



DIVISION 4

Standards for Lift Stations

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4-1.000 SEWER LIFT STATIONS

4-1.010 General

Sanitary sewer lift stations shall only be allowed upon written approval by the District. The Developer shall provide written documentation to support the request for lift station installation. It is intended that the Contractor shall furnish and install a complete, tested, and operational lift station with provisions for backup power and pumping, in accordance with State, District, and Local requirements.

Lift stations and their force mains shall be in conformance with the Washington State Department of Ecology (DOE) Criteria for Sewage Works Design (Orange Book), latest edition, for sewage pump stations. The station shall meet requirement of Class I Reliability, as defined by Ecology.

Sanitary sewer lift stations shall meet the more stringent noise requirements of either Snohomish County Code (SCC) or the local noise ordinance for the municipality in which the station is located.

Sanitary sewer lift stations shall be in compliance with all applicable odor ordinances and codes, including applicable municipal codes, the Snohomish County Code, and regulations enforced by the Puget Sound Clean Air Agency. Sanitary sewer lift stations shall comply with Snohomish County's seismic ordinance.

The District may require a lift station to be sized to accommodate flows or hookups in addition to those identified for a specific development/project. The District will include the number of hookups and the lift station type in the Developer Extension Agreement.

Prior to final acceptance for Type 1 and 2 lift stations, as defined below, the Developer shall provide the following items:

- A reproducible set of as-built drawings showing final location of all equipment, conduit, and wiring, and vertical and horizontal locations of all pipe and pipe inlets and appurtenances.
- Manufacturer's equipment warranties on all equipment. Warranty periods to be approved by the District prior to acceptance of warranties.
- A completed new asset information electronic spreadsheet on a format provided by the District. This spreadsheet includes equipment data and other information.
- Deed to the District the applicable recorded tract of land or easements encompassing station and force main.
- Four (4) complete sets and one searchable electronic copy, on a Digital Versatile Disc (DVD) of the operation and maintenance manuals.

The District has established a naming convention for equipment numbering, conduit numbering and wire labeling that shall be used for Type 1 and 2 lift stations. The Developer shall request and obtain the Districts a current version of the memorandum “Numbering System for all Non-GIS based Assets” prior to design. All wire labeling and required nameplates shall be installed prior to startup & testing of the lift station.

4-1.020 Type of Sewer Lift Stations

The three types of factory built lift stations or pumping facilities available under these standards are:

A. Type 1: Wet well/dry well station

The lift station shall consist of a separated wet well and dry well as described in the DOE Orange Book. The factory built dry well shall consist of an access tube and below grade pump room. The station shall accommodate a minimum of two pumps. Pumps shall be Cornell pumps designed for pumping raw sewage and capable of passing a minimum 3-inch spherical solid. Pump speed shall be a maximum of 1800 rpm and a minimum of 1200 rpm when available.

Acceptable manufacturers include Dakota Pump Incorporated and USEMCO Inc for the factory built dry well. All other manufacturers, pumps, or configurations will require approval by the District.

B. Type 2: Wet well submersible pumps and motors station

The sewage lift station shall use Flygt submersible pumps or equivalent. Pumps shall be designed for pumping raw sewage and capable of passing a minimum 3-inch spherical solid, or have a Flygt N-impeller. Pump speed shall be a maximum of 1800 rpm and a minimum of 1200 rpm when available. The pump control panel, and liquid level control shall be installed within an above grade NEMA 4X enclosure approved by the District.

C. Type 3: Individual grinder pumps

The sewage lift station shall be Environment One Model DH071 or DR071 grinder pump with Sentry PreSTAT controls.

The three types of lift stations are limited to the following applications and the type shall be selected by and approved by the District.

Type	Station Description	Application/Number of Equivalent Residential Units to be Served	Minimum Flow Rate
1	Wet well-dry well	51 and greater	125 gpm
2	Wet well submersible pumps and motors	Up to 50	125 gpm
3	Individual Grinder pumps	Single residence/unit	No minimum

4-1.030 Type 1 and 2 Lift Stations

A. Lift Station and Force Main Locations

Lift stations and force mains shall be located well out of the buffers for sensitive areas as defined by the local land use jurisdiction. If this requirement cannot be met, additional conditions shall be added by the District to protect and assure adequate environmental protection for the station and adjacent areas.

A geotechnical report stamped by a licensed geotechnical engineer shall be provided for the area proposed for the lift station. The geotechnical report shall include a discussion of seismic faults and conditions, groundwater conditions, sensitive slopes, wetlands, and other geotechnical issues.

Sufficient land shall be provided to the District for the station for ingress and egress of District equipment for maintenance and operation of the station including, fencing for the site. The land area shall be approved by the District prior to construction approval.

B. Construction Standards

All materials, installation, and workmanship shall be in accordance with District Standards and the latest edition of the State of Washington Standard Specifications for Road, Bridge, and Municipal Construction (Standard Specifications).

In addition, the lift station standards, materials and installation shall comply with the manufacturer's Engineering Data and specifications for pump stations as prepared and provided by the lift station manufacturer.

The first manhole upstream of the wet well shall have an eighteen inch deep sump below the lowest pipe invert. This manhole shall be located so that it is accessible for regular cleaning of the manhole by a sewer vacuum truck. The interior shall be coated with Raven 400 lining systems, or an approved equal, and exterior coated with Karnak #83AF fibered damp proofing asphalt compound or an approved equal.

The manhole in which the force main will discharge into shall be fully coated inside and out with the same products as noted in previous paragraph.

C. Hydraulics

The peak design flow shall be determined as recommended in the latest revision of the DOE's Criteria for Sewage Works Design (Orange Book). This analysis shall be compared with the most recent planning information available from District.

The lift station capacity shall be the peak hour flow rate with its largest pump offline (firm capacity, as defined by the DOE).

Pump selection and force main size shall ensure a minimum velocity of 3 feet per second in the force main. Force main velocities shall not exceed 8 feet per second.

Hydraulic and pump design shall conform to the Orange Book and the latest revision of the Hydraulic Institute Standards.

The Developer shall submit a lift station and force main pressure surge analysis (water hammer) to the District as recommended in the Orange Book in a format acceptable to the District. The analysis shall incorporate calculations for minimum and maximum pressures in the system for the anticipated worst case scenario, including pump starts and sudden power outage shutdowns. Surge protection shall be installed as required by the surge analysis and approved by the District. If required, surge protection could include devices such as: pump control valves, variable frequency drives, use of high strength piping, and vacuum relief valves (swing check type). Critical surge protection devices shall protect the system under all operation conditions, including a power outage shutdown while the station is operating at its highest allowed capacity. Hydro pneumatic tanks shall not be used for surge control.

If vacuum relief valves are used, a total number of two valves shall be installed in a vault for redundancy and maintenance purposes. Vaults shall be drained to the nearest gravity sewer, side sewer lateral, unless the District determines another means is acceptable. Vault floors shall be sloped to the drain. Vaults shall meet all requirements of this Division 4 and those applicable from Divisions 2 and 3.

All hydraulic calculations, including the pressure surge analysis, shall be signed and stamped by a Professional Engineer licensed in the State of Washington and shall be provided to the District in a station design report.

D. Station Requirements

For the Type 1 wet well/dry well lift station, the below grade dry well shall be completely factory built, unless otherwise approved by the District. The drywell shall have an above ground entrance with lockable hatch (typically 1.5 feet above grade) made of steel or fiberglass, as approved by the District.

The wet well for Type 1 and Type 2 shall have an at grade, lockable, flat lid with H20 or H30 (pending location in station and or as directed) rated 36"x72" LW products HD Access hatch or approved equal

Both Type 1 and 2 lift station construction shall be in compliance with the Occupational Safety & Health Act (OSHA), Underwriters Laboratory (UL), American Society for Testing and Materials (ASTM), National Electrical Code (NEC) and other applicable codes and regulations. Sewage lift stations shall be provided with the following options in addition to those described in the instrumentation and pump control sections of this document:

- Running time meters
- Intrinsically safe displacement switch relays
- Pump failure alarm relays
- Phase fail relays
- Pump running lights

- Ultrasonic level sensors (bubblers or other level sensors are not acceptable)
- Level indicators
- Operator in trouble button
- Check valve position sensor
- Amp meters
- Hand-Off-Auto (H/O/A) switch
- Motor disconnect located in the drywell or within sight of the motor

The following spare parts shall be provided to the District:

Type 1 & 2 lift stations:

- Mechanical seal
- 2 Impellers (1-right and 1-left)
- Impeller wear rings, if applicable
- Impeller shaft
- Bearings
- Set of gaskets and O-ring seals
- Set of keys, dowels, pins. Etc.
- Set of shaft sleeves
- Check valve re-build kit
- Any special tools required to dismantle pump
- Spare motor

Type 2 lift station shall also include: one spare pump

E. Pumps and Motors

A minimum of two sewage pumps are required for both Type 1 and 2 lift stations. Each pump shall be designed to handle raw, unscreened, sanitary sewage. The pumps shall have sufficient capacity and capability to efficiently handle the peak design flow, including infiltration and inflow requirements, as determined by the District, with the largest pump out of service. Design calculations and pump curves indicating the same shall be provided with the submittal information.

The pump and motor shafts shall be the maximum diameter available for these units.

For Type 1 and 2 lift stations, pump motors shall be standard 480 Volt, 3-phase, 60-cycle, N.E.M.A. Standards, starting Code "G" or better. Motors shall be premium efficiency and have a 1.15 service factor. Motors controlled by a variable frequency drive (VFD) shall be rated for inverter duty and must include a stainless steel nameplate showing "Inverter Duty Motor." Contractor shall supply certification with submittals that the motors meet all requirements of NEMA MG1-2004, Part 31.

Type 2 lift station pumps shall be submersible dual slide rail type and have the pumps and mechanical slide rail accessories installed in the wet well. Slide rail and accessories shall be a type 316 stainless steel. A hoisting bail shall provide for proper balance of pump and removal from the discharge connection while using a single lift cable. Lifting cable shall consist of a type 316 stainless steel braided wire cable attached to the pump lifting bail. A crimped ball end shall be provided at the upper end of this cable for attaching to the wet well

access frame.

All external surfaces of the Type 2 lift station submersible pumps coming into contact with sewage shall be protected by an epoxy coating of 8 mils minimum thickness. All exposed fasteners and lock washers shall be of type 316 stainless steel.

The Type 2 lift station casing shall be easily removable from the motor for full inspection of impeller. The pump(s) shall be heavy duty, electric submersible, centrifugal non-clog or chopper type units designed for handling raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. Non-clog impellers shall pass a 3-inch minimum spherical solid or greater. The Flygt N impeller can be provided as an alternative to providing a 3-inch solid passing capability. The pumps provided shall be capable of operating in an ambient liquid temperature of 104 degrees F. Since the high temperature of 104 degrees F is specified by the National Electrical Manufacturers Association (NEMA) and Factory Mutual (FM), motors with a maximum ambient temperature rating below 104 degrees F shall not be acceptable.

The Type 1 lift station pump and motor unit shall be suitable for continuous operation in the dry well environment.

The Type 2 lift station pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged.

The use of shower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable.

The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

For Type 1 and Type 2 lift stations, thermal protection shall consist of three separate thermostatic switches embedded into the stator windings. Each switch shall open independently and terminate motor operation if temperature of the protected winding reaches the high temperature set point.

For Type 2 lift stations, any moisture in the motor housing shall be detected by a mechanically activated moisture sensing micro-switch. The switch shall be sensitive enough to detect airborne moisture and terminate operation of motor before liquid enters the cavity.

Use of probes or floats that rely on the presence of liquid to initiate signal is acceptable

The thermal and moisture sensing devices shall be connected to the pump control panel by the Contractor. The motor and pump shall be connected to form an integral unit.

F. Manufacturer's Services

The sewage lift station supplier shall check the station during installation and startup to determine if the installation is correct. The District shall be present at each check by the supplier. Written confirmation and recommendations from each visit shall be provided to the District within one week of the visit.

The sewage lift station supplier shall provide 4 hours of training for District personnel at the

lift stations site during startup. The District reserves the right to video tape the training session.

The sewage lift station supplier shall provide four complete bound paper copies and one complete searchable electronic copy on a Digital Versatile Disc (DVD) of maintenance and operation materials to the District. These manuals shall be complete and shall include all information necessary to allow District personnel to maintain the lift station.

G. Wet Well and Dry Well

Lift station wet wells shall be sized to provide adequate hydraulic inlet conditions for the pumps. Wet wells shall be a minimum 96 inch inside diameter precast concrete manhole. Provide access platform and ladder if so directed by District. All other wet well configurations will require District approval.

The Type 2 lift station shall use a factory built base. The lid shall be sized for the installation and removal of the specified pumps, and shall be of sufficient size to permit access to the wet well. The base shall be sized to accommodate an H20 or H30 (pending location in station and or as directed) rated 36"x72" LW Products HD Access hatch or approved equal.

For pump removal, a Type 2 lift station shall be furnished with a flush-mounted pedestal/socket base cast into concrete or as approved and shall be compatible the District's portable hoist, refer to Section X." General Site Conditions" for make and model. If pumps are heavier than what the District's portable hoist equipment can facilitate, the contractor shall provide a portable hoist and socket as part of the station and shall not weigh more than 75 pounds.

Type 1 and 2 lift stations wet wells shall:

- Provide a hopper style wet well bottom with a minimum of 60% slope at the base of the wet well as recommended by Washington State Department of Ecology.
- The wet well shall be sized to provide a minimum of 15 minutes between pump cycles at half of peak pump design capacity, unless approved otherwise by the District and pumps are operated by variable frequency drives. The high water alarm shall be set a minimum of 7 inches below the invert of the lowest gravity sewer inlet pipe. High water alarm shall be set at a level below the lid to allow for temporary storage of six hours anticipated average daily design flow unless otherwise directed by the District.

Provide buoyancy calculations of all structure that extend below ground surface to the District and include any protection needed to prevent buoyancy. Calculations shall be stamped and signed by a Professional Engineer licensed in the State of Washington.

The wet well chamber shall be provided with a fiberglass ladder secured to the wall with stainless steel hardware and a light fixture rated for Class 1, Division 1 Environment. The wet well light shall be switch controlled with a manual switch located in the electrical enclosure or as directed. Pipe hangers located inside the wet well shall be stainless steel. All nuts, bolts, washers, fasteners etc. shall be stainless steel. All stainless steel shall be grade 316 or better. Depending on station flows, the District may require a stainless steel

baffle installed on the inlet pipe.

The interiors of wet wells and dry wells shall have a corrosion resistant lining appropriate for protection against hydrogen sulfide corrosion. Concrete surfaces in the wet well shall be sealed with Raven 400 lining systems or approved equal. Linings shall be installed per manufacturer's recommendations. All non stainless steel metals, such as process pipe and conduits, within the wet well shall be coated with a minimum of 16 mils of high performance epoxy.

Dry Well floors shall be slopped towards floor drain or sump, no ponding will be allowed.

The exteriors shall be coated with Karnak #83AF fibered damp proofing asphalt compound or an approved equal and shall be applied per manufacturer's recommendations.

Wet wells shall be provided with a candy cane style vent with a pest screen. Vent to be sized accordingly to accommodate air displacement due to changes in the liquid level in the wells. Vent shall be piped from the well near the top of the lid. Vent and screen shall be coated with or constructed of non corrosive materials or as approved by the District.

H. Overflow Storage

Overflow storage shall be provided for Type 1 and 2 lift stations. The overflow storage volume shall provide for a minimum of 1 hour of storage for peak flow conditions as a recommended minimum per the Washington State Department of Ecology Criteria for Sewage Works Design. The District may require a storage volume greater than the minimum based upon lift station capacity, distance from the District's Maintenance Facility, proximity to sensitive areas and other factors.

When designing the overflow storage facility, the design engineer shall take into consideration the District's conditional surcharge criteria regarding impacts to the system upstream of the station and allowable surcharge. Conditional surcharge criteria:

- If a pipe invert is less than or equal to 10 feet below the ground surface, the maximum allowable surcharge is 1 foot above the pipe crown.
- If a pipe invert is greater than 10 feet below the ground surface, the maximum allowable surcharge is 3 feet above the crown

The overflow storage vault (tank or pipe) shall be concrete or as approved by the District. The overflow storage vault floor shall be sloped at a minimum of 2% to drain to the wet well. The overflow storage shall be provided with a H20 rated, minimum 36-inch square LW Products access hatch or equal at the upstream end of the vault and a minimum 24-inch diameter access opening, manhole frame and cover, at the vault discharge point toward the wetwell.

All interior concrete surfaces of the storage vault (including end pieces riser sections) shall be coated as required for the wet well and upstream manhole.

I. Piping

All piping materials shall be per Division 3, Sewer Installation.

The suction lines from the Type 1 lift station wet well to the dry well shall be a single length

of Ductile Iron pipe.

The force main shall be Ductile Iron or HDPE piping and provided with a continual positive slope to the discharge location. There shall be no intermediate high point between the pump station and the force main discharge point (depth shall be a minimum of 4 feet) unless approved otherwise by the District. If an intermediate high point cannot be eliminated through design and is approved by the District, an appropriately sized pressure sewer air release valve shall be submitted for District approval. The pressure sewer air release valve may be required to be equipped with odor control and shall be installed in a vault or other District approved enclosure. Orifices of air release valves shall be sized to eliminate damaging pressure surges (waterhammer) when evacuating air from the force main.

Force mains shall be installed and tested in accordance with pressure testing of water mains under Division 2, Water Installation.

All pipes (gravity and pressure) entering and leaving the wet well shall have a minimum of two flexible couplings within 18 inches and 36 inches of the structure. The geotechnical report may recommend additional requirements specific to the site.

The pipe between the overflow storage vault and the wetwell shall conform to the requirements of Division 3, Sewer Installation.

J. Electrical

The electrical service, controls, auxiliary generator and telemetry shall be furnished and installed in accordance with the applicable federal, state and local codes and standards including:

- National Electrical Safety Code (NESC)
- National Electrical Manufacturers Association (NEMA)
- Insulated Power Conductor Engineering Association (IPCEA)
- American National Standards Institute (ANSI)
- Institute of Electrical & Electronic Engineers (IEEE)
- National Fire Protection Association (NFPA)

The Contractor shall coordinate and obtain power service from Snohomish County Public Utility District (PUD) as required to meet the electrical requirements of the lift station and appurtenances. All electrical service installations shall be approved by the land use agency having jurisdiction and Snohomish County PUD and shall be in conformance with the NEC (current version), UL 98, OSHA, and city, county and state electrical codes.

District shall be provided with a certificate of final inspection by the appropriate building official.

All materials shall be suitable for the environmental conditions including classified hazardous areas as defined in NFPA 820.

All wire shall be copper and labeled per Section T. "Wiring".

All conduits shall be labeled where entering or leaving ground surface, manholes,

handholds, pull boxes, and at each end of the conduit. The District has established a naming convention for equipment numbering, conduit numbering and wire labeling that shall be used. The Developer shall request and obtain the Districts a current version of the memorandum "Numbering System for all Non-GIS based Assets" prior to design.

Conduit shall be as follows:

- Outside or exposed: PVC coated galvanized rigid steel (GRS) (PRS)
- In wet well: PVC coated GRS (PRS)
- Underground: Schedule 40 PVC (PVC 40) or PRS
- Embedded in concrete: PVC 40 or PRS
- Transition Between Grade (Conduit Stubs): PVC coated GRS (PRS)

All underground conduits shall have a minimum of 24 inches of cover and shall be marked with polyethylene tape placed 6 to 12 inches below finished grade and directly above the conduit.

K. Electrical Enclosures

The District allows two options for electrical enclosures depending upon type of lift station. The enclosure shall be specified by the District at the time of approval of the lift station.

The electrical enclosure options are:

Type 1 Station

Provide 24 gauge metal roofing on a covered rack mounted utility electrical service entrance and equipment using a minimum of 4" square galvanized HSS posts and 2" X 4" galvanized HSS cross for electrical equipment. NEMA 4X stainless steel electrical enclosures shall be used.

The roofing on all enclosures shall overhang on all sides far enough to cover the open door of the control panel and so that the water does not hit the personnel working on the control panel. The concrete slab shall be the same dimensions as the roof.

Enclosures for a Type 1 Station include these listed attributes:

- The main circuit breaker in NEMA 4X Stainless enclosure
- Automatic transfer switch in NEMA 4X Stainless enclosure
- Generator Load Bank Test Disconnect switch in NEMA 4X
- Generator Load Bank Test Receptacle shall be NEMA 4:high impact strength copper-free aluminum
- Pump control and telemetry panel (RTU) in NEMA 4X stainless steel enclosure
- Minimum mini power center NEMA 4X Stainless(MPC = 480V CB, 15 KVA transformer, 120/240V CB panel) or equivalent
- All Disconnects NEMA 4X
- HOA/Junction Panel NEMA 4X
- Manual Transfer Switch NEMA 4X
- Auxiliary Generator Plug shall be NEMA 4:high impact strength copper-free aluminum

- Motor Control Center NEMA 4X
- Lights shall be LED where applicable
- 120V GFI receptacle
- Communications interface with telemetry communication interface as required.
- Any other power or control components required for a complete and operational system
- Ground rods and conductor where used, shall have connections to rods accessible
- An externally mounted air conditioner, if necessary

The utility power meter base and if required, leading disconnect, shall be mounted on the outside of the electrical enclosure. The concrete pad shall provide for at least 3-feet of standing space in front of any enclosure access door. At least one spare 2-inch conduit shall be stubbed out beyond the pad.

Type 2 Station

Provide 24 gauge metal roofing on a covered rack mounted utility electrical service entrance and equipment using two 6" I.D. schedule 40 galvanized conduit columns with 16 gauge stainless steel unistrut mounted between for electrical equipment. NEMA 4X stainless steel electrical enclosures shall be used.

The roof shall overhang on all sides far enough to cover the open door of the control panel and so that the water does not hit the personnel working on the control panel. The concrete slab shall be the same dimensions as the roof.

Enclosures for a Type 2 Station include these listed attributes:

- The main circuit breaker in NEMA 4X enclosure
- Automatic transfer switch in NEMA 4X enclosure
- Generator Load Bank Test Disconnect switch in NEMA 4X
- Generator Load Bank Test Receptacle shall be NEMA 4:high impact strength copper-free aluminum
- Pump control and telemetry panel (RTU) in NEMA 4X stainless steel enclosure
- Minimum mini power center (MPC = 480V CB, 15 KVA transformer, 120/240V CB panel) or equivalent
- Lights shall be LED where applicable
- 120V GFI receptacle
- Any other power or control components required for a complete and operational system
- Ground rods and conductor where used, shall have connections to rods accessible
- An externally mounted air conditioner, if necessary

The utility power meter base and if required leading disconnect shall be mounted on the utility electrical service entrance rack. The concrete pad shall provide for at least 3-feet of standing space in front of any enclosure access door. At least one spare 2-inch and 1-inch conduit shall be stubbed out 1-foot beyond the pad.

L. Auxiliary (Standby) Power System

Standby power generation equipment shall be provided which will operate the pump station in the event of a power outage. The auxiliary diesel engine generator shall be manufactured by one of the following acceptable manufacturers: Cummins-Onan, Kohler, or Caterpillar.

Provide a sound attenuating, weatherproof enclosure, such as Quiet Site II type or better enclosure, to achieve noise levels specified by the most stringent governing local noise ordinance. Specified noise levels vary by land use and if equipment is used for emergency purposes. The enclosure shall include but not be limited to the following features:

- Provide an internal, 120VAC LED style luminaire above each access door. The luminaires shall be controlled by access door switches such that when any access door is open all the access door luminaires shall be energized. The luminaires shall be powered from a single external 20A, 120VAC supply circuit. The luminaires shall be sized and located to provide sufficient light for operation, inspection, and maintenance activities.
- Each access door shall be equipped with an Intrusion switch which provides a series connected signal to the SCADA system. The intrusion switches shall be normally open, held closed.
- All hardware and hinges shall be stainless steel.

The auxiliary power unit shall be complete in every respect and shall include but not be limited to the following:

- Generator, control panel, and circuit breaker.
- Engine, radiator, and exhaust system.
- Generator set noise and weather enclosure.
- Automatic transfer switch to be installed in the electrical enclosure by the enclosure manufacturer.
- Battery and rack.
- Battery charger with remote status indication.
- Coolant heater.
- Conduit, wire, and piping.
- Fuel storage with a 4-20mA level transducer, non mechanical direct contact level transducer such as Intempco LTX20 or equal.
- Digital Communication and or modules compatible for complete communications to PLC.
 - Generator control panel and ATS shall be programmable and have digital connectivity to SCADA RTU/PLC (refer to Sections M & O respectively).

Provide a minimum of 24 hours of onsite fuel storage tank at full load. Sub-base fuel tanks shall not exceed 3-feet in height. If separate fuel tank is needed, fuel piping shall be located below grade. Piping shall conform to appropriate standards including double containment and leak detection. Fuel tank shall be equipped with a low fuel-level alarm. The fuel tank and fuel piping shall comply with all local requirements, including International Fire Code (IFC) Chapter 34, NFPA 30 and NFPA 37.

The fuel system shall be provided with an electrical shutoff valve with flexible connection to the generator. The generator set shall be built in compliance with the following codes, regulations, and standards: NEMA, IEE, ANSI, NEC, and OSHA.

Provide a fuel tank heating system. System shall consist of a silicone rubber heating pad controlled by a thermostat. Heating pad shall be affixed to the top of the diesel fuel tank, inside of the sound attenuating, weather proof enclosure. Thermostat shall be installed interior to the enclosure, adjustable and initially set to activate the heating pad at temperatures below 40 degrees Fahrenheit. Device shall be on a dedicated circuit. Heating pad shall be "BriskHeat SRL series Silicone Rubber Heating Blanket" or approved equal and sized to maintain fuel in diesel tank above 32 degrees Fahrenheit when external temperatures are 15 degrees Fahrenheit. Thermostat shall be adjustable from -30 to 212 degrees F and located in a surface mounted NEMA 4X enclosure.

Common alarms, ATS position status, alerts and fuel level shall be connected to the telemetry system as directed by the District.

M. Generator Set

The generator set shall be capable of automatic starting and maintaining a full load from a cold start. The generator set is to be equipped with the following features:

- Full circulation, pressure-type lubrication with replaceable filter with bypass.
- Gear-type, mechanical engine governor.
- Replaceable-type engine air filter.
- Engine oil drain extension with ball valve and plug.
- Radiator cooled by engine-mounted radiator system.
- Revolving field, dynamically balanced, static excited, static regulated 12-lead.
- Radio suppression.
- Self-ventilated, drip-proof construction.
- Brushless, fast response, amortized winding, Class "B" and "H" fungus resistant.
- Coils and stator mechanically secured and epoxy dipped.
- Contact for an alarm and report system (6 contacts) N.O./N.C.
- Line circuit breaker rated at full generator capacity.
- Current transformers.
- Frequency meter.
- Panel light.
- Generator load meter (to measure true load on generator) in kW. The generator manufacturer's standard digital controls shall be an acceptable substitute while meeting all of the specified functions.
- Switches on all cabinet doors wired in a Normally Open held close configuration.
- Digital communication connected to the PLC outlined in Section Q. "Control System Architecture".
 - Generator control panel shall be programmable and have digital connectivity to SCADA RTU/PLC . Integration of data includes but not limited to; generator, hour meters, and maintenance & equipment data.
- Provide necessary software and cables to maintain & troubleshoot the Generator Set.

The generator set shall meet the following performance requirements:

- Performance of the generator set shall be based on operation of the assembly with fan, battery charging alternator and all specified and required appurtenances.

- The generator set shall be rated for continuous standby service, however the temperature rise of the generator shall not exceed 105 degree C above a 40 degree C ambient, when producing full rated load for a continuous period of time.
- Voltage Drop: The engine generator unit supplied shall start the indicated load with a sustained RMS voltage drop no greater than 20% of rated phase to phase voltage during the starting period. The starting period shall be from zero up to 3 seconds. The instantaneous voltage dip may be greater than 20% but shall not cause motor starter chatter or relay dropout or exceed a level which causes undesirable motor starting. If motor starting problems are encountered, the size of the generator set shall be increased as required to reduce voltage dip until the motors can be started without problems. The method of measurement shall be by light beam oscilloscope.
- Frequency regulation shall be plus or minus 3 hertz maximum, not load to rated load.
- Voltage regulation shall be plus or minus 2% maximum.
- The generator set shall be capable of starting and operating the following load without exceeding the temperature ratings of the engine or the generator. Connected base load consisting of one lead motor and miscellaneous loads totaling an additional 17 kVA. Start an additional lag motor.
- The generator set shall be sized by the manufacturer to start and operate the load indicated herein (all electrical equipment on and all pumps running simultaneously and continuously) while meeting the performance requirements set forth herein. The minimum acceptable engine generator set shall be capable of producing at least the kilowatt rating shown here at 0.8 power factor, continuously. If the generator supplies power to variable frequency drives (VFD) then the generator set shall be compatible with the VFD's specified for the project. The Contractor shall submit a certification letter which verifies that the generator set is compatible with the specified VFDs.

N. Generator's Manufacturer's Services

The generator supplier shall check the generator installation and startup to determine if the installation is correct. The District shall be present at each check by the supplier. Written confirmation and recommendations from the visit shall be provided to the District within one week of the visit. The generator supplier shall provide all tools for the generator set as recommended and required by the manufacturer.

The generator supplier shall provide 4 hours of training for District personnel at the lift station site during startup. The District reserves the right to video tape the training session.

The generator supplier shall provide four complete bound paper copies and one complete electronic copy on a Digital Versatile Disc (DVD) of maintenance and operation materials to the District. These manuals shall be complete and shall include all information necessary to allow District personnel to maintain the generator.

O. Transfer Switches

The transfer switch shall be sized, in amps, to equal the full connected load of the lift station generator and auxiliary equipment plus 25 percent. The transfer switch shall be enclosed in a NEMA-4X cabinet for installation in the electrical enclosure. Transfer switch shall be manufactured by the same manufacturer as the generator. The transfer switch shall be an automatic-transfer switch compatible to the selected generator and meeting the following

specifications:

- The transfer switch shall be equipped with three poles for normal and emergency service of 480 volts, 60 hertz, 3 phase power. The transfer switch shall be mechanically and electrically held and rated to 600 volts for all classes of load and continuous inductive duty.
- The transfer switch shall conform to UL 1008 Revision 4 provisions for Withstand Current Ratings and Closing Ratings. The calculated fault current available is 20,000 amperes RMS symmetrical.
- The switch shall be capable of enduring 6000 cycles of complete opening and closing at the rated current and voltage at a rate of 6 cycles per minute without failure.
- The switch shall be double throw inherently interlocked mechanically and electrically to prevent supplying the load for both sources simultaneously. The operating current shall be obtained from the source to which the load is to be transferred. The transfer mechanism shall be of the double break design and solid silver cadmium surface contacts and individual heat resistant arc chambers.
- All contact coils, etc. shall be readily accessible for replacement from front of panel without major disassembly of associated parts.
- Transfer switch shall be manufactured by the same company as the generator.
- Provide ATS system status signals to the PLC system to monitor ATS on utility/S1, ATS on emergency power/S2 and other system signals as directed by the District.
- Provide remote telemetry starting function connectivity.
- Provide a prior to retransfer notification via dry contact.
- The switch shall provide a “double lug” on the generator side of the switch for connection to an additional disconnect for load testing.
- Generator Load Bank Test Disconnect switch shall be wired with equivalent sized generator conductors. Digital readout on front cover for voltage and connected load.
- Digital communication connected to PLC as outline in Section Q. “Control System Architecture”.
 - ATS shall be programmable and have digital connectivity to SCADA RTU/PLC . Integration of data includes but not limited to; power data, switch position and equipment data.
- The Manual Transfer Switch shall be rated for the load served and be the ESL Power Systems Tripleswitch 3-way Manual Transfer Switch or approved equal.

Provide a mobile generator receptacle and manual transfer switch for the ability to use a mobile generator at the lift station located downstream of the automatic transfer switch. Plug shall be manufactured by Crouse Hinds, Model APR 100 AR or Model APR 200 AR or an approved equal

P. Controls

Control and instrument system plans shall be thoroughly and completely depicted in the station design. The plans, in conjunction with the specifications, shall define the type of control system, the type of components in the system, set points, and the interface between the instrumentation and control system and the lift station. To accomplish this, the control and instrument plan(s) should include at a minimum the following:

- Control and instrumentation system legend and general notes;

- Control, instrumentation, and distribution diagram;
- Plans showing location of all control, instrument, and distribution system equipment and components, both electrical and pneumatic; and
- Equipment and installation details.

All electrical components, terminals, wires, and enclosures provided with the control system shall be UL recognized or UL listed.

All control panels shall conform to UL508A Part 1-General Use Industrial Control Panels and Section T. "Wiring", and shall bear a UL label certifying the control panel as a "Listed Enclosed Industrial Control Panel". The control panels shall be fabricated at the factory. No fabrication other than correction of minor defects or minor transit damage shall be permitted onsite. UL508A Part 2-"Specific Use Industrial Control Panel Types" is not applicable to sanitary sewer lift stations.

The lift station controls shall be designed for operation on emergency generator power and capable of load management and include enhanced telemetry as required. The programmable logic controller (PLC), instrumentation and telemetry shall be backed up by a DC uninterruptible power supply (UPS) capable of a minimum 2 hours of operation unless otherwise approved by the District.

Equipment for the power supply and UPS shall be the following or approved by the District:

- Power supply: Sola HD SDN-P and AB 1606-XLP
- UPS: Sola HD SDU and AB 1606-XLS

A complete set of spare fuses shall be provided for all fused equipment.

Q. Control System Architecture

All lift station pump control and telemetry functions shall be provided by a programmable logic controller (PLC). The PLC system shall be installed within a NEMA 4X enclosure (remote telemetry unit/RTU). The RTU enclosure shall be designed to contain all of the equipment required to support the operation of the PLC system and the wiring interfaces between the PLC and the pump station electrical equipment. The RTU shall include climate controls with a minimum of a heater and dehumidifier. The local operator interface shall be installed through a full sized inner front door of the RTU enclosure.

The RTU shall be designed and constructed to match the District standard. The standard RTU design is available from the District.

A Confidentiality and Non-disclosure Agreement must be executed with the District prior to receiving software from the District.

Specific PLC components shall be selected from the list below or as approved by the District. All PLC equipment shall be products of Rockwell Automation (Allen-Bradley) Compact Logix Series. No substitutions are allowed, however based on new technology products are subject to change by the District.

Device	Description	Model No.
CPU	PLC Central Processing Unit, W 2.0MB Memory, with 1GB SD card	1769-L33ER
PS	Power Supply	1769-PB2
AI	Analog Input Module	Hart compatible equivalent 1769-IF8
AO	Analog Output Module	1769-OF4CI
DI	Discrete Input Module	1769-IQ16 or 1769-IQ32
DO	Discrete Output Module	1769-OW8I
LOI	Local Operator Interface	Panelview Plus 700 Ethernet #2711P-B7C4D8
	Legacy Serial Port Adapter Card	AB DF1 Interfacing Option MVI69-DFCM or Equivalent in Chassis Options at District Approval

R. Instrumentation

A Toshiba LF654 (or as approved by the District) magnetic flow meter shall be installed on the force main discharge piping and located within a vault. Ground rings shall be installed on both sides of the flow meter. The flow meter transmitter shall be a Toshiba LD622,(or as approved by the District) capable of sending a 4-20 mA signal to the telemetry system and Hart compatible. The flow meter shall be capable of sending a totalized pulse to the District's telemetry system. The meter shall include all required valves so that the meter can be bypassed for maintenance or replacement without affecting the operation of the lift station. Flow meter vault shall be equipped with a light, intrusion switches, flood switches, and with an h20 or H30 rated 36"X72"LW Products HD Access hatch or approved equal access hatch. The vault floor shall slope to a floor drain with an elastomer trap guard. The drain line from vault shall drain into the wet well. The interior and exterior of the vault shall be coated the same as the wet well and dry well, refer to Section G.

The flow meter vault shall also be equipped with a discharge pressure transducer, with double blocking & bleed valves, see detail LS-XX. The pressure transducer shall be and Endress+Hauser PMC71 or as approved by the District.

An ultrasonic level sensor and transmitter (Siemens, XPS-15F and Hydro-Ranger 200 HMI) shall be installed for wet well level indication and pump control. The level sensor shall be mounted within the wet well and the transmitter shall be installed within the lift station control enclosure. The level transmitter shall be capable of sending a Hart compatible 4-20 mA signal to the telemetry system and shall be located in the wet well to obtain maximum range.

At the District's discretion, a rain gauge may be required at the site. When a rain gauge is required, a minimum of 1 dry contact shall be provided to the PLC for the telemetry system.

The rain gauge shall be a HyQuest Solutions TB3 or an approved equal.

S. Lift Station Control Functions

All pump control logic shall be programmed in the PLC and local operator interface. The PLC and local operator interface programs shall match existing pump station programs for content and structure. The Contractor shall request an electronic version of the standard PLC and local operator interface programs from the District for their use upon execution of the Confidentiality and Non-disclosure Agreement.

Pump controls shall operate in the following manner:

1. A Siemens level transmitter and transducer shall be used by the control system to operate the pumps automatically in a Lead/Lag(s) configuration.
2. Each pump shall have an associated Hand-Off-Automatic selector switch.
 - In hand position, the pumps will operate continuously. In Off position, the pumps will not operate.
 - In automatic position, the pumps will operate in response to the Lead/Lag pump control sequence.
3. The lead pump shall start when the level in the wet well exceeds the lead pump start level set point.
4. The lag(s) pump shall start when the level in the wet well exceeds the lag pump start set point.
5. All pumps shall stop when the level in the wet well falls below the pump stop setpoint.
6. All pump control permissive and protection features shall be handled by a self contained pump logic module or micro PLC.

Provide the ability for the operator to adjust the pump start/stop level set points locally.

Provide a Lead/Lag/Alternate control selector that will allow the operator to select the Lead/Lag(s) pump sequence or to place the pump control into an automatic alternation mode. In automatic alternation mode, the control system shall automatically switch which pump is Lead when all pumps are detected as not operating.

Provide pump failure recovery if a Lead or Lag(s) pump fails to operate. The pump failure recovery control shall start the next available pump in the operating sequence to take the place of the failed pump. Provide an alarm signal to the telemetry system upon detection of a pump failure.

Provide auxiliary contacts that confirm motor starter is engaged to be used in conjunction with the check valve switches for pump run status. Provide (non-mechanically operated) switches on check valves to confirm pump run. Check valves should interlock with pump controls for protection of equipment.

In addition to the transmitter and transducer, install a float-style level switch in the wet well to detect a high wet-well level condition. The level switch elevation shall be a minimum of seven (7) inches below the lowest gravity sewer inlet pipe. Annunciate the alarm on the local operator interface. Provide an alarm signal to the telemetry system when a high wetwell level condition is detected.

Provide hard-wired backup pump control circuitry. Backup control for the pumps shall follow the criteria listed below:

- Both pumps shall be signaled to start from the backup sensing device.
- The primary pump shall start immediately once the backup sensing device is triggered. It should continue to run until an adjustable time (but not more than 5 minutes) after the sensing device is returned to normal condition.
- The secondary pump shall start after the backup sensing device has triggered and after an adjustable amount of time has passed (but not more than 5 minutes). It shall continue to run while the backup sensing device is engaged and until the primary pumps system has completed its backup cycle.
- Shall be handled within the pump logic module or micro PLC independently for each pump.
- Shall be wired to only work if the Pump package is set to an auto status, and works in tandem to back up the RTU PLC controls.

Each pump shall be provided with 4-20mA current sensors that shall be monitored by the PLC system. The system shall be capable of sending alarms as determined by the District and shall include low warning, low alarm, high warning and high alarm.

Provide running and fault status signals to the PLC system for all pumps, compressor, motors, fans and other equipment as identified by the District. Provide computed running hours for each within the PLC code. Provide any additional related signals as directed by the District.

A smoke detector shall be installed within the pump station with the location to be determined by the District. Provide an alarm signal to the telemetry system if smoke is detected. Smoke detector shall be resettable and equipped with a dry contact relay for output signals to the PLC.

An intrusion detection system shall be provided for the pump station access, wet well, storage covers, the standby generator enclosure access doors, meter and bypass pumping vaults and specified electrical enclosures as defined by the District. The intrusion detection equipment and sequence of operation shall be specified by the District. All switches shall be wired in a normally open held closed method. Provide an alarm signal to the telemetry system upon detection of an intrusion event. Manual alarm reset shall be required at the lift station.

District preferred intrusion switches include:

- Dry locations such as vault lids and doors: IFM Efector, Model: IM0055
- Intrinsically safe or wet areas: IFM Efector, Model: NM500A

Provide standby generator system status signals to the PLC system to monitor generator running, low fuel, intrusion detection on all door(s), battery charging status and other power system signals as directed by the District.

Provide ATS system status signals to the PLC to monitor ATS switch on utility/Source 1, ATS switch on Emergency power/Source 2, Intrusion detection on door, retransfer notification, ATS alarms or alerts and other system signals as directed by the District.

Provide a control output from the PLC system that will allow the control system to automatically or remotely command the generator to start and stop.

Provide a control output from the PLC system that will allow the control system to automatically or remotely command the Auxiliary (Standby) Power System to exercise under load.

A minimum of one Operator in Trouble annunciation system shall be installed. The Operator in Trouble system hardware and sequence of operation shall be specified by the District.

Provide a PLC panel power, UPS System, DC power systems failure alarm signal to PLC and other system signals as directed by the District.

Provide a RTU cabinet temperature sensor connected to the PLC. Provide Signals for Temperature, Low and High temperature alarming and other system signals as directed by the District.

Provide any additional system signals based on provided equipment as directed by the District.

All components within the lift station system, including both internally- and face-mounted instruments and devices, shall be clearly identified with phenolic nameplates of black background with white letters and shall be installed prior to startup & testing of the lift station.

T. Wiring

All control wiring shall be marked with permanent machine printed wire labels at both ends.

All wiring entering or leaving a control panel shall be landed on terminal strips within the control panel Layout. All terminal strips shall be marked with permanent machine printed labels manufactured specifically for the provided terminal.

All wiring shall be copper.

All wiring that goes below grade shall be of XHHW type or equivalent

All Wiring within control panels shall be MTW or THHN/THWN-2

Use the District wire color code provided below. Deviations from the District's wire color code are not allowed without written permission from the District.

Description	120/208V	277/480V	Control
Phase A	Black	Brown	
Phase B	Red	Orange	
Phase C	Blue	Yellow	
Neutral	White	Grey	White
Ground	Green	Green	Green
120V Control			Red

120V Control	Neutral		White
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Description	24V/DC Control
DC Common -	White With Blue stripe
DC Control +	Blue
DC Signal (Discrete)	Purple
Description	DC Signaling
Analog Signaling +	White or Red
Analog Signaling -	Black

All Analog Signals Shall be prepared in a Shielded/Unshielded method, as shown in Detail LS-9.

The District has established a naming convention for equipment numbering, conduit numbering and wire labeling that shall be used. The Developer shall request and obtain the Districts a current version of the memorandum “Numbering System for all Non-GIS based Assets” prior to design.

All labeling shall be in place prior to startup & testing of the lift station.

U. Motor Control

All pump controls including motor starters and main circuit breakers shall be located outside of the lift station electrical enclosure on the electrical equipment service rack or enclosure. There shall be a Hand-Off-Auto (HOA) station located near the pump motors and within the drywell where applicable The HOA panel shall provide digital display of Pump(s) Amperage, Wet Well Level, an HOA Switch for each pump and other system signals as directed by the District.

All pump motors shall have an independent circuit breaker and shall be capable of being locked out. All motors shall have a main circuit breaker located outside the pump station electrical enclosure as part of the electrical service entrance equipment. There shall also be a local disconnect located near and/or within sight of the pump motors.

Pump controllers shall be Allen Bradley Power 6-pulse Flex Series, or approved equal for VFD’s for motors 20 hp or higher. Provide VFD harmonic mitigation (eg. Active Harmonic Filter) as necessary to comply with IEEE 519 using a point of common coupling located at the electrical service main disconnect All pump starters for motors smaller than 20 hp shall be Allen Bradley brand SMC FLEX soft starters.

All pump soft starters, variable frequency drives, overloads, and contactors shall be provided with Ethernet connectivity and other model options as directed by the District and connect to the PLC in the RTU. All devices will be require to have a hardware signal for starting, stopping, speed reference, and other system signals as directed by the District..

At the discretion of the District, the sewer lift station shall contain interlocks to lock out any pump or pump(s) upon a generator run to avoid overloading the generator. The lockout shall be automatically overridden on operating pump failure such that the failed pump is automatically replaced by previously locked out, operable pump while continuing to avoid generator overload.

V. Telemetry

The PLC system for the lift station shall include the local pump station telemetry functions. The Contractor shall provide all equipment consistent with the District Standards at the lift station required to provide the communications functions, and all required central-based equipment at the District's office.

Telemetry shall be compatibly configured within the pump station PLC system to match the operation of existing pump station telemetry systems and shall send all signals to the District office. The data parameters that shall be communicated between the pump station and the District office will be provided by the District upon execution of the Confidentiality and Non-disclosure Agreement.

The telemetry between the central based system and the Type 1 and 2 lift station site shall be coordinated with the District for direction between Options A or Option B

Option A: Communication methods and materials as directed by the District.

Option B: A voice-grade circuit leased to the District from the telephone service supplier. The Developer shall coordinate with the District to ensure proper circuits are furnished.

Provide the following communications devices:

Modem	Multitech modem	Multitech MT 5600BA
Modem	Multitech modem	Multitech MT 5600BR

The Multitech MT 5600BA shall be installed within the RTU for communications along with a telephone line protector unit. The unit shall protect the equipment from transient and electrical surges on the telephone line. The protector shall include 1/2 amp line fuses and voltage clamps for voltages over 25 volts. Gas tubes shall be provided as an integral part of the lightning protection unit.

The Multitech MT 5600BA shall be provided to the district prior to connection and testing.

Provide a minimum of a 16"X16"X6" (Pentair A16R166HCR) enclosure for the telephone service suppliers equipment. It shall be located at the lift station site on the electrical rack.

W. Other Equipment

Check valves shall be the spring assisted external swing-arm type.

Provide a bypass pumping connection with quick disconnect type fitting such as Camlock or an approved equal. Size pumping connection and quick disconnect fitting for peak flow with a maximum velocity of 8 feet per second; size shall be a minimum of 4-inch and a maximum of 6-inch diameter or larger as determined to accommodate the required flow. Location of bypass shall be readily accessible as determined by the District.

When determined by the District that the bypass pumping connection be in a vault. The vault floor shall slope to a floor drain with an elastomeric trap guard. The drain line from vault shall drain into the wet well. The interior and exterior of the vault shall be coated the same as the wet well and dry well, refer to Section G.

Pending the site and vault location, the District may require the vault to be equipped with intrusion switches, flood switches, a light, and with an H20 or H30 rated 36"x72" LW Products HD Access hatch or approved equal access hatch.

Provide emergency eyewash shower if chemicals are used onsite.

X. General Site Conditions

Provide adequate access for a tandem rear-axle-style maintenance vehicle. Access shall be paved with 6-inch of asphalt or 6-inch of concrete and shall include a pullout in the road alongside the lift station to allow a maintenance vehicle to pull out of traffic while unlocking the gate. The design shall show turning radius adequate for maintenance vehicle ingress and egress.

Provide a perimeter 6-foot cyclone 1-inch mesh security fence with a 16-foot split-gate opening with an appropriately located 3-foot man gate. Galvanized chain link fence fabric shall be PVC-coated or Polymer-coated fabric. Fabric color shall be dark green. Unless otherwise approved by the District, provide dark green polyethylene-tubular-privacy slats with UV inhibitor, sized to fit mesh.

Provide three (3) rows of barbed wire across the top of fence and gates.

Provide a potable water connection and freeze-proof yard hydrant hose bib in accordance with all applicable plumbing codes and Division 2 Water Installation. A reduced-pressure backflow preventer shall be housed in a hot box. Provide power and electrical outlet to the hot box with heat tape installed to prevent freezing. The heat tape shall be plugged into a GFCI protected electrical receptacle installed in the hot box and have LED lighted indication for power.

Above ground structures, if needed, shall be constructed of decorative CMU block with a standing seam metal roof. Block and roof color and styles to be approved by the District.

Site surfacing shall consist of asphalt concrete with catch basins as needed to accommodate surface water runoff to the storm water drainage system unless otherwise directed by the District. Asphalt concrete shall be sloped to the catch basin.

At each location on the lift station site where confined space entry is required, provide and install stainless steel flush floor mount sleeves into concrete for the District's Miller Durahoist Portable Confined Space Safety System davit crane. Flush floor mount sleeves shall be Miller DH20SS or equal and shall be compatible with the District's safety system. Provide stainless steel sleeve caps to keep debris from entering the sleeve. Provide a ½-inch weep in the bottom of the sleeve to prevent sleeve from filling with water.

Provide odor control to achieve detectable odor threshold units specified by the governing local code. Odor control system shall be approved by the District.

Some locations may require landscaping as determined by the District and or by local land-use agency. When required, use low-maintenance landscaping that can tolerate no irrigation.

Provide mouse-proofing where applicable to ground-mounted structures.

All keys, miscellaneous items, and spare parts shall be given to the District prior to acceptance.

Provide a switch controlled light for night time work or as required by the District for security of the station and yard. Provide a manual switch located inside the electrical enclosure or as directed. Lighting shall be installed in such a way to minimize light disturbance to adjacent properties. All lighting onsite shall be of LED type.

All structures classified as Class 1 Division 1 environment that may require access at night shall be provided with appropriate light fixtures.

The objective is a non-obtrusive, clean, neat site.

Outside signage, including pump station identification and safety notification requirements for confined space entry and any chemical storage, shall be provided as specified by the District.

A tract of land shall be deeded to the District to encompass the Type 1 or 2 lift station that provides sufficient and safe access for District staff and designated third party service providers for operations, maintenance, and construction of the station.

Pending site location, the District may require the installation of a security camera system. Security camera locations and system will be determined by the District.

4-1.040 Type 3 Lift Stations –Individual Grinder Pumps

AA. Lift Station

The Type 3 lift station requires a side sewer permit and inspection. Type 3 lift station shall have one grinder basin assembly per residence and/or unit. Each grinder basin assembly shall have one independent power source per residence and/ or unit. A grinder basin shall not be shared between a residence and/ or unit.

The Type 3 lift station with shared side sewer shall require each residence and/or unit to have an individual force main terminating into a common gravity sewer service.

The Type 3 lift station and force main are maintained by the property owner. Property owner shall enter into an agreement with the District regarding maintenance provided by the owner.

BB. Piping

The force main shall meet the requirements of Division 3, Sewer Installation. A inch and a quarter outside diameter HDPE Force main shall connect to the 1-1/4- inch diameter stainless pump discharge line leaving the wet well. HDPE pipe shall have butt-fused joints completed in accordance with manufacturer's recommendations.

It is recommended the inch and a quarter private non-metallic force main be installed with a tracer wire or other means for locating in the future.

For single residence and/ or unit, the force main shall connect to a gravity side sewer in accordance with Division 5, Detail Drawing SS-7.

For a shared gravity sewer by multiple single residence's and/ or units, each residence/ and or unit shall have an individual force main connecting into a common gravity side sewer as directed by the District.

CC. General

A reduced pressure backflow assembly (RPBA) shall be installed directly behind the domestic water meter in accordance with the District's Premise Isolation Cross-Connection Control Program. . The installation of the RPBA shall be per Division 2, Water Installation.