ROBERT G. DASHIELL, JR., P.E., INC.
Consulting Engineers
1225 West 26th Street, Norfolk, Virginia 23508 (757) 623-5012

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Draft – Electrical Portion of the PER
Petersburg Main Sanitary Sewage Pumping Station Re-habilitation
262 Joseph Jenkins Roberts St., Petersburg, VA 23803

Note: The office/work area is not in the scope of the PER.

Existing Condition

Current Electric Service

The existing electric service for the sewage pump station is 480Y/277V, 3-phase. The service laterals are run overhead from three 167 KVA pole mounted Dominion Virginia Power (DVP) transformers then to building mounted weather-heads, into the building and down to DVP's current transformer (CT) cabinet. The weather-heads and CT cabinet appear to be in fair condition.

Photo 1 – DVP Overhead Service Lateral

Photo 2 – DVP CT Cabinet

The main service disconnect switch is a 1200A, 480V, 3-pole switch retrofitted with a 1600A, 480V, 3-pole circuit breaker set at 80% capacity. The switch feeds a 1200A, 480Y/277V, 3-phase, 4-wire main distribution panelboard (MDP). The MDP feeds the sewage pump motors and three 208Y/120V, 3-phase panelboards through a step-down transformer. The transformer and panelboards show some sign of rusting but appear to be in fair condition. The MDP appears to be in good condition. The main service disconnect switch is in poor condition.

Photo 3 – Main Service Disconnect Switch (cover removed)

Photo 4 – Main Distribution Panel (MDP)

Current SCADA System

The existing SCADA system consist of a GE Fanuc, Series 90-30 programmable logic controller

(PLC) and ESTEEM model 192C RF wireless ethernet modem. The SCADA system is in poor condition. The City currently has an RFP advertised to provide a new City-wide standard SCADA system. The existing pump control panel is manufactured by Systems East, Inc. It is equipped with pilot devices that are no longer in use. A wet well level transducer provides the on/off control of the three sewage pumps. The pump control panel is outdated and appears to be in poor condition.

Photo 5 – GE Fanuc SCADA System

Photo 6 – SEI Pump Control Panel

Current Motor Starters

The existing sewage pump motors are 200HP, 460V, 3-phase. At the time of our site visit, sewage pump #2 was out of service. The pump bearings were in the process of being replaced. The starter type for sewage pump motor #1 is a Westinghouse reduced voltage

auto-transformer (RVAT). The starter type for sewage pump motor #2 is a Siemens variable frequency drive (VFD). The starter for sewage pump motor #3 failed recently and was replaced with a new WEG CFM-11 VFD. The starters for pump #1 and #2 are older models, circa early 1990, and appear to be in fair condition.

Photo 7 – Pump Motor #1 Starter

Photo 8 – Pump Motor #2 Starter

Photo 9 – Pump Motor #3 Starter

Current Heating and Ventilation System

Motor Room: The existing heating and ventilation system consists of a wall mounted propeller type fan, two unit heaters and a 10 ton York split AC system for cooling. The exhaust fan and unit heaters are in poor condition. The York split AC system appears to be in fair condition. At the time of our site visit, the AC split system was operating. Supply air comes in through a wall louver on the east side of the building. The louver appears to be in fair condition.

Photo 10 – Wall Mounted Prop. Fan

Photo 11 – Unit Heater (typ. of 2)

Photo 12 – Split AC Sys. Air Handler Unit (condenser on roof)

Dry Well: The existing ventilation system for the dry well is an inline fan with an external direct drive motor. The fan is wall mounted high in the motor room. The ventilation ducting extends up from the dry well, into the motor room and through the roof. Supply air comes in from the same wall louver on the east side of the building used to bring supply air into the motor room. The fan, motor and ducting appear old and in poor condition.


Photo 13 – Dry Well Inline Ventilation Fan

Screen Room and Wet Well: The existing ventilation system for the screen room and wet well consist of an inline fan with an external belt drive motor. The screen room is equipped with a

unit heater. The fan is wall mounted high in the screen room. The ventilation ducting extends up from the wet well, into the screen room and through the roof. The opening for the screen room roll-up door is used to bring in supply air. The roll-up door must first be opened before the fan is operated. The unit heater, fan, fan motor, metal ducting and support brackets show signs of corrosion. They appear to be in poor condition.

Photo 14 – Well Well and Screen Room Inline Ventilation Fan

Photo 15 – Screen Room Unit Heater

Current Lighting Fixtures

Motor Room: The existing lighting fixtures in the motor room are 8-foot, 2-lamp T12, strip type industrial fluorescent fixtures. The fixtures appear to be in fair condition.

Photo 16 – Motor Room Lighting Fixture

Dry Well: The existing light fixtures in the dry well are wall mounted, cast metal type, metal halide flood lights. The fixtures are located high in the drywell. The wall mounted fixtures provide minimal lighting to the platforms above. The fixtures appear to be in fair condition.

Photo 17 – Dry Well Lighting Fixture

Screen Room and Wet Well: The existing light fixtures in the screen room and wet well are surface mounted, cast metal type, tungsten halogen fixtures. The fixtures are not explosion proof. Three of the four ceiling mounted fixtures in the screen room are missing lenses and do not work. Five fixtures in the wet well are missing lenses and do not work. The fixtures in the

screen room and wet well show signs of corrosion and appear to be in poor condition.

Photo 18 – Screen Room Fixture

Photo 19 – Wet Well Fixture

Screen Room and Wet Well

The screen room is not physically separated from the wet well. The wet well stairwell is open to the screen room. The comminutor and bar screen rake access openings are also open to the screen room. H2S gasses migrating from the wet well into the screen room have caused corrosion to the electrical equipment enclosure and conduit. The electrical equipment and wiring are not corrosion resistant or explosion proof, except for the bar screen rake disconnect switch and control panel.

Photo 19 – Ventilation Fan Starter and Disconnect Switch

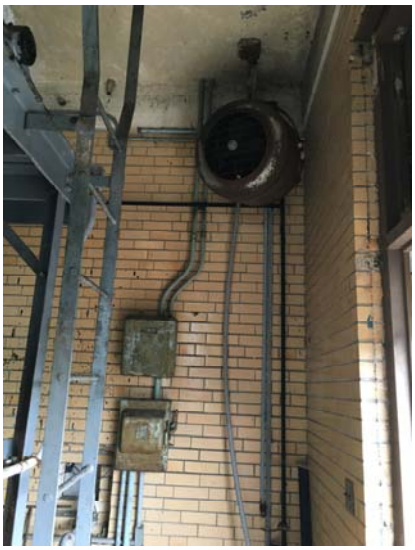

Photo 20– Screen Room Unit Heater, Starter and Disconnect Switch

Proposed

Proposed Electric Service Upgrade

Due to the age and condition of the main service switch, we recommend replacing it with a new 1200A fused switch. The size of the pumps selected for the pump upgrade is the same as the existing 200 HP pumps. The new 1200A fused switch and existing 1200A main panel should be adequate to support the selected pumps and station loads. Coordination with DVP will be required to confirm that the existing pole mounted transformers are adequate to support two motors running with the third motor starting.

The City wants the capability to power the pump station from a portable generator. To achieve this, we recommend the installation of a new manual transfer switch and generator connection box on the building's exterior wall. Mechanical lugs will be included in the generator connection box design to allow direct connection of the portable generator cables.

Proposed Motor Control Panel and VFD's

The proposed pump control panel will be designed to include three new 200 HP variable frequency drives (VFD), level transducer liquid level measurements, and a programmable logic controller (PLC) based pump controller. A backup hi-water and low-water float switch alarm will be provided in the wet well. The pump control panel will be provided with liquid level and flow measurement displays, pump run-time displays, pushbuttons, selector switches, pilot devices and a VGA color touch-screen operator interface terminal. The following auxiliary control components will be provided:

- Check valve limit switches
- Pump lock-out switches
- Discharge line pressure transmitter
- Magnetic flow meter (existing)

Termination points for alarm, supervisory and control points will be provided in the proposed pump control panel for final connection to the City furnished and installed SCADA system.

Proposed Heating and Ventilation

Ventilation equipment in the motor room, dry well, screen room and wet well will be upgraded to meet the latest DEQ and NFPA 820 ventilation requirements. Ventilation ducting and air intake louvers will be upgraded and sized according to the latest code air flow requirements.

Continuous ventilation and air flow monitoring will be provided in the dry well to downgrade the current code classification of the space from "Class 1, Div. 2" to "Unclassified" in accordance with NFPA 820. The air flow alarm point will be connected to the SCADA system for remote monitoring by the City.

Due to the age and condition of the unit heaters in the motor room and screen room, the unit heaters will be upgraded to newer, more efficient models.

The existing York split AC system will be re-used to provide cooling from the heat generated

by the VFD's and motors. The ducting will be re-configured to distribute cooling air evenly throughout the space.

Proposed Lighting

The existing lighting fixtures in the motor room and dry well are old but appears to be in fair condition. These fixtures should be cleaned, re-lamped and remain for continued use. We recommend installation of new energy efficient fluorescent type supplemental lighting above the catwalks.

The fixtures in the screen room and wet well are not explosion proof. The fixtures are not up to current code. The fixtures are old, corroded with missing lenses and 80% of the fixtures are not working. We recommend upgrading these fixtures to explosion proof, energy efficient fluorescent fixtures to meet the latest IES illumination recommendations.

Proposed Screen Room and Wet Well Equipment and Wiring

The screen room and wet well are considered classified areas as defined by the NEC and NFPA 820. We recommend upgrading all wiring and equipment in these spaces to Class 1, Div. 1 per NEC. The small opening in the wall between the screen room and office/work area is to be patched to match the existing wall construction. The bar screen rake disconnect switch and control panel are Class 1, Div. 1. They should be cleaned, serviced and remain for continued use.

Bathroom Sink

The bathroom sink is in poor condition. The drain piping for the sink is a 1 ½" flexible hose that is discharged directly on the bathroom floor. There is no floor drain. The bathroom sink should be upgraded with a 1 ½" drain pipe that empties into a waterless inline drain trap sealer. The inline drain trap sealer automatically re-seals itself after the liquid has drained into the wet well.