials.

Safety Boots protect toes from falling objects and when moving heavy items.

Oxygen, Toxic Gas, and Explosive Condition Detectors are used to assure that the air in confined spaces or other work areas is not hazardous.

Portable Air Blowers are used for ventilating manholes and other confined spaces before entering.

Self-Contained Breathing Apparatus or Hose Masks are used when atmospheres immediately hazardous to life or health must be entered.

Safety Harness is required where individuals are exposed to hazardous atmospheres; the only type that should be used is that consisting of a body belt with a buckle and a shoulder harness.

Warning Signs or Tags are required to be placed in strategic areas around dangerous or potentially dangerous areas; temporary tags should be attached to broken-down units to prevent start-up resulting in an injury.

Tools are required by OSHA standards that the management makes sure that proper tools in good repair are available at all times (even those tools owned by employees); non-sparking tools should be available and used in required areas.
Fire Extinguishers are required to place fire extinguishers approved by the Underwriter's Laboratories in areas of possible fire hazards.

Medical Aid is required by OSHA standards that the employer must ensure the availability of medical personnel; if there are no medical facilities in the nearby area, some employees trained in first aid should be available, as should a first aid kit.

Gas Detection Meter is used to prevent injury by the detection of explosive and toxic gases before removal of manhole covers.

# APPENDIX A:

# PUMP STATION LIST OF EQUIPMENT

# Pump Station No. 38 - Central Underpass Equipment List

| Equipment Number | Description | Manufacturer | Model Number | Serial Number | Size, Capacity | Local Source for Parts and Service |
|---|---|---|---|---|---|---|
| | Control panel | | | | | Yukon & Assoc.;Albuquerque, NM |
| | Interface control panel | Red Lion | G308A230 | | | Yukon & Assoc.;Albuquerque, NM |
| | Lighting control panel | | | | | Yukon & Assoc.;Albuquerque, NM |
| CV53801 | Lift Pump 1 Check Valve | VAL-MATIC | | | 6 IN | Pipestone Equipment; Golden, CO |
| CV53802 | Lift Pump 2 Check Valve | VAL-MATIC | | | 6 IN | Pipestone Equipment; Golden, CO |
| CV53803 | Lift Pump 3 Check Valve | VAL-MATIC | | | 6 IN | Pipestone Equipment; Golden, CO |
| | Motor Control Center | | | | | Yukon & Assoc.;Albuquerque, NM |
| | Lift Pump 1 Reduced Voltage Starter | SQUARE D | TVS1EMA12 | | | Yukon & Assoc.;Albuquerque, NM |
| | Lift Pump 2 Reduced Voltage Starter | SQUARE D | TVS1EMA12 | | | Yukon & Assoc.;Albuquerque, NM |
| | Lift Pump 3 Reduced Voltage Starter | SQUARE D | TVS1EMA12 | | | Yukon & Assoc.;Albuquerque, NM |
| | Wet well level switch | FLYGT | ENM-10 | | | James, Cooke, and Hobson; Albuquerque, NM |
| | Wet well level switch | FLYGT | ENM-10 | | | James, Cooke, and Hobson; Albuquerque, NM |
| | Wet well level switch | FLYGT | ENM-10 | | | James, Cooke, and Hobson; Albuquerque, NM |
| | Wet well level switch | FLYGT | ENM-10 | | | James, Cooke, and Hobson; Albuquerque, NM |
| | Wet well level switch | FLYGT | ENM-10 | | | James, Cooke, and Hobson; Albuquerque, NM |
| P53801 | Lift Pump 1 | FLYGT | NP 3153/436 | 3153.095-1670017 | 15 HP, 6 IN | James, Cooke, and Hobson; Albuquerque, NM |
| P53802 | Lift Pump 2 | FLYGT | NP 3153/436 | 3153.095-1670018 | 15 HP, 6 IN | James, Cooke, and Hobson; Albuquerque, NM |
| P53803 | Lift Pump 3 | FLYGT | NP 3153/436 | 3153.095-1670019 | 15 HP, 6 IN | James, Cooke, and Hobson; Albuquerque, NM |
| | Telemetry system | MOTOROLA | | | | Yukon & Assoc.;Albuquerque, NM |
| V53801 | Lift Pump 1 Plug Isolation Valve | VAL-MATIC | | | 6 IN | Pipestone Equipment; Golden, CO |
| V53802 | Lift Pump 2 Plug Isolation Valve | VAL-MATIC | | | 6 IN | Pipestone Equipment; Golden, CO |
| V53803 | Lift Pump 3 Plug Isolation Valve | VAL-MATIC | | | 6 IN | Pipestone Equipment; Golden, CO |
| | Intrusion Alarm | | | | | |
| | Lift Pump 1 Check Valve Position Switch | VAL-MATIC | | | | Pipestone Equipment; Golden, CO |
| | Lift Pump 2 Check Valve Position Switch | VAL-MATIC | | | | Pipestone Equipment; Golden, CO |
| | Lift Pump 3 Check Valve Position Switch | VAL-MATIC | | | | Pipestone Equipment; Golden, CO |

# APPENDIX B:

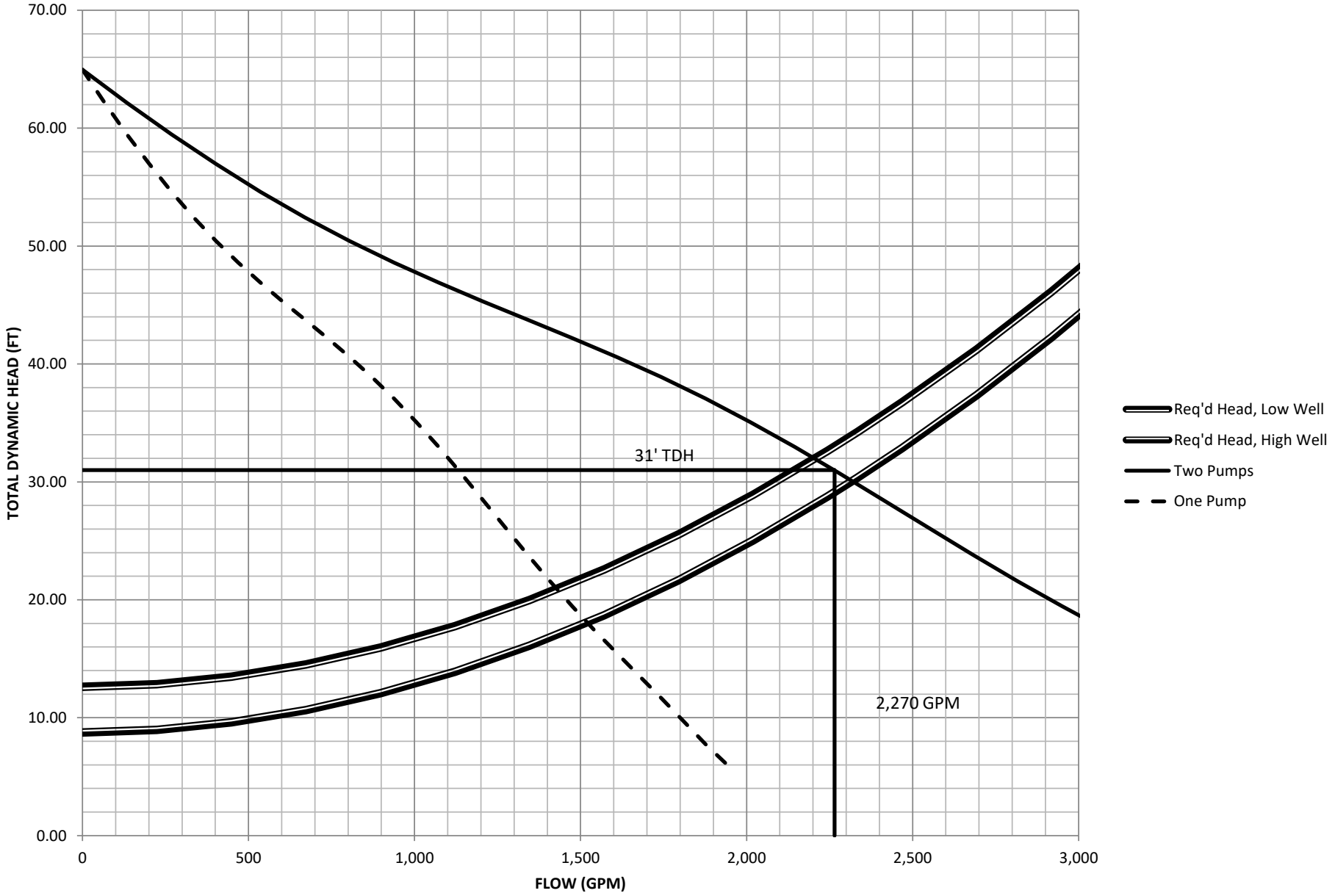
# NOT USED

# APPENDIX C:

# MANUFACTURER'S LIFT PUMP CURVE AND GENERAL INFORMATION

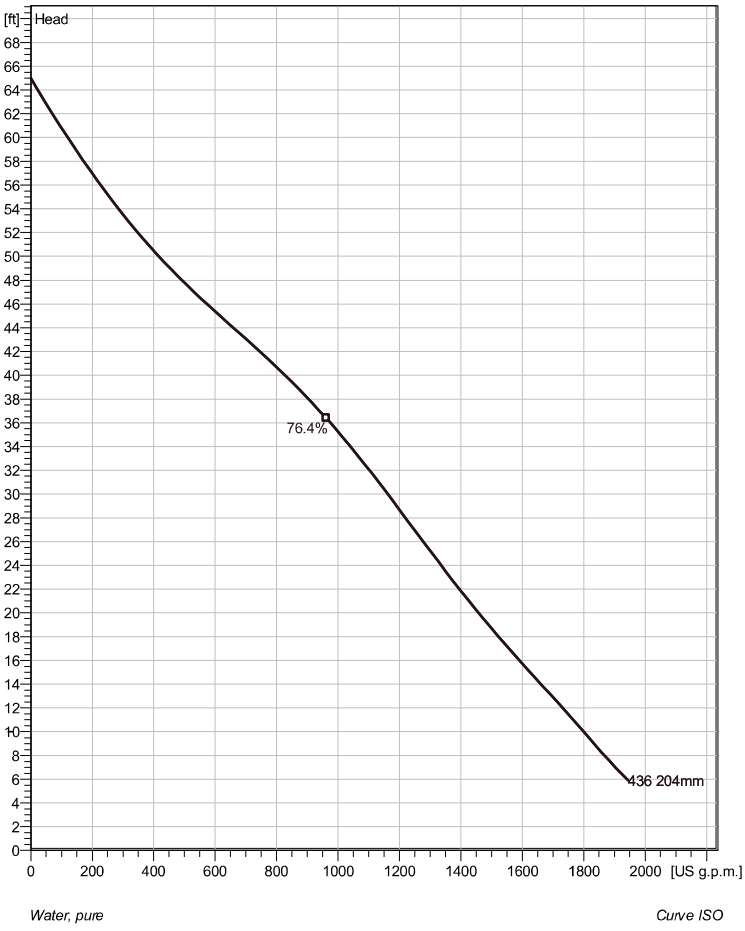
# SWPS 38 - CENTRAL UNDERPASS, SYSTEM HEAD CURVE

TRIPLEX STATION WITH TWO DUTY PUMPS IN OPERATION, 12" DIP FORCE MAIN



# NP 3153 MT 3~ 436

## Technical specification




*Water, pure* *Curve ISO*


*Note: Picture might not correspond to the current configuration.*

### General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

### Impeller

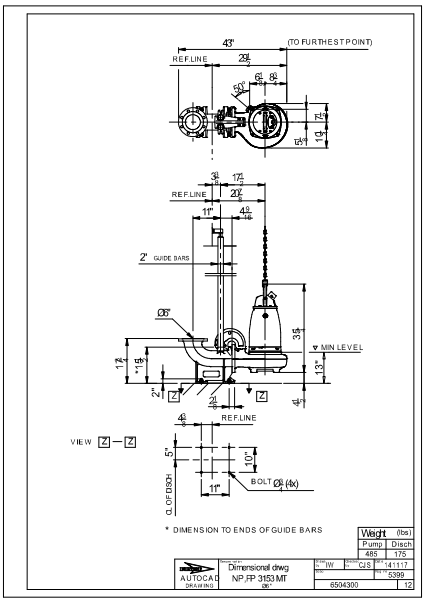
| | |
|---|---|
| Impeller material | Hard-Iron ™ |
| Discharge Flange Diameter | 5 7/8 inch |
| Inlet diameter | 5 7/8 inch |
| Impeller diameter | 204 mm |
| Number of blades | 2 |

### Motor

| | |
|---|---|
| Motor # | N3153.095 21-15-4AA-W 15hp |
| Approval | FM |
| Stator variant | 5 |
| Frequency | 60 Hz |
| Rated voltage | 460 V |
| Number of poles | 4 |
| Phases | 3~ |
| Rated power | 15 hp |
| Rated current | 19 A |
| Starting current | 114 A |
| Rated speed | 1755 rpm |
| Power factor | |
| 1/1 Load | 0.82 |
| 3/4 Load | 0.77 |
| 1/2 Load | 0.65 |
| Motor efficiency | |
| 1/1 Load | 87.5 % |
| 3/4 Load | 88.5 % |
| 1/2 Load | 88.0 % |

### Configuration

**Installation: P - Semi permanent, Wet**

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|---|---|---|---|---|
| | | | 2017-02-19 | |

# NP 3153 MT 3~ 436

## Performance curve

### Pump

| | |
|---|---|
| Discharge Flange Diameter | 5 7/8 inch |
| Inlet diameter | 150 mm |
| Impeller diameter | $8^{1}/_{16}$" |
| Number of blades | 2 |

### Motor

| | |
|---|---|
| Motor # | N3153.095 21-15-4AA-W 15hp |
| Approval | FM |
| Stator variant | 5 |
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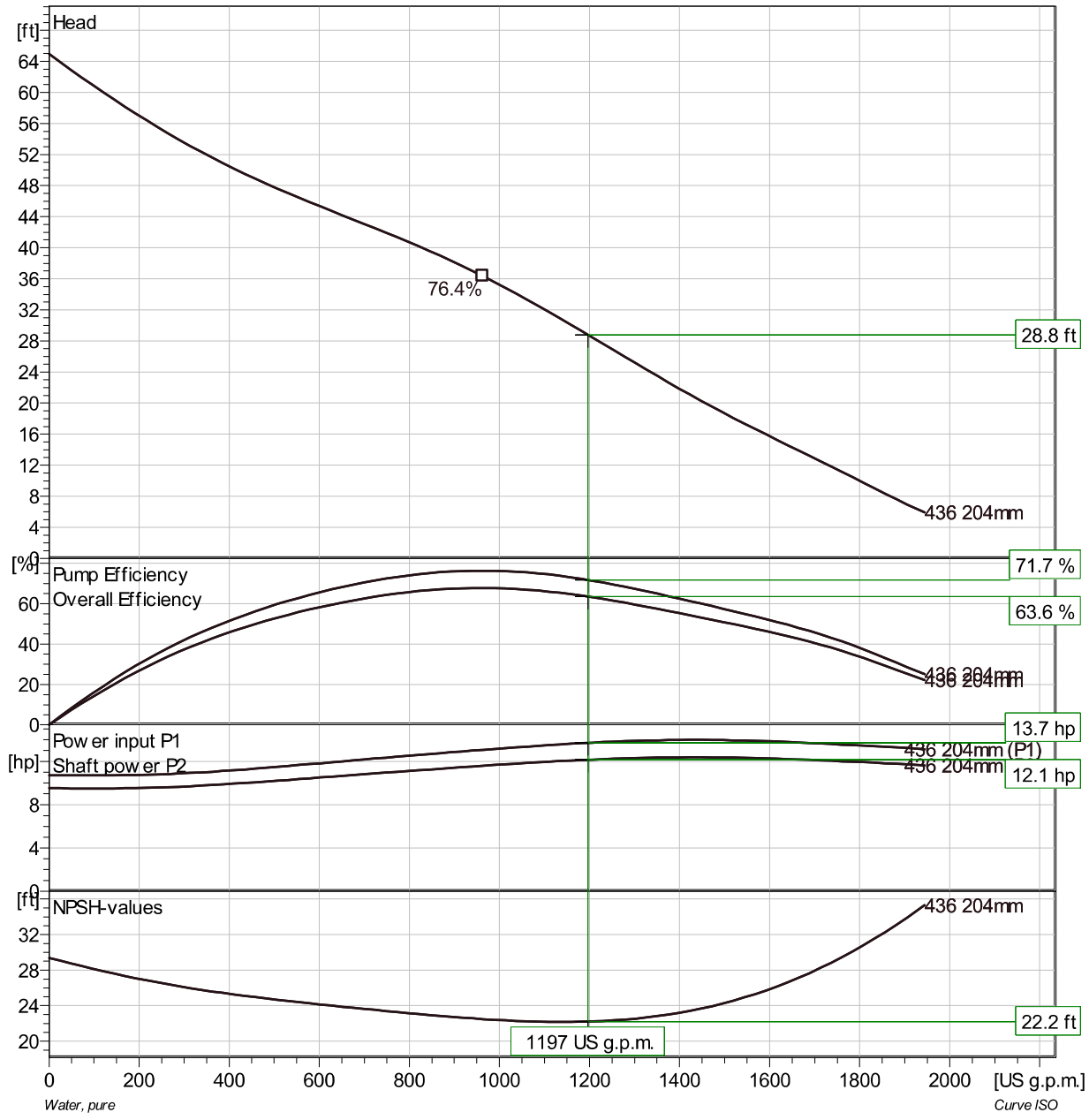


| Duty point | | Guarantee |
|---|---|---|
| Flow | Head | ISO_9906_Grade3Grade |
| 1170 US g.p.m. | 28 ft | No |

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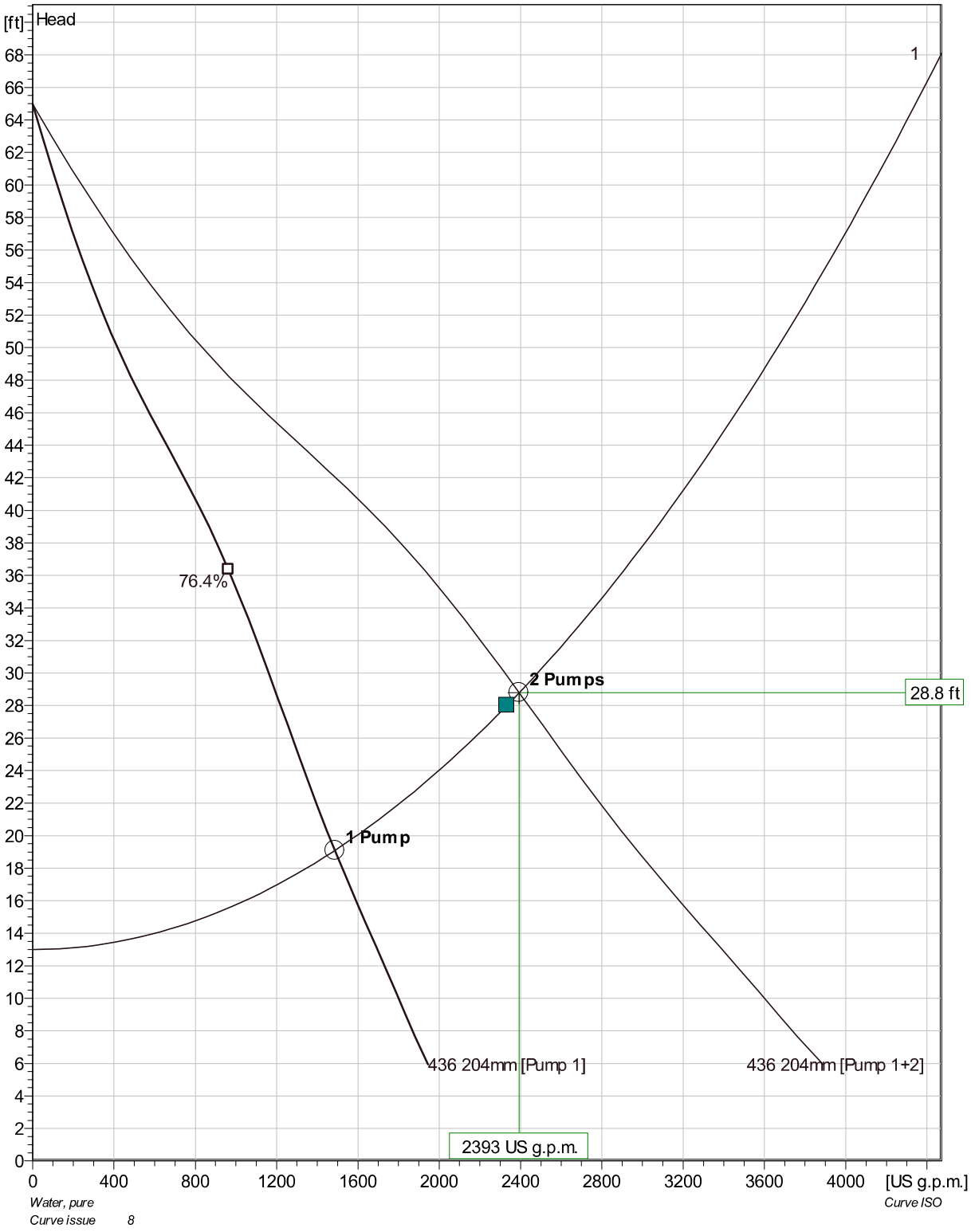
# NP 3153 MT 3~ 436

## Duty Analysis




| Pumps running /System | Individual pump Flow | Head | Shaft power | Total Flow | Head | Shaft power | Pump eff. | Specific energy | NPSHre |
|---|---|---|---|---|---|---|---|---|---|
| 2 / 1 | 1200 US g.p.m. | 28.8 ft | 12.1 hp | 2390 US g.p.m. | 28.8 ft | 24.3 hp | 71.7 % | 142 kWh/US MG | 22.2 ft |
| 1 / 1 | 1490 US g.p.m. | 19.1 ft | 12.4 hp | 1490 US g.p.m. | 19.1 ft | 12.4 hp | 58 % | 116 kWh/US MG | 24.1 ft |

| Project | Project ID | Created by | Created on | Last update |
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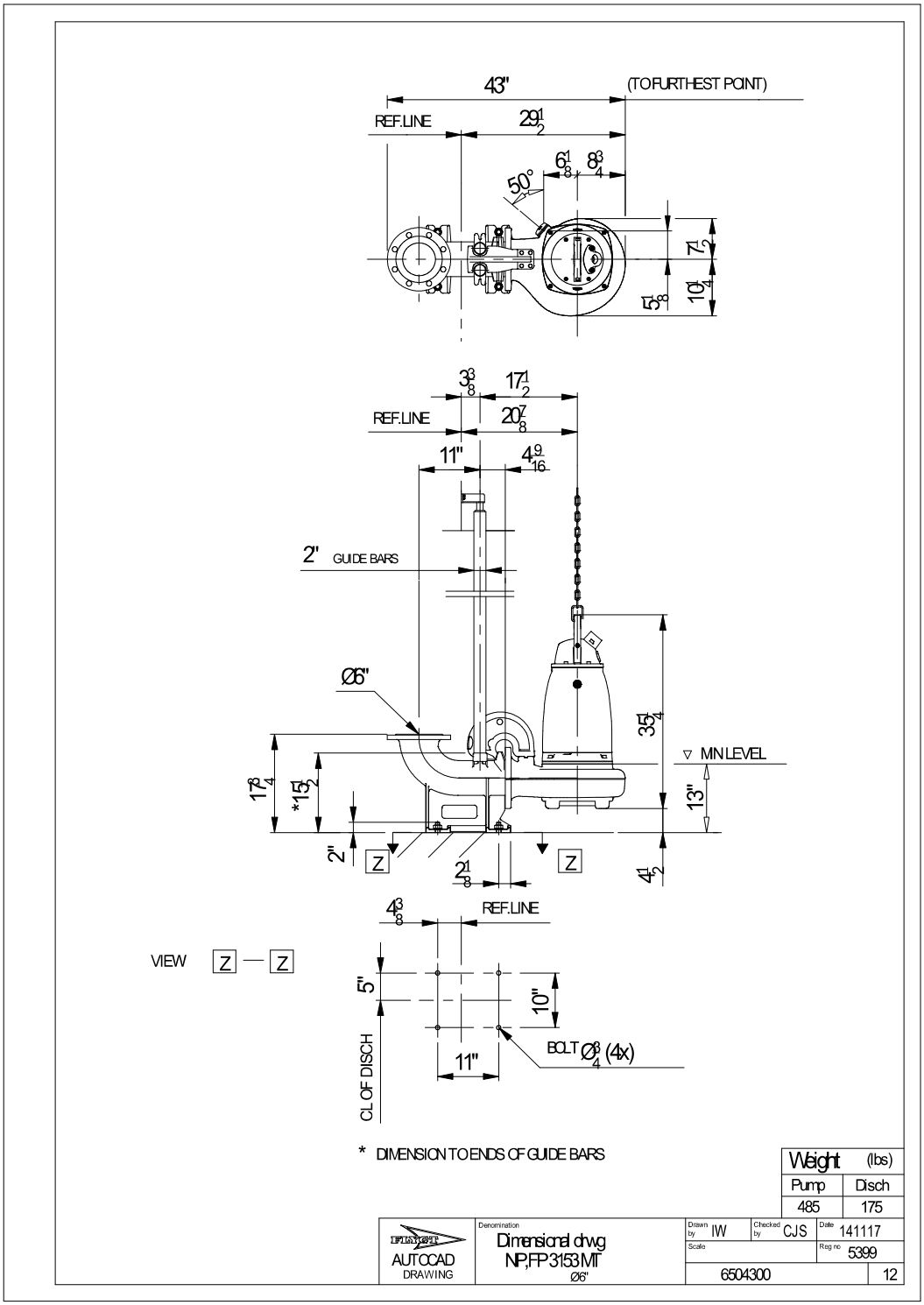
| | | | 2017-02-19 | |

# NP 3153 MT 3~ 436

## Dimensional drawing

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| | | | 2017-02-19 | |

ITT
Water & Wastewater

# ~~FP~~/NP-3153

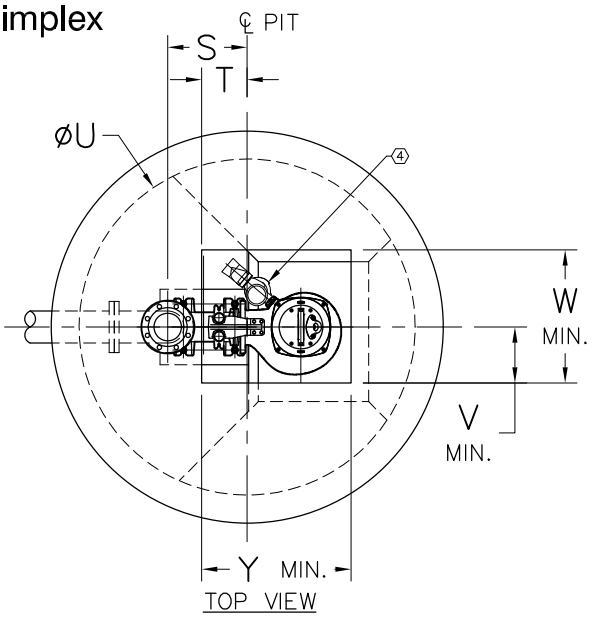
## Lift Station Dimensions

Issued: 2/09 | Supersedes: 2/08

NOTES:

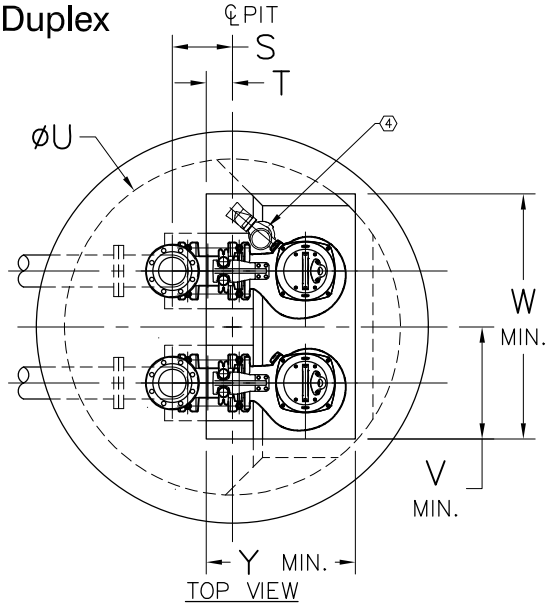
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. ITT FLYGT MIX–FLUSH VALVE.

Simplex

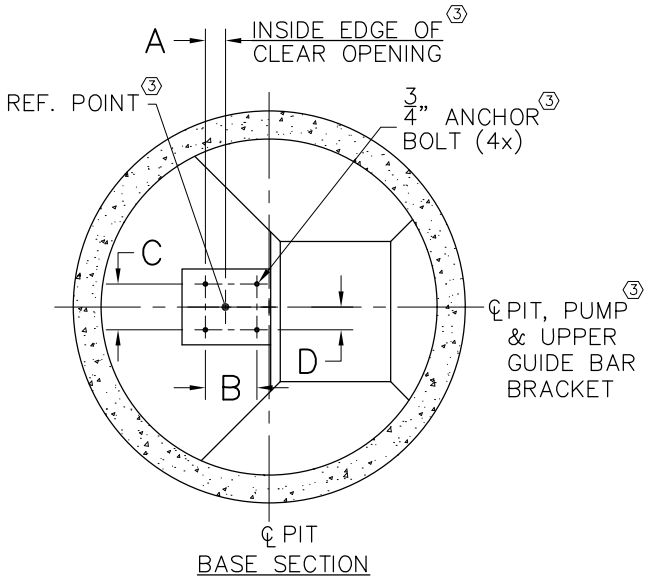



TOP VIEW

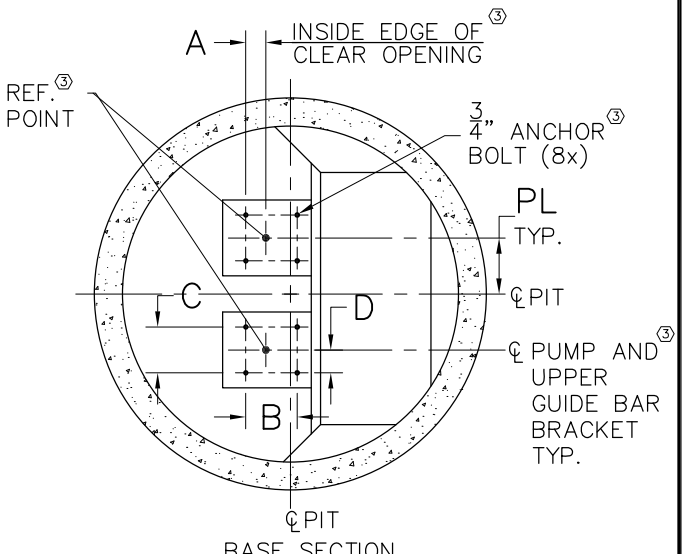
Duplex




TOP VIEW




BASE SECTION



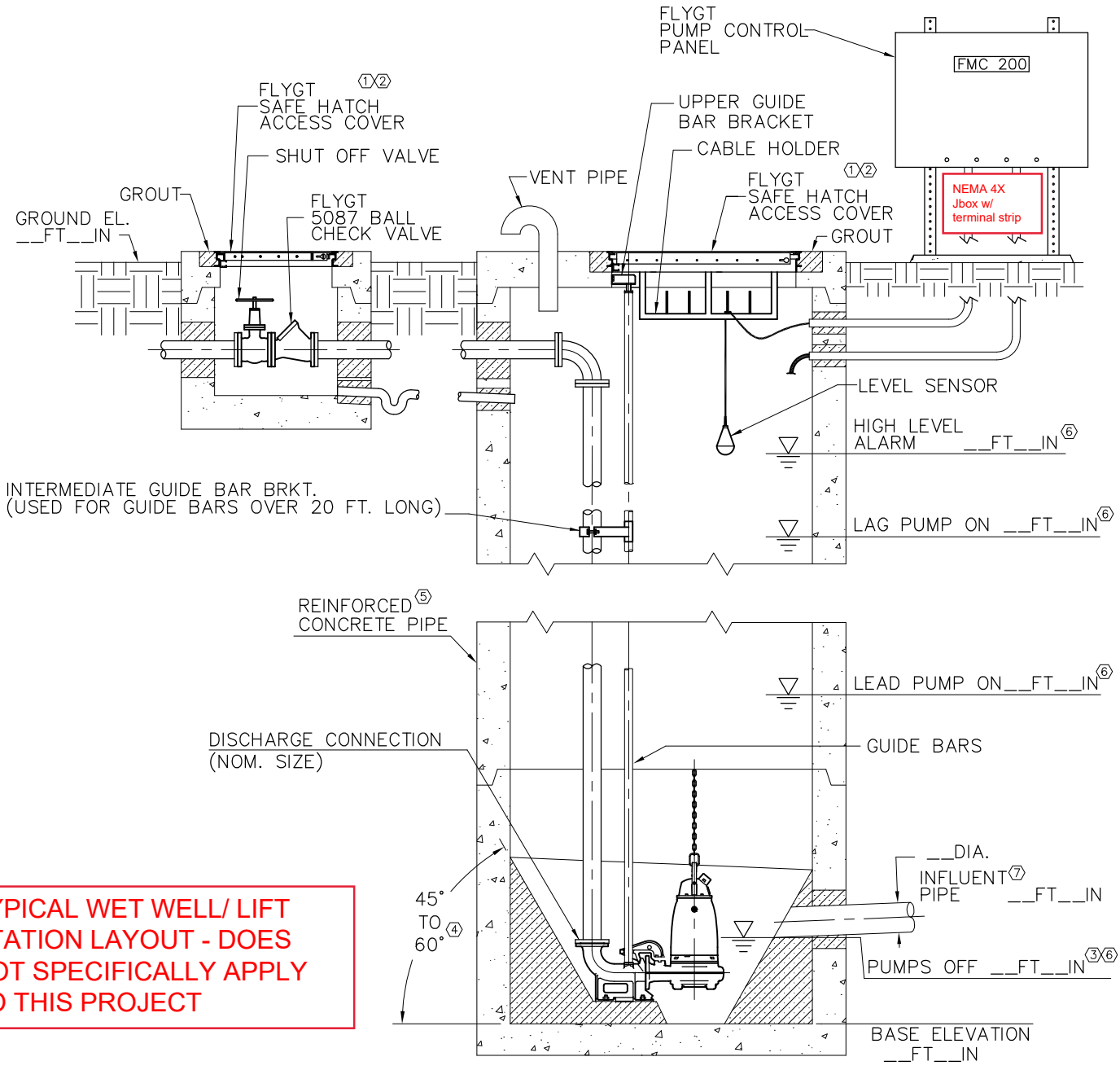

BASE SECTION

ALL DIMENSIONS ARE IN INCHES

| MODEL | NOM. SIZE | VERSION | SIMPLEX | | | | | | | | | | DUPLEX | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | S | T | U | V | W | Y | S | T | U | PL | V | W | Y |
| FP/NP | 3" | SH | 2½ | 9⅞ | 8 | 4 | 21¼ | 15¼ | 72 | 9 | 27 | 29½ | 18⅜ | 12⅜ | 72 | 11 | 20 | 49 | 29½ |
| FP/NP | 4" | SH | 2¾ | 9⅞ | 8 | 4 | 19¾ | 13¼ | 72 | 9 | 27 | 29½ | 16½ | 10 | 72 | 11 | 20 | 49 | 29½ |
| ~~FP/NP~~ | ~~4"~~ | ~~HT~~ | ~~2¾~~ | ~~9⅞~~ | ~~8~~ | ~~4~~ | ~~19¾~~ | ~~13¼~~ | ~~72~~ | ~~11~~ | ~~27½~~ | ~~30½~~ | ~~16½~~ | ~~10~~ | ~~72~~ | ~~11~~ | ~~22~~ | ~~49½~~ | ~~30½~~ |
| NP | 6" | MT | 4⅜ | 11 | 10 | 5 | 17⅜ | 9¾ | 72 | 12 | 28½ | 32 | 12⅞ | 5¼ | 72 | 12 | 24 | 52½ | 32 |
| ~~NP~~ | ~~8"~~ | ~~LT~~ | ~~5½~~ | ~~11~~ | ~~10~~ | ~~5~~ | ~~14¼~~ | ~~5⅜~~ | ~~72~~ | ~~14~~ | ~~30½~~ | ~~35~~ | ~~16½~~ | ~~7⅝~~ | ~~84~~ | ~~13~~ | ~~27~~ | ~~56½~~ | ~~35~~ |
| NP | 10" | LT | 14⅛ | 19¾ | 10 | 5 | 23¾ | 13 | 96 | 16½ | 35½ | 40 | 16¾ | 6 | 96 | 18 | 34½ | 71½ | 40 |

682020B

# Generic Duplex Lift Station Layout




TYPICAL WET WELL/ LIFT STATION LAYOUT - DOES NOT SPECIFICALLY APPLY TO THIS PROJECT

## NOTES:

1. COVER SHOWN IS A STANDARD DUTY SAFE HATCH WITH ANGLE FRAME. FOR DIMENSIONS ON ACCESS COVERS WITH SAFE HATCH OR WITHOUT SAFE HATCH AS WELL AS HEAVY DUTY OR OTHER TYPES, CONSULT FLYGT ENGINEERING.
2. INSTALL ACCESS COVERS PER MANUFACTURER'S INSTRUCTIONS.
3. MIN. LIQUID LEVEL MUST NOT FALL BELOW TOP OF VOLUTE.
4. 60° RECOMMENDED.
5. OTHER MATERIALS AVAILABLE. CONSULT FLYGT ENGINEERING.
6. FLYGT LIQUID LEVEL CONTROL MONITORING SYSTEM.
7. GOOD DESIGN PRACTICE DICTATES THAT INFLUENT PIPE ELEVATIONS HIGHER THAN LWL SHOULD BE AVOIDED DUE TO RISK OF AIR ENTRAINMENT, UNLESS SPECIAL ARRANGEMENTS ARE MADE.

Note: This submittal was provided by the pump supplier before the Engineer was notified of the change in station numbering from. 27 to 38 and still refers to the lift station as "Station 27". This submittal is representative of the equipment installed at Stormwater Pump Station No. 38.

**ABCWUA Lift Station 27 (Storm Water, Central and First Street)**
**NP3153.095 Specification**

**REQUIREMENTS**
Furnish and install Three (3) FM rated explosion proof submersible non-clog wastewater pumps. Each pump shall be equipped with a 15 HP submersible electric motor, connected for operation on 460 volts, 3 phase, 60 hertz service, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval.

**PUMP DESIGN CONFIGURATION (Wet pit installation)**
The pump shall be supplied with a mating cast iron 6 inch discharge connection and be capable of delivering 1,490 GPM at 19 FT. TDH. The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with 20 feet of stainless steel lifting chain. The working load of the lifting system shall be 50% greater than the pump unit weight.

**PUMP CONSTRUCTION**
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

**COOLING SYSTEM**
Each unit shall be provided with an integral motor cooling system. A stainless steel motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

**CABLE ENTRY SEAL**
The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal.

**MOTOR**
The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.
The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

**BEARINGS**
The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two row angular contact ball bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum $L_{10}$ bearing life shall be 50,000 hours at any usable portion of the pump curve.

**MECHANICAL SEALS**
Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant

expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

**Seal lubricant shall be non-hazardous.**

**PUMP SHAFT**
The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

**IMPELLER**
The impeller shall be of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

**VOLUTE / SUCTION COVER**
The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

**PROTECTION**
Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

# N-3153

## Materials of Construction

| Components | Cast Iron Pump |
|---|---|
| **Major Castings:** | Cast iron, A48, Class 35B |
| **Pump Lifting Handle:** | Stainless steel |
| **Motor Cable:** | Chloroprene rubber jacketed |
| **Cable Entry Grommets:** | Nitrile rubber |
| **Shaft:** | Stainless steel<br>ASTM A479 S43100-T |
| **Impeller:** | Hard Iron™ (25 ASTM A-532 (Alloy III A)<br>25% chrome cast iron) |
| **Insert Ring** | Hard Iron™ (25 ASTM A-532 (Alloy III A)<br>25% chrome cast iron) |
| **O-Rings:** | Nitrile rubber |
| **Lubricant Plug** | 316 Stainless steel |
| **Screws, studs and nuts** | 316 Stainless steel |
| **Inner Mechanical Shaft Seal:** | *Tungsten carbide/<br>*Tungsten carbide |
| **Outer Mechanical Shaft Seal:** | *Tungsten carbide/<br>*Tungsten carbide |

*All corrosion and abrasion resistant

# APPENDIX D:

# NOT USED

# APPENDIX E:

# ABCWUA
# LOCKOUT / TAGOUT (LOTO)

Albuquerque Bernalillo County
Water Utility Authority

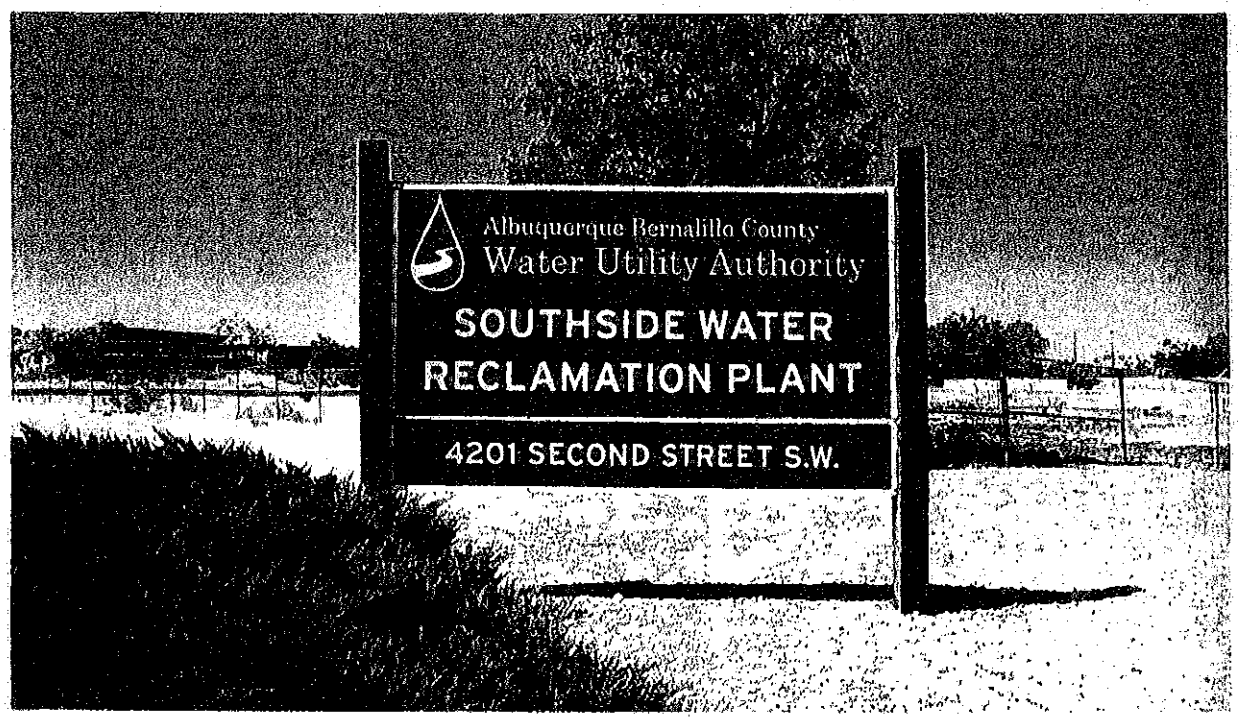
# Southside Water Reclamation Plant

***Program for the***

# Control of Hazardous Energy (Lockout/Tagout)

**Based on**

**OSHA 29 CFR PART 1910.147**



# The Control of Hazardous Energy (Lockout/Tagout) Program

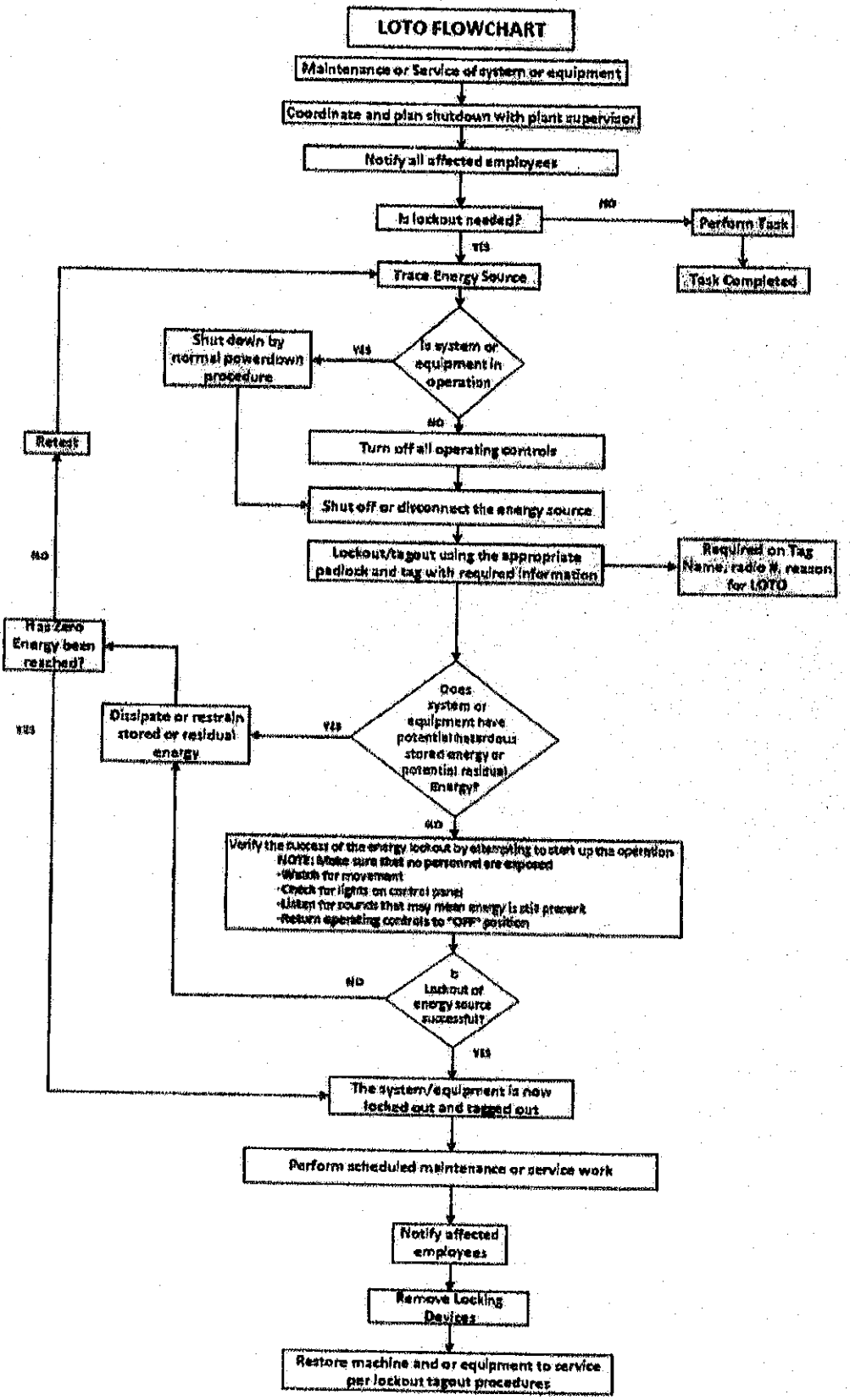
## Table of Contents

# Lockout/Tagout

*Last Revised: March 2013*

REVIEWED/APPROVED

| Title/Name | Signature | DATE |
|---|---|---|
| **Chief Engineer**<br>Jeff Romanowski | | 3-28-13 |
| **Operations Superintendent**<br>Joey Nogales | | 3-29-13 |
| **Maintenance Superintendent**<br>Jeff Romero | | 4-1-13 |
| **SAF**<br>J. Frank Bailey | | 4-1-13 |
| **Safety Manager**<br>Mike Cummings | | 4/4/13 |


LOTO FLOWCHART
Maintenance or Service of system or equipment
Coordinate and plan shutdown with plant supervisor
Notify all affected employees
Is lockout needed?
NO
Perform Task
Task Completed
YES
Trace Energy Source
Is system or equipment in operation
YES
Shut down by normal powerdown procedure
NO
Turn off all operating controls
Shut off or disconnect the energy source
Lockout/tagout using the appropriate padlock and tag with required information
Required on Tag Name, radio #, reason for LOTO
Does system or equipment have potential hazardous stored energy or potential residual energy?
YES
Dissipate or restrain stored or residual energy
Has Zero Energy been reached?
NO
YES
Retest
NO
Verify the success of the energy lockout by attempting to start up the operation
NOTE: Make sure that no personnel are exposed
-Watch for movement
-Check for lights on control panel
-Listen for sounds that may mean energy is still present
-Return operating controls to "OFF" position
Is Lockout of energy source successful?
NO
YES
The system/equipment is now locked out and tagged out
Perform scheduled maintenance or service work
Notify affected employees
Remove Locking Devices
Restore machine and or equipment to service per lockout tagout procedures

## I. Introduction

The following "Lockout/Tagout" (LOTO) are the specific practices and procedures of the Albuquerque Bernalillo County Water Utility Authority (ABCWUA, hereafter referred to as Water Authority) Southside Water Reclamation Plant (SWRP) requirements to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of any stored hazardous energy during service or maintenance activities. This stored energy could be electrical, hydraulic, mechanical or any other source that may cause unexpected movement. This requires that a designated individual turns off, disconnects, disengages or blocks the machinery or equipment from its energy source(s) before performing service or maintenance.

All employees are required to follow the procedures outlined in this program.

## II. Purpose

It is the policy of the SWRP for all employees working at this facility to follow all these established and effective lockout/tagout practices and procedures to ensure the safety of Water Authority employees.

## III. Program Management Responsibilites

**(A) Management (Chief Engineer):**

**(1)** Responsible for providing the tools and resources necessary to implement this program and for ensuring that the provisions in this program are being followed by the Program Administrator.

**(2)** Developing specific lockout procedures for each individual piece of machinery/equipment at the facility. The Administrator will involve the maintenance staff, electricians, and employees operating the machinery/equipment in the development of the procedures to ensure all energy sources are identified.

**(3)** Identifying employee classifications – "Authorized" and Affected".

**(B) Program Administrator (Safety Manager):**

**(1)** Review program at least annually, or more frequently if changes are needed or new equipment is aquired.

**(2)** Identifying the proper personal protective equipment (PPE) needed, if any, during the LOTO procedures.

**(3)** Providing appropriate level of safety training to employees based on their classification.

**(4)** Providing outside contractors working at the SWRP with training and information on the SWRP Lockout/Tagout Program and procedures.

**(C) Superintendents and Supervisors:**

**(1)** Ensuring that only Authorized Employees who are qualified and trained apply and remove locks and tags.

**(2)** Ensuring that employees who are found to have insufficient skills or understanding of LOTO requirements do not perform LOTO and receive retraining before conducting any lockout/tagout procedures.

**(3)** Ensuring employees comply with all elements described in this program.

(4) Providing any information necessary for the continued functioning or updating of this program.
(5) Implement disciplinary procedures for employees deviating from the LOTO procedure.

**(D) Employee Classification:**

**(1) "Authorized" Employees:** Employees who are trained on the dangers of exposure to hazardous energy and are authorized (and trained) to perform de-energization of this hazardous energy. Employess are also trained to perform proper lock and tag out on a machine or piece of equipment in order to conduct servicing or maintenance on that machine, tool or piece of equipment under this program.

Duties of an "Authorized" employee include:

(a) Completing all training required to be authorized to perform lockout/tagout procedures on specific equipment, tool(s) or machinery under this program.
(b) Performing lockout/tagout activities which are in conformance with this program.
(c) Retaining control of the equipment, system or machinery while a lockout/tagout is in progress and works only under their own lock and tag.
(d) Maintaining lockout/tagout hardware and tags in good condition.
(e) Notifications of staff.

**(2) "Affected" Employees.** All employees whose job requires them to operate or use a machine or piece of equipment on which servicing or maintenance activities are being performed under LOTO, or whose job requires them to be in an area in which LOTO is being used, are considered "Affected" employees. They are not authorized to implement lockout/tagout procedures.

## IV. Training and Communication

**(A) Authorized Employees and their Supervisors**

(1) The SWRP has developed and will provide LOTO training on the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, the methods and means available for energy isolation and control, and removal of energy-control devices. Equipment-specific training will be accomplished by presenting applicable written procedures to Authorized Employees, verifying that they understand the requirements of the procedure and observing correct performance of the lockout/tagout procedure(s). Reference SOJP's, SMJP's, and O&M manuals. Employees shall be trained on all individual lockout devices.

**(B) Affected Employees**

(1) Affected Employees working in areas where lockout/tagout may be used will be trained in the purpose of the lockout/tagout program, identification of locks and tags and restrictions these impose on equipment operation.
(2) Affected Employees must be retrained if a significant OSHA regulation or SWRP lockout/tagout guideline change has been made (i.e., new requirement, change in locks or tags).
(3) Affected Employee retraining can be delivered through awareness campaigns. Other Employees will be trained on the procedure and instructed never to attempt to restart or reenergize a machine that has been locked out or tagged out.

**(C) Retraining of Authorized and Affected Employees**

Retraining is required if:

**(1)** There is a change in task assignment that involves use of different LOTO procedures for which the Authorized Employee has not been previously trained.

**(2)** There is a change in the machine, equipment or processes that presents new hazards.

**(3)** There is a change in the energy-control procedures.

**(4)** The Supervisor has reason to believe, or determines through a periodic inspection or observation, that an Authorized or Affected Employee is performing the energy-control procedures inadequately or has deviated from or lacks sufficient knowledge of established procedures.

**(D) Record retention**

**(1)** All training records, including employee names and training dates, will be maintained in the employee's personnel files, or in plant administrative safety files.

**(2)** Training records will be maintained indefinitely.

**(3)** Training will be certified using Attachment A (Authorized Personnel) or Attachment B (Affected and Other personnel). The certifications will be retained in the employee personnel files.

## V. Lockout/Tagout Control

LOTO devices are provided by the Water Authority. LOTO devices must be standardized as to color, size and shape. Each authorized person will have access to his/her individual lockout devices. Locks must be individually keyed. It shall be the responsibility of the employees performing the maintenance or repair to implement the lockout/tag out procedure before work begins. Supervisors are responsible for maintaining LOTO stations.

*Note:* LOTO procedures are the required method of isolating equipment. Tag out alone shall only be used when it is not possible to lock out the energy-isolating device and **shall not** be considered as an alternative method until all other options have been proven "Infeasible". When alternative methods are proven infeasible and only a tagout is used a safety watch, visual barriers, and danger or caution tape are required to be in place.

**(A) Short-term locks** are working-locks that are individually keyed in *red*, working locks are to be attached to energy isolation devices by each person in a work crew. Working locks are to be removed when maintenance is no longer being performed. Whenever a working lock is used, a "Danger - Do Not Operate" lock out tag shall be attached to the working lock. The lock out tag must also include the date that the lock is attached, a legible name and radio number of the person attaching the lock (see Appendix A).

**(B) Long-term locks** are color coded for operations and each maintenance group as shown in the table below:

| DEPARTMENT | COLOR |
|---|---|
| Electrical | White |
| Instrumentation | Yellow |
| Mechanical | Blue |
| Operations | Green |
| Operations (* construction coordination) | Black |

* Black padlocks are used by the Operations Superintendent or Assistant Operations Superintendent for new construction, contractor coordination and assistance requests.

## VI. TAG OUT REQUIREMENTS

Tags used in the LOTO program (Appendix A) will be constructed of a laminated material (so that the following information can be recorded/written with a "grease pencil"); this information will contain but not be limited to:

(1) Full name
(2) Date, radio number, and phone number if applicable
(3) Reason for the LOTO / description

These Tags will be standardized as described below:
When a long-term lock is used, an identification tag shall be attached to a lock. The identification tag must also include the date that the lock was attached, a legible name and radio number of the person attaching the lock, and a brief description of work. Long-term locks are common keyed per work group and controlled by work group supervisors.

A tag may be used when it is infeasible to, or may create an unsafe condition to use a lockout/tagout device, and such no other means of isolation is possible. This tag will need approval from the Superintendent.

Tags shall be attached in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "neutral" or "off" position is prohibited. Tags shall be attached using all environment-tolerant nylon tie-wraps. Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

Note: Other (caution or work order) tags are not part of the LOTO program, but is used for informational purposes. They are not intended for employee protection. This process is referred to as an "administrative control" and is not a part of the LOTO procedure.

## VII. ENERGY CONTROL PROCEDURE

(1) Coordinate and plan the shutdown of process equipment with the plant or field operations supervisor, as appropriate. Operations is primarily responsible for shut down, isolation, and lockout of plant process equipment. All personnel shall place their work group specific lock on the isolation device relevant to the equipment that they will be working on, along with a lock out tag.
*Note:* Planning and coordination must be done between the affected groups and all isolation points must be identified and addressed prior to the commencement of any work.
(2) Notify impacted employees that a lock out procedure is going to be utilized, and advise them of the machine or equipment that is involved.
(3) Isolate the equipment from all applicable energy sources using the isolation switches, breakers, valves or other energy isolating devices as appropriate.
*Example:* To change the drive belts on a HVAC system, isolate the voltage source. To perform maintenance on the heating cores, on a HVAC System, isolate the voltage source and the hot water supply and return lines. Bleed any stored thermal and hydraulic energy.

(4) Relieve stored energy associated with the equipment. Stored energy (such as that in springs, elevated machine members, hydraulic systems and air, gas, steam or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down pressure, etc. *Example:* To remove a hotsy after isolating all energy sources (voltage, gas and water supplies), allow the unit to cool, bleed off the water pressure, and after ensuring proper ventilation, vent off the gas pressure before proceeding to remove the equipment.
(5) LOTO the energy isolating device with an assigned padlock and attach a tag (Appendix A) to the lock.
(6) Verify that the equipment will not operate using normal operating controls.

## VIII. REMOVING THE LOTO FOR START-UP

(1) After the servicing and/or maintenance are complete, and equipment is ready for normal operation, check the area around the machine or equipment that is locked out. Ensure that no one is exposed to danger if the machine or equipment is energized.
(2) Check the machine or equipment to ensure that all tools have been removed from the machine or equipment and that any guards that were removed have been reinstalled.

CAUTION: Insure controls are in "neutral" or "off" position prior to start-up and testing of equipment. Follow applicable SOJP's when starting or testing equipment.

(3) Notify operations supervisor that the equipment is ready for testing or start-up. Plant Operations is responsible for the start-up of plant equipment by removing operations locks from energy isolating devices. Operate the energy isolating devices to restore energy to the machine or equipment. Test the operation of the machine or equipment that was locked out for proper operation.
(4) Notify shift supervisor and the control room operator that the machine or equipment is no longer locked out and available for service or appropriate equipment status.

## IX. DISCIPLINARY ACTION REQUIRED FOR VIOLATING LOTO PROCEDURES

The only person authorized to remove the LOTO devices is that person who installed the devices; therefore, unauthorized removal or by-passing the LOTO device procedure compromises the worker's safety. Any person who violates a LOTO procedure and energizes, starts or otherwise activates a machine or who removes a LOTO device without authorization shall be disciplined according to Water Authority policies and procedures. Disciplinary action shall be taken whether or not injury or damage occurs.

## X. PROCEDURES INVOLVING MORE THAN ONE PERSON

If more than one person is involved in the service or repair of a machine or equipment, each individual will place his/her personal LOTO device on all energy isolating devices. When an energy isolating device cannot accept multiple locks or tags, a multiple lockout device (a hasp) may be used.

If LOTO is used, a single lock may be used to lockout the machine or equipment, but the key to that lock must be placed in a lockout box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his/her LOTO protection, that person will remove his/her own lock from the lockout device or from the lockout box.

## XI. PROCEDURES INVOLVING MORE THAN ONE WORK GROUP

When a work group finishes its daily work, the work crew shall ensure that all tools are removed. Only that crews red lock out device and identification tag shall be removed from the energy isolating device associated with the machine or equipment. The technician/operator shall not remove his/her lock until all coworkers and affected personnel are notified and clear. If the equipment is ready for service, the last work crew to complete its work will assist operations in the complete procedure for removing the lock out devices and ensuring proper operation.

There may be occasions when a LOTO device must remain in place for more than one work shift or after other personnel changes. The procedure depends on whether or not employees on the incoming shift will be working on the locked out or tagged out equipment.

**(A)** Service or repair work will be continued by the new shift:
Employees leaving the work place will remove their locks and incoming employees will connect their locks under the direct observation of their supervisors. The supervisors for both shifts will be present for the transfer of the LOTO.

**(B)** Employees on other shifts will not be working on the machines:
The LOTO devices will remain in place and the incoming personnel will be notified that a LOTO is in affect. The supervisors of both shifts will be responsible for ensuring that the information is made available to the incoming personnel.

## XII. NON-ROUTINE REMOVAL OF A LOTO DEVICE

When the employee who applied the LOTO device is not available to remove it, the LOTO may be removed under the direction of the supervisor of the employee who applied the lock out device, or under the direction of the responsible superintendent. The rules for LOTO removal still apply. Moreover, the supervisor must:

**(1)** Verify that any Authorized Employee who applied lock(s) and associated tag(s) is not on duty and that their work is no longer in progress. All reasonable efforts will be made to contact the Authorized Employee(s) to discuss the planned removal of their lock(s) and determine if the Authorized Employee(s) have any safety concerns with removal of their lock(s).
**(2)** An Authorized Employee/Supervisor returns the equipment to service and notifies the Affected Employees that service or maintenance is completed and the equipment is ready for use.
**(3)** When the Authorized Employee(s) whose lock(s) were removed return to work, their Supervisor(s) will again notify them that their lock(s) and tag(s) were removed.

## XIII. HOT TAP OPERATIONS

Hot Tap Operations requires preapproval of the Chief Engineer. Work involving transmission and distribution systems for substances such as gas, steam, water or petroleum can be performed on pressurized pipeline systems if:
**(A)** The employer can demonstrate that the continuity of service is essential.
**(B)** Shutdown of the system is infeasible, and could lead to employees being exposed to other

hazards. In this case employees will need to follow established safe work procedures, developed for these operations.

**(C)** Special equipment is used that will provide effective protection for employees.

## XIV. AUDIT/INSPECTION OF THE LOTO PROCEDURE

All LOTO procedures will be reviewed at least **annually**. The procedure will be reviewed for adequacy and completeness by an Authorized Employee who does not regularly use the machine/equipment-specific lockout procedure or by the Safety Manager or his/her designee. If any deviations or inadequacies are identified, the Program Administrator will take all necessary steps to update the procedure. The annual inspection will include a review, between the Reviewer and each Authorized Employee of that machine/equipment, to determine if they understand their responsibilities under that procedure. Annual inspections are documented with the information shown in **Attachment D**. This inspection record will be retained indefinitely.

## XV. PROCEDURES FOR OUTSIDE PERSONNEL/ CONTRACTORS

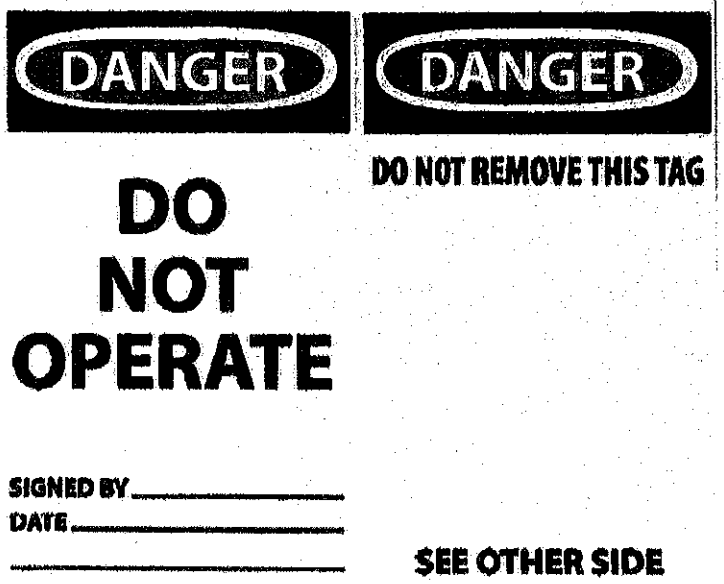
**(A)** Outside personnel/contractors shall be advised that the SWRP has and enforces the use of LOTO procedures. They will be informed of the use of locks and tags and notified about the prohibition of attempts to restart or re-energize machines or equipment that are locked out or tagged out.

**(B)** The company will obtain information from the outside personnel/contractor about their LOTO procedures and advise affected employees of this information.

**(C)** The outside personnel/contractor will be required to sign a certification form (see Attachment E). If outside personnel/contractor has previously signed a certification that is on file, additional signed certification is not necessary.

# APPENDIX A

**Lock Out Tag**



# ATTACHMENT A

**Certification of Training**
**(Authorized Personnel)**

I certify that I received training as an "Authorized Employee" under SWRP Lockout/Tagout program. I further certify that I understand the procedures and will abide by those procedures.

AUTHORIZED EMPLOYEE SIGNATURE

DATE

# ATTACHMENT B

**Certification of Training**
**(Affected Personnel)**

I certify that I received training as an Affected Employee under SWRP Lockout/Tagout Program. I further certify and understand that I am prohibited from attempting to restart or re-energize machines or equipment that are locked out or tagged out.

AUTHORIZED EMPLOYEE SIGNATURE _____ DATE _____

# ATTACHMENT C

**Lockout/Tagout Equipment Inspection Certification**

I certify that _____was inspected on this date utilizing lockout/tagout procedures. The inspection was performed while working on

_____.

_____ _____

AUTHORIZED EMPLOYEE SIGNATURE DATE

_____ _____

INSPECTOR SIGNATURE DATE

# ATTACHMENT D

**Annual Evaluation Report**

Date(s) of Evaluation _____

Evaluation was made by _____.
(PRINT)

General policy has been reviewed: YES____NO____

Comments on general policy:

The following specific procedures have been reviewed (list below):

Does the procedure comply with the SWRP program?

If a specific lockout/tagout were inspected in the field placed by the employee evaluated:

Location: _____

Equipment No.: _____

Equipment Name: _____ Serial No.: _____

Department who apply the Lockout/Tagout in the machine/equipment: _____

Does the machine/equipment have properly the LOTO? Yes____ No____

If not explain what need to be addressed and fix it:_____

# ATTACHMENT E

**Outside Personnel/Contractor Certification**

I certify that _____and _____ (outside personnel/contractor) have informed each other of our respective Lockout/Tagout procedures.

_____ _____

AUTHORIZED EMPLOYEE SIGNATURE DATE

_____ _____

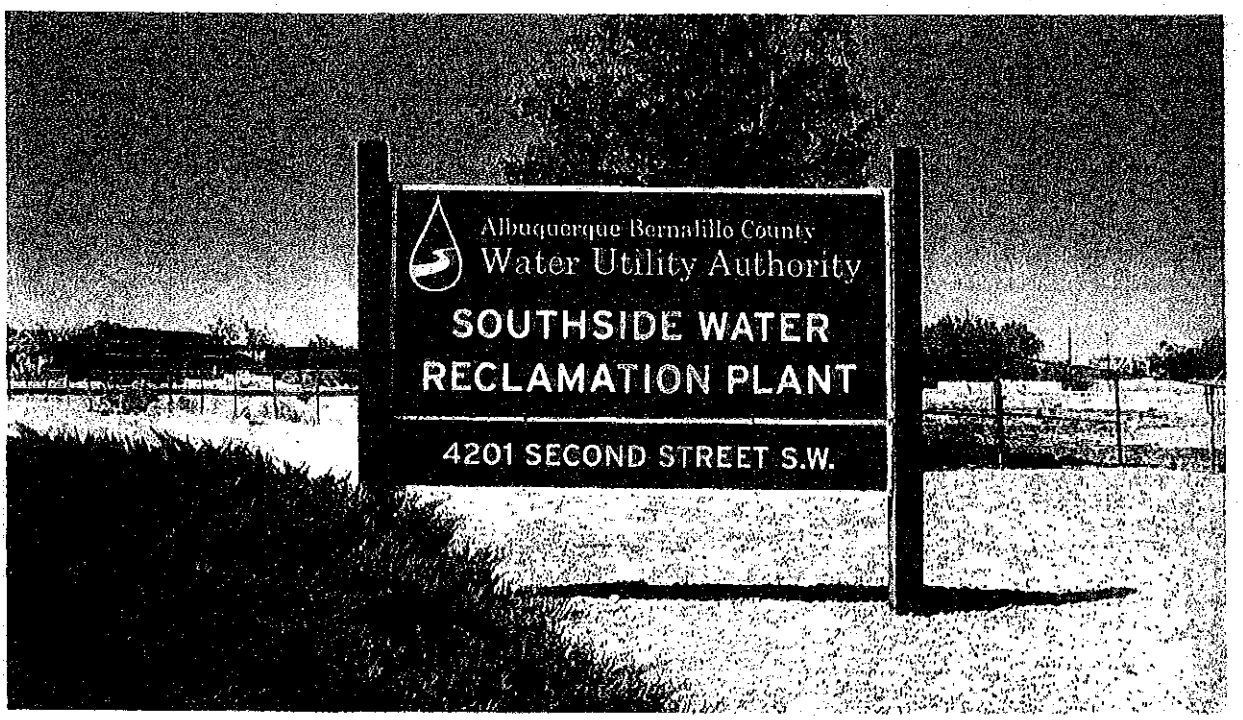
INSPECTOR SIGNATURE DATE

# APPENDIX F:

# ABCWUA
# CONFINED SPACE PROGRAM

Albuquerque Bernalillo County
Water Utility Authority

# Confined Space Program
# For
# Southside Water Reclamation Plant



Albuquerque Bernalillo County
Water Utility Authority

**Southside Water Reclamation Plant**

**Confined Space Program**

**Last Revised:** April 3, 2014

**REVIEWED/APPROVED**

**SAFETY SUPERVISOR:** _____

**SWRP CHIEF ENGINEER:** _____

**SWRP OPERATIONS SUPERINTENDENT:** _____

**SWRP MAINTENANCE SUPERINTENDENT:** _____

# TABLE OF CONTENTS

## CONFINED SPACE ENTRY PROCEDURES

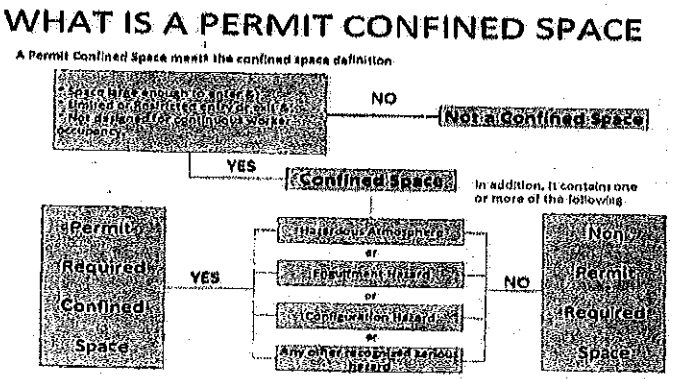
# ALBUQUERQUE BERNALILLO COUNTY WATER UTILITY AUTHORITY
# CONFINED SPACE ENTRY PROGRAM

## I. Description of our Water Authority Program

The purpose of this program is to set forth the requirements for practices and procedures to protect Water Authority employees and contractors from exposure and injury from the hazards of entering and performing work in confined spaces. The policies and procedures in this document are elements that make up the Water Authority's Permit Space Program. This program is intended to meet and exceed the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration's Confined Space Standard 29 CFR 1910.146.

## II. Scope

This program applies to all confined spaces owned by the Water Authority. This program also applies to all confined spaces that may be entered by Water Authority employees. Included in this program are the Southside Water Reclamation Plant, Surface Water Treatment Plant, Sanitary Lift Stations, Storm Water Lift Stations, Well Stations, Water Pump Stations, and Chemical Feed Stations.




## III. Requirements of the Water Authority

(1) In administering this Confined Space Entry Program the Chief Engineers and Safety Manager will:

(a) Monitor the effectiveness of the program;

(b) Provide training to affected employees and supervisors that is sufficient to impart necessary understanding, knowledge and skills;

(c) Certify that training has been accomplished. Certification must include employee's name, signature of trainer, dates of training;

(d) Provide atmospheric testing equipment as needed;

(e) Provide personal protective equipment as needed;

(f) Provide technical assistance as needed;

(g) Review and update the program on an annual basis or more often as needed.

(2) The Chief Engineers and Operation/Maintenance Superintendents are responsible for managing the Confined Space Entry Program in the Water Authority facilities and they will:

(a) Verify that all confined spaces at their facilities are properly labeled and maintained;
(b) Review all confined space entry permits for successful operation and perform "lessons learned" for any entry that experienced any problems or presented any condition that caused the permit to be canceled and the confined space to be evacuated;
(c) Maintain hard copies and electronic storage of all canceled/completed confined space entry permits. These canceled/completed permits will be kept for a minimum of 3 years;
(d) Require all employees who enter confined spaces to receive training which will make them both competent and qualified to perform confined space entry operations and establish employee proficiency in required duties;
(e) Verify that employees are provided all necessary confined space entry/rescue equipment, maintain that equipment properly, and ensure employees use that equipment properly;
(f) Perform monthly inspections of all related confined space entry equipment and verify all such equipment meets manufacturers' standards.

## IV. Safety Policies and Regulations

It is the safety policy of the Water Authority that a confined space:
(1) Is large enough and so configured that an employee can bodily enter to perform assigned work; and
(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
(3) Is not intended for continuous employee occupancy.

It is the safety policy of the Water Authority that a Permit-Required Confined Space means a confined space that has one or more of the following characteristics:
(1) Contains or has a potential to contain a hazardous atmosphere;
(2) Contains a material that has the potential for engulfing an entrant;
(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
(4) Contains any other recognized serious safety or health hazard.
Unauthorized entry into a permit-required confined space by Water Authority employees and contractors is forbidden and cause for disciplinary action.

Manpower and equipment shall be available during permit-required confined space entry to immediately and safely remove any disabled worker from the confined space. Assisted Self-Rescue is the approved procedure Water Authority employees will use to remove a disabled worker from a confined space.

Water Authority employees will perform Assisted Self-Rescue (ASR) vertical direct retrieval operations only. Horizontal confined space rescue is not allowed and will be contracted out to Rocco or some other confined space rescue service.

No Hot Work shall be conducted inside a confined space prior to completion of the appropriate Hot Work Permit.

Facial hair at the facepiece-to-face interface that may interfere with the operation of the full-face piece of the supplied air respirator shall not be permitted. This facial hair may include beards, sideburns, mustaches, long hair and or bangs.

Water Authority employees are required to consider all confined spaces as Permit-Required Confined

Spaces unless they can be reclassified as a Non-Permit Confined Space.

Multiple confined space entries are not to be monitored by a single attendant.

When the Water Authority arranges to have a contractor perform work that involves permit space entry, the Authority shall:
**(1)** Inform the contractor that the workplace contains permit-required confined spaces and that permit space entry is allowed only through compliance with the Water Authority permit space program;
**(2)** Apprise the contractor of the hazards identified and the Water Authority's experience to include but not limited to the presence of hydrogen sulfide ($H_2S$), carbon monoxide (CO), carbon dioxide (CO2), hydrogen chloride (HCL), and methane (CH4) gas in the space, that make the space in question a permit space;
**(3)** Apprise the contractor of any precautions or procedures that the Water Authority has implemented for the protection of employees in or near permit spaces where contractor personnel will be working;
**(4)** Coordinate entry operations with the contractor, when both Water Authority personnel and contractor personnel will be working in or near permit spaces;
**(5)** Meet and debrief the contractor at the conclusion of the entry operations regarding the Water Authority's permit space program regarding any hazards confronted or created in permit spaces during entry operations.

## CONFINED SPACE IDENTIFICATION

### V. Confined Space Identification

The Water Authority has implemented this written permit space program and it is available for inspection by employees and their authorized representatives. The Water Authority has evaluated the workplace and has determined that the workplace contains permit-required confined spaces. The permit spaces are posted with one or more of the following danger signs:

DANGER
PERMIT-REQUIRED CONFINED SPACE
AUTHORIZED ENTRY ONLY

DANGER
PERMIT-REQUIRED CONFINED SPACE
DO NOT ENTER

The Permit-Required Confined Spaces are also labeled with a number that identifies the confined space for identification and inventory purposes. The inventory label is PRCS followed by the confined space number, for example PRCS 365. This evaluation/inventory system will be used for annual review and to provide employees additional information about the confined space they will be working in. The Water Authority has evaluated the hazards of our permit spaces and the following procedures, practices, and acceptable entry conditions necessary for safe permit space entry operations are specified below.

### VI. Permit-Required Confined Space Entry Permit

The Water Authority's confined space entry permit documents compliance with the Water Authority's Permit Space Program and authorizes entry to a permit space. The confined space entry permit is the most essential tool for assuring employee safety during entry operations in permit-required confined spaces with known hazards, or with unknown or potentially hazardous atmospheres. The entry permit process guides the entry supervisor, attendant, and entrants through a systematic evaluation of the permit space to be entered. The entry permit will be used to establish acceptable conditions before each entry and verify that conditions in the confined space are acceptable throughout the duration of an authorized entry.

## VII. Permit-Required Confined Space Entry Procedures

(1) When entry into a permit-required confined space is necessary the Operations/Maintenance Superintendent from the appropriate section will select an entry supervisor, attendant, and entrant(s) to initiate the confined space entry procedures. An Operations/Maintenance Supervisor may also select the entry team.

(2) Prior to entry of the permit-required confined space, the entry supervisor, attendant, and entrant shall be responsible for the following:

(a) Completion of the confined space entry permit;
(b) Verify acceptable entry conditions in the confined space;
(c) Isolation of the permit space; establishing communication with the Control Room;
(d) Verifying the availability of the Assisted Self-Rescue service;
(e) Signature of the entry supervisor on the entry permit after its completion.

(3) Remove the entrance cover, hatch, or grating to the confined space to be entered. Any conditions making it unsafe to remove an entrance cover to the confined space shall be eliminated before the cover is removed. When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

(4) Before an employee enters the confined space, the internal atmosphere shall be tested, with a calibrated direct-reading gas detector, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order. Any entrant who enters the confined space shall be provided an opportunity to observe the pre-entry testing. The approved gas detectors for atmospheric testing are the RKI GX-2012, GX-2009 and GX-2001.

(5) Isolate the confined space from any potential hazards that may be encountered. This includes electrical hazards, mechanical hazards, Engulfment hazards, Entrapment hazards, and physical hazards. Make sure the proper isolation procedures are followed such as lock out/tag out, double block and bleed, blanked, blocked, chocked and disengaged. Document this isolation on the confined space entry permit. Employees are required to observe and assist with this isolating of the permit space.

(6) Ventilate the permit-required confined space with continuous forced air ventilation. The entry supervisor, attendant, and entrant shall be responsible for setting up the mechanical ventilation and it shall be used, as follows:

(a) An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;
(b) The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space;
(c) The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.

(7) Test the confined space for a hazardous atmosphere. The entry supervisor, attendant, and entrant shall continuously monitor the atmosphere within the confined space. The pre-entry atmospheric check shall be documented on the entry permit. The entrant must have a calibrated gas detector on

his/her body at all times during entry operations. The entry supervisor, attendant, or designee shall monitor the atmosphere within the permit space from outside the confined space using a calibrated gas detector with a sample draw pump and tubing. This atmospheric testing will ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. There may be no hazardous atmosphere within the space whenever any employee is inside the space.

**(8)** If a hazardous atmosphere is detected during entry;

**(a)** Each employee shall leave the space immediately;

**(b)** The space shall be evaluated to determine how the hazardous atmosphere developed;

**(c)** Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

**(9)** The entry supervisor, attendant, and entrant shall establish the communication procedures to be used by the authorized entrants and attendants to maintain contact during entry operations. The preferred communication procedures are visual and voice contact at all times; every effort should be made to maintain this type of contact between the attendant and entrant. Visual contact at all times and the Authority radio system are also acceptable communication procedures. Any other communication procedures necessary must be preapproved by the entry supervisor.

**(10)** The attendant shall establish contact with the Control Room and inform the control room operator that a permit-required confined space entry is taking place. Give the control room operator the location of the confined space, authorized attendant, authorized entrant, and the purpose of the entry in case an emergency arises and emergency medical services needs to be contacted. A copy of the entry permit may also be posted in the Control Room if it is going to be a prolonged entry. The confined space entry permit must be located at the confined space during all entry operations.

**(11)** The entry supervisor shall select an Authority Assisted Self-Rescue Team required for the permit-required confined space entry. The entry supervisor will select an Assisted Self-Rescue team leader and team members. This Assisted Self-Rescue team will be responsible for rescue procedures associated with the confined space entry. Log this information down on the entry permit.

**(12)** The entry team (entry supervisor, attendant and entrant) shall procure all required personal protective equipment required for the permit entry. Don all equipment properly and set up the DBI-SALA confined space entry/retrieval system required for Assisted Self-Rescue.

**(13)** The entry supervisor shall certify that the confined space is safe for entry and that the pre-entry measures required by the confined space entry permit have been taken. The entry supervisor will then sign the permit-required confined space entry permit and allow work to commence.

**(14)** The entry supervisor shall assign a person to take periodic atmospheric tests of the atmosphere inside the confined space during entry operations. If an attendant is assigned this task it cannot interfere with his attendant duties. The interval between atmospheric readings shall be every 15 minutes unless specified otherwise by the entry supervisor. The names or initials of the person conducting these tests and an indication of when the tests were performed must be noted on the entry permit.

**(15)** When the confined space entry is completed the entry supervisor will make sure the permit is cancelled and closed out; all equipment is returned to its proper location and the entrance cover is replaced to the confined space.

Water Utility Authority

## CONFINED SPACE ENTRY PERMIT

PERMIT VALID FOR 8 HOURS MAXIMUM ONLY. ALL COPIES OF PERMIT WILL REMAIN AT JOB SITE UNTIL JOB IS COMPLETED.
DATE: _____ PERMIT SPACE TO BE ENTERED: _____
PURPOSE OF ENTRY: _____
AUTHORIZED DURATION OF THE ENTRY PERMIT (Hours): _____
AUTHORIZED ENTRANTS (Full Name): _____, _____,
_____, _____.
AUTHORIZED ATTENDANTS (Full Name): _____, _____.
ENTRY SUPERVISOR (Full Name): _____
HAZARDS OF THE PERMIT SPACE TO BE ENTERED

| EMPLOYEES COULD BE EXPOSED TO THE FOLLOWING: | YES | NO | N/A | LIST |
|---|---|---|---|---|
| Engulfment/Entrapment | ( ) | ( ) | ( ) | _____ |
| Presence of toxic gases | ( ) | ( ) | ( ) | _____ |
| Presence of explosive/flammable gases | ( ) | ( ) | ( ) | _____ |
| Oxygen deficiency | ( ) | ( ) | ( ) | _____ |
| Bio-hazards | ( ) | ( ) | ( ) | _____ |
| Wet conditions, slip, trip, and fall hazards | ( ) | ( ) | ( ) | _____ |

Mitigation: _____

| ISOLATION OF THE PERMIT SPACE (Lock out/tag out devices specific to entry) | YES | NO | N/A | LIST & INITIAL ISOLATION |
|---|---|---|---|---|
| Electrical systems locked out and tagged out | ( ) | ( ) | ( ) | _____ |
| Mechanical systems (blocked, chocked, disengaged) | ( ) | ( ) | ( ) | _____ |
| Gas systems (blanked) locked out and tagged out | ( ) | ( ) | ( ) | _____ |
| Liquid systems (double block, bleed) locked out | ( ) | ( ) | ( ) | _____ |
| Secure area (Post, Flag, Barricade) | ( ) | ( ) | ( ) | _____ |

Mitigation _____

| VENTILATION MODIFICATION | YES | NO | N/A | MODEL & FLOW RATE |
|---|---|---|---|---|
| Mechanical | ( ) | ( ) | ( ) | _____ |
| Mechanical explosion proof | ( ) | ( ) | ( ) | _____ |
| Natural ventilation only | ( ) | ( ) | ( ) | |

ATMOSPHERIC CHECK AFTER ISOLATION AND VENTILATION
DATE: _____ TIME: _____ TESTER: _____ CALIBRATION DATE: _____
(Must be within 2 month period)
Percent Oxygen _____ % (Must be between 19.5% to 23.5%)
Explosive Gases _____ %LEL (Must be less than 10% LEL)
Toxic Gas (H2S) _____ PPM (Must be less than 5 PPM)
Toxic Gas (CO) _____ PPM (Must be less than 35 PPM)
Other (Specify) _____ PPM (Must be less than PEL)

| COMMUNICATION PROCEDURES | YES | NO | N/A | LIST |
|---|---|---|---|---|
| Authority Radio System or Cellular Phone | ( ) | ( ) | ( ) | _____ |
| Contact established with Control Room/Dispatch | ( ) | ( ) | ( ) | _____ |

**RECLASSIFICATION (NON-PERMIT CONFINED SPACE)**
If all hazards have been eliminated or mitigated, then this permit-required confined space can be reclassified as a non-permit confined space.

| All hazards mitigated: | YES | NO |
|---|---|---|
| | ( ) | ( ) |

Certification by: _____ Date: _____ Time: _____
(If "NO" continue with permit-required confined space procedures. If "YES" refer to WUA non-permit confined space procedures or OSHA 1910.146(C)(7) for further clarification on reclassifying a PRCS to non-permit confined space)

| ASSISTED SELF-RESCUE & EMERGENCY SERVICES | YES | NO | N/A |
|---|---|---|---|
| Authority Assisted Self-Rescue on Site | ( ) | ( ) | ( ) |
| 911 Emergency Medical Service Available | ( ) | ( ) | ( ) |

Authority Assisted Self-Rescue Team (Full Name): _____, _____
Assisted Self-Rescue Team Leader: _____
All confined space, CPR, and first aid certifications current? YES ( ) If not do not proceed

**PROTECTIVE CLOTHING AND EQUIPMENT IN ADDITION TO REGULAR HARD HAT, SAFETY SHOES AND SAFETY GLASSES**

| | YES | NO | N/A | LIST |
|---|---|---|---|---|
| Review MSDS, Post at Confined Space | ( ) | ( ) | ( ) | |
| Respiratory protection (Check one): ☐ SCBA ☐ Airline ☐ Cartridge type | ( ) | ( ) | ( ) | _____ |
| Eye protection (Check one): ☐ Chemical goggles ☐ Face shield ☐ Dust goggles | ( ) | ( ) | ( ) | _____ |
| Gloves (Check Type): ☐ Chemical ☐ Leather ☐ Other _____ | ( ) | ( ) | ( ) | _____ |
| Protective clothing (Check Type): ☐ Chemical suit ☐ Rubber apron ☐ Rubber boots | ( ) | ( ) | ( ) | _____ |
| Electrical shock protection ☐ Flash suit ☐ Rescue hook ☐ Hot stick | ( ) | ( ) | ( ) | _____ |
| Full body harness with lifeline, **(Mandatory)** | ( ) | ( ) | ( ) | _____ |
| Rescue davit & retrieval winch **(Mandatory)** | ( ) | ( ) | ( ) | |
| Hearing protection _____ | ( ) | ( ) | ( ) | |
| Fall protection _____ | ( ) | ( ) | ( ) | |
| Lighting (Explosive Proof) _____ | ( ) | ( ) | ( ) | |
| Hot work permit | ( ) | ( ) | ( ) | |
| Fire extinguishers _____ | ( ) | ( ) | ( ) | |
| First Aid kit | ( ) | ( ) | ( ) | |

I have reviewed the work authorized by this permit and the information contained here-in.
Permit Approved By:
ENTRY SUPERVISOR: _____
(Printed Name) (Signature)
Reviewed By: (Unit Superintendent) _____
(Printed Name) (Signature)
Reviewed By (Safety Manager) _____
(If Available #239-4122) (Printed Name) (Signature)

ATMOSPHERE TEST RESULTS, RECORD CONTINUOUS MONITORING RESULTS EVERY 15 MINUTES OR AS NECESSARY TO ENSURE PERMIT COMPLIANCE.
(Permissible safe limits for personnel are 19.5 - 23.5% Oxygen, less than TWA for toxics and less than 10% LEL.)
Instrument Model _____ Serial # _____ Date Calibration Performed? _____ Calibration Performed by Whom? _____

Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____
Tester_____ Time_____ Oxygen_____%, LEL._____%, H2S_____PPM, CO_____

**VIII. Duties of Authorized Entrants**

(1) Complete all required confined space training prior to entry operations.

(2) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure. Review the appropriate Material Safety Data Sheet (MSDS) for each chemical hazard that may be encountered;

(3) Properly use equipment as required by the Water Authority's permit-required confined space program. This equipment must be properly maintained and includes:

(a) Testing and monitoring equipment (RKI GX-2012, GX-2009 or GX-2001);
(b) Ventilating equipment needed to obtain acceptable entry conditions;
(c) Communications equipment;
(d) Personal protective equipment;
(e) Lighting equipment needed to work safely and to exit the space quickly in an emergency;
(f) Barriers and shields;
(g) Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;
(h) Rescue and emergency equipment;
(i) Any other equipment necessary for safe entry into and rescue from permit spaces.

(4) Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space as required by the permit-required confined space program.

(5) Alert the attendant whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation or the entrant detects a prohibited condition.

(6) Exit from the permit space as quickly as possible whenever:

(a) An order to evacuate is given by the attendant or the entry supervisor;
(b) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
(c) The entrant detects a prohibited condition; or
(d) An evacuation alarm is activated.

**IX. Duties of Attendants**

(1) Complete all required confined space training prior to entry operations.

(2) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure. Review the appropriate MSDS for each chemical hazard that may be encountered;

(3) Is aware of possible behavioral effects of hazard exposure in authorized entrants;

(4) Continuously maintain an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants accurately identifies who is in the permit space;

(5) Remain outside the permit space during entry operations until relieved by another attendant;

(6) Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the confined space;

(7) Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:

(a) If the attendant detects a prohibited condition;
(b) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;
(c) If the attendant detects a situation outside the space that could endanger the authorized entrants; or
(d) If the attendant cannot effectively and safely perform all the duties required;

(8) Activate assisted Self-Rescue Procedures or summon emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;

(9) Take the following actions when unauthorized persons approach or enter a permit space while entry is underway:

(a) Warn the unauthorized persons that they must stay away from the permit space;
(b) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and
(c) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;

(10) Perform non-entry rescue as specified by the Water Authority Assisted Self-Rescue procedures; and

(11) Perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

**X. Duties of Entry Supervisors**

(1) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure. Review the appropriate MSDS for each chemical hazard that may be encountered;

(2) Check that the appropriate entries have been made on the permit, all tests specified by the permit have been conducted and all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;

(3) Terminate the entry and cancel the permit when;

(a) The entry operations covered by the entry permit have been completed; or
(b) A condition that is not allowed under the entry permit arises in or near the permit space;

(4) Verify Authority Assisted Self-Rescue services are available and that the means for summoning them are operable;

(5) Remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and

(6) Reevaluate the permit space in the presence of any authorized entrant who has reason to believe

that the evaluation of that permit space may not have been adequate;

(7) Determine, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

(8) The Entry Supervisor shall provide at least one authorized attendant outside the permit space into which entry is authorized for the duration of entry operations. Multiple spaces are not to be monitored by a single attendant according to the Water Authority's Permit Space Program.

## NON-PERMIT CONFINED SPACE

**XI. Non-Permit Confined Space**

(1) A non-permit confined space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. The only hazard posed by the confined space is an actual or potential hazardous atmosphere.

(2) A space classified by the Authority as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:

**(a)** If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.

**(b)** If it is necessary to enter the permit space to eliminate hazards, such entry shall be performed as a permit-required confined space entry. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.

**(c)** The Authority shall document the basis for determining that all hazards in a permit space have been eliminated through a certification that contains the date, the location of the space, and the signature of the person making the determination. The certification shall be made available to each employee entering the space. This non-permit confined space certification shall be documented through the Confined Space Entry Permit.

**(d)** If hazards arise within a permit space that has been declassified to a non-permit required confined space, each employee in the space shall exit the space. The entry supervisor shall then reevaluate the space and determine whether it must be reclassified as a permit space.

(3) The Water Authority has determined that many of the permit-required confined spaces around its facilities may be declassified or reclassified to a non-permit required confined space if the proper reclassification procedures have been followed and documented. This reclassification procedure requires an entry supervisor, authorized attendant, or authorized entrant to perform an analysis of the hazards within the confined space and demonstrate and certify that these hazards have been eliminated.

(4) The certification that these confined space hazards have been eliminated will be accomplished through the first page of the Water Authority's Confined Space Entry Permit. The first page of the confined space entry permit will require an employee to document his or her basis for making a non-permit confined space reclassification and document the procedures followed. If the confined space cannot be reclassified as a non-permit confined space then it shall be treated as a permit-required confined space and the appropriate procedures shall be followed.

**(5)** All confined spaces shall be considered permit-required confined spaces until the pre-entry procedures completed on the Confined Space Entry Permit demonstrate that the space can be maintained in a safe condition for entry by natural ventilation or mechanical ventilation alone.

**(6)** When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the Authority shall reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

## XII. Non-Permit Confined Space Entry Procedures

**(1)** Prior to initiating the entry, the entry supervisor, attendant, and entrant shall:

**(a)** Obtain the Confined Space Entry Permit/Reclassification Form for the confined space to be entered. The Confined Space Entry Permits are on file in the SWRP Control Room or appropriate Maintenance/Operations shop.

**(b)** Assess whether or not recent changes due to construction, equipment failures, or other causes may have generated actual or potential hazards not anticipated in the Reclassification Permit.

**(c)** Designate authorized entrant(s).

**(d)** Designate authorized attendant(s).

**(e)** Designate Assisted Self-Rescue team members, minimum of two including the team leader.

**(f)** Establish contact with the Assisted Self-Rescue Team Leader and the Control Room. Advise them of all relevant details of the proposed entry, providing at least, the following information:

**(1)** Exact location of the confined space to be entered.

**(2)** Number of people who will be performing the entry.

**(3)** Estimated length of time the work will take.

**(4)** Radio call number of the authorized attendant.

**(g)** Verify that all required personal protective equipment, rescue equipment, and hazardous gas monitors are available for the entry to take place.

**(h)** The authorized attendant and authorized entrant shall check the calibration on the hazardous gas monitor and verify the operability of the gas detection equipment.

**(2)** Any conditions making it unsafe to remove an entrance cover to the confined space shall be eliminated before the cover is removed.

**(3)** When the entrance cover(s) are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening.

**(4)** Test atmospheric conditions in the confined space to determine if acceptable entry conditions exist before entry is authorized to begin and are being maintained during the course of entry operations;

**(a)** When testing for atmospheric hazards, test for oxygen first, test for combustible gases and vapors second, and then for toxic gases and vapors.

**(5)** Acceptable atmospheric conditions inside the confined space shall be 19.5% to 23.5% oxygen, less than 10% LEL, less than 5 ppm $H_2S$, and less than 35 ppm CO.

**(6)** The authorized attendant and authorized entrant shall continuously and independently monitor the atmosphere inside the non-permit confined space during entry operations. The entrant must have a calibrated gas detector on his/her body at all times during entry operations. The attendant shall monitor the atmosphere within the space from outside the confined space using a calibrated gas detector with a sample draw pump and tubing.

(7) The authorized attendant shall maintain contact with the Control room and the Assisted Self-Rescue team leader during entry operations.

(8) The authorized attendant shall notify the Control Room and the Assisted Self-Rescue team leader upon completion of the work inside the confined space.

(9) The confined space entrance shall be properly secured by entrant(s) before leaving the site.

(10) All equipment used during the entry operation shall be returned to proper storage.

## ASSISTED SELF-RESCUE AND EMERGENCY SERVICES

**XIII. Assisted Self-Rescue and Emergency Services**

(1) The Water Authority will provide Assisted-Self Rescue Services to all employees required to enter permit-required confined spaces. Assisted Self-Rescue means trained, equipped rescuers standing by outside the confined space, prepared to perform vertical direct retrieval operations. Water Authority employees will not perform horizontal confined space rescue, an outside contractor like ROCCO will be contracted out to perform horizontal confined space rescue. Water Authority employees who have been designated to provide vertical permit space Assisted Self-Rescue shall be considered Assisted Self-Rescue Team members and shall take the following measures:

(a) Assisted Self-Rescue Team members shall be trained as permit space entrants and attendants at a minimum, including training in the potential hazards of all permit spaces from which rescue may be needed. Assisted Self-Rescue Team members shall demonstrate proficiency to perform assigned rescue duties;

(b) Assisted Self-Rescue Team members will be provided with and properly trained in the use and need for PPE, such as SCBA or fall arrest equipment, which may be required to perform permit space rescues. Every team member shall be properly trained to perform his or her functions and make rescues, and to use any rescue equipment, such as ropes and harnesses, that may be needed in a rescue attempt. Assisted Self-Rescue Team members shall demonstrate proficiency in the use of that PPE;

(c) Assisted Self-Rescue Team members shall be trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit spaces until Emergency Medical Services arrive. At least one member of the rescue team must have current certifications in CPR, Basic First Aid, and Hazwoper 40; and

(4) Assisted Self-Rescue Team members shall practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces.

(2) Assisted Self-Rescue Team members shall focus on their own safety before considering the safety of the victim. Members shall be able to test the atmosphere to determine if it is IDLH. Members shall be able to identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs.

(3) To facilitate non-entry rescue, employees will use the DBI-SALA confined space entry/retrieval systems whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of injury or would not contribute to the rescue of the entrant. The DBI SALA retrieval systems meet the following requirements:

(a) Each authorized entrant (includes rescue entrants) must use a full body or chest harness, with a

retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head.

**(b)** The other end of the retrieval line shall be attached to the DBI-SALA rescue davit retrieval system outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. The rescue davit retrieval system shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.

**(4)** If an injured entrant is exposed to a substance for which a MSDS or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.

**(5)** Assisted Self-Rescue Team members shall properly package and retrieve victims from a permit space that has a limited size opening (less than 24 inches in diameter), limited internal space, or internal obstacles or hazards. Airline respirators shall be used when required.

**(6)** The Chief Engineer, Safety Manager, Superintendents, and Assisted Self-Rescue Team members shall develop a plan for each of the kinds of permit space rescue operations at the facility that may be required. This rescue plan shall be developed in writing and shall be updated annually or as needed. Rescue operation plans of representative permit spaces with: Internal configuration, Elevation, Portal size and Space access.

## XIV. Assisted Self-Rescue Procedures

Once an employee is assigned to an Assisted Self-Rescue Team or is selected to be an Assisted Self-Rescue team leader the following procedures shall be followed:

**(1)** Obtain all required personal protective equipment (PPE) as well as monitoring, communication, and rescue equipment to make a rescue feasible. SCBAs and mechanical ventilation are an example of PPE required to be on site at all times. Most of the required PPE will be housed in the Safety Equipment Building adjacent to the Operations and Maintenance Facility;

**(2)** Set up the required DBI-SALA rescue/retrieval equipment at the confined space to be entered before entry operations begin. This will ensure immediate Assisted Self-Rescue services are available at all times;

**(3)** Assisted Self-Rescue Team members will evaluate the confined space and scheduled work to be completed and assist with the isolation of the confined space and mitigation of all confined space hazards;

**(4)** Assisted Self-Rescue Team members will come up with a rescue plan that details how to rescue authorized entrants should an emergency situation arise. This rescue plan can be verbal among the rescue team members or it can be a written plan as long as all rescue team members understand how rescue procedures will be conducted and their roles;

**(5)** The Assisted Self-Rescue Team shall outfit every authorized entrant with a chest or full body harness equipped with fall protection, a retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head, and a retrieval hoist system. The confined space entry/rescue equipment authorized by the Water Authority is the DBI-SALA hoist systems;

**(6)** Continuously monitor the atmospheric conditions and potential hazards during entry operations. Two gas detectors are required during entry/rescue procedures, one detector on the entrant and the

other outside the confined space monitoring the internal atmosphere. Perform required duties until entry operations are completed. Assisted Self-Rescue Team members have the authority to stop permit space entry operations should a prohibited condition be detected;

(7) Once entry operations have been completed and the confined space entry permit has been cancelled, return all rescue equipment and personal protective equipment to its proper location. Please make sure the entrance cover to the confined space is properly secured.

## DEFINITIONS

**XV. Definitions**

**Acceptable entry conditions** means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

**Assisted Self-Rescue** means Water Authority employees trained to provide vertical confined space rescue procedures.

**Attendant** means an individual stationed outside a permit space who monitors the authorized entrants and who performs all attendant's duties assigned in the Water Authority Permit Space Program.

**Authorized entrant** means an employee who is authorized by the Water Authority to enter a permit space.

**Bio-Hazard or Biological Hazard** refers to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include medical waste or samples of a microorganism, virus or toxin that can affect human health. It can also include substances harmful to animals.

**Blanking or blinding** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (spectacle blind or skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

**Confined space** means a space that:

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and

(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and

(3) Is not designed for continuous employee occupancy.

**Double block and** bleed means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

**Emergency** means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

**Engulfment** means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

**Entrapment/engulfment** means converging walls; to swallow up or overwhelm by or as if by overflowing and enclosing.

**Entry** means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

**Entry** permit means the written or printed document that is provided by the Water Authority to allow and control entry into a permit space and that contains the information required in **1910.146(f) Entry permit.**

**Entry supervisor** means the person (such as the operations/maintenance supervisor or superintendent) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by the Water Authority Permit Space Program.

**Hazardous atmosphere** means an atmosphere that may expose employees to the risk of death, incapacitation, and impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

**(1)** Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);

**(2)** Airborne combustible dust at a concentration that meets or exceeds its LFL;

**(3)** Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

**(4)** Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit;

**(5)** Any other atmospheric condition that is immediately dangerous to life or health.

**Hot work permit** means the Water Authority written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

**Immediately dangerous to life or health (IDLH)** means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

**Inerting** means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

**Isolation** means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

**Line breaking** means the intentional opening of a pipe, line, or duct that is or has been carrying

flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

**Mitigate or Mitigation** means to become less harsh or to eliminate the hazard.

**Non-permit confined** space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

**Oxygen deficient atmosphere** means an atmosphere containing less that 19.5 percent oxygen by volume.

**Oxygen enriched atmosphere** means an atmosphere containing more than 23.5 percent oxygen by volume.

**Permit-required confined space** means a confined space that has one or more of the following characteristics:

**(1)** Contains or has a potential to contain a hazardous atmosphere;
**(2)** Contains a material that has the potential for engulfing an entrant;
**(3)** Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
**(4)** Contains any other recognized serious safety or health hazard.

**Permit-required confined space program** means the Water Authority's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

**Permit system** means the Water Authority's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

**Prohibited condition** means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

**Rescue service** means the personnel designated to rescue employees from permit spaces. This rescue service could be provided by a contractor such as ROCCO.

**Retrieval system** means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

**SWRP** means the Southside Water Reclamation Plant.

## TRAINING

### XVI. Training

Training shall be provided by the Water Authority so that all employees whose work is regulated by the permit space program acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned.

**(A)** Training shall be provided to each affected employee:

**(1)** Before the employee is first assigned duties under the permit space program;

**(2)** Before there is a change in assigned duties;

**(3)** Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained;

**(4)** Whenever the Water Authority has reason to believe either that there are deviations from the permit space entry procedures or that there are inadequacies in the employee's knowledge or use of these procedures.

**(B)** The training shall establish employee proficiency in the duties required by the permit space program and shall introduce new or revised procedures, as necessary, for compliance.

**(C)** The Water Authority shall certify that the training required of this program has been accomplished. The certification shall contain each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees.

## XVII. Respirator Fit Testing

Before a Water Authority employee may be required to use any respirator with a negative or positive pressure tight-fitting face-piece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used. Water Authority employees will use the SCOTT AV-3000 full facepiece respirator or the SCOTT XCEL half facepiece respirator.

**(A)** The Water Authority shall ensure that employees using a tight-fitting facepiece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT).

**(B)** Employees using a tight-fitting facepiece respirator are to be fit tested prior to initial use of the respirator and whenever a different respirator facepiece (size, style, model, or make) is used. Employees must pass a qualitative fit test at least annually thereafter.

**(C)** The Water Authority shall conduct an additional fit test whenever the employee reports, or the employer, PLHCP, supervisor, or program administrator makes visual observations of, changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.