

ITEM 28

LIFT STATION

1.0 DESCRIPTION. The Contractor shall furnish all materials, equipment, labor, and supplies to construct, replace or rehabilitate the lift (pump) station(s). The Contractor shall properly adjust, test and place in service in the location shown on the contract drawings a submersible lift station with pumps (complete) including but not limited to excavation, dewatering, sheeting, bedding, backfill, topsoil & seeding, pavement, access drive, fence per plan, manholes, wet well, valve vault, specified pumps (complete), slide-away, pump couplings, valves for pumps, all ductile iron piping inside and outside the pump station from wet well through the valve vault, and meter vault where called for, any other incidental sewer piping of any type needed for reconnections, new connections, or other use; control panel, level controls for pump operation, spare parts and all other appurtenances necessary to provide a complete installation of the precast concrete pump station as shown on contract drawings and/or described herein.

2.0 SUBMITTALS.

A. Reference Standards. Latest revisions; where materials and equipment are specified to be constructed in accordance with the standards of UL, ASME, ASTM, or AWWA, the Contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements.

1. ASTM A-48, Class 30 for pump construction.
2. OSHA regulations for open excavation, shoring and underground work.
3. ASTM B-43 for alloy 230 brass.
4. ASTM C478 for precast reinforced concrete manhole sections.
5. ASTM C443 for concrete joints and rubber gaskets.
6. ASTM C990 and C877.

B. Shop Drawings.

1. Electronic copies of shop drawings, materials and equipment lists and spare parts data shall be submitted in accordance with the provisions of the "General Conditions".
2. Shop drawings shall be complete in all details and shall include identified parts lists. Shop drawings shall show relationship of all components, connections, gears, bearings, lubrication connections, mounting arrangements, lifting bales and support items.
3. Complete piping, instrumentation and electrical diagrams shall be included. Manufacturer's catalog information will not be sufficient to fulfill shop-drawing requirements.

4. After examination of such drawings by the Engineer and the return thereof, the Contractor shall make such correction to the drawings as have been indicated and shall furnish the Engineer with corrected electronic copies.
 - a. If requested by the Engineer, the Contractor must furnish additional copies.
 - b. If field changes are made to the lift station, "as built drawings" shall be supplied.
5. Detail, scaled drawings and specifications shall be submitted in writing by the Contractor and approved by the Engineer for any modifications to the equipment layout, as required for the installation and proper operation of the equipment. No work or fabrication shall be done until the Engineer's approval has been obtained. These detailed drawings shall clearly show the composition, size and dimensions, extent, method of support, kinds of materials and equipment, hardware, pumps, valves, piping and similar work.

C. Calculations.

1. Where called for on the contract drawings, vault access doors shall be reinforced to support AASHTO H-20 wheel load with a maximum deflection of 1/150th of the span. The door manufacturer shall provide structural calculations stamped by a registered professional engineer upon request.

D. Certifications.

1. Prior to shipment, the manufacturer will certify the pumps to verify that they will meet the proposed project conditions. These tests shall be documented and provided to the Engineer.
2. Contractor shall submit a written certificate from a testing agency approved by the Engineer, stating that the materials and equipment have been tested and that the items conform to the requirements, including method of testing.
3. Pump curves and testing Data: The Contractor shall furnish with each size pump a certified and properly identified characteristic curves prepared by the pump manufacturer showing capacities, heads, efficiencies, and brake horsepower throughout the entire range of the pump.
 - a. Data collected during pump testing, including meggering tests, shall be supplied. Provide certified pump curves with meg-ohm readings from the factory.
 - b. A pump performance test shall be provided to the Engineer for approval during the submittal process for each of the actual pumps supplied.

E. Operation & Maintenance Instructions.

1. Operation and maintenance manuals containing complete information in connection with the assembly, operation, lubrication, adjustment, maintenance, and repair of items and control devices therefore, together with detailed parts list and drawings, or photographs, shall be submitted by the contractor/manufacturer. Manufacturer's catalog instruction alone will not be sufficient. The operation and maintenance instructions shall include cut sheets updated to include all items as they were actually installed. The instruction shall

- be in the form of manuals and shall be furnished to and approved by the Engineer.
2. Provide written instructions for each system listed in the specifications. Submit one electronic copy to the Engineer for approval. After approval, submit two (2) copies to the SCMSD.
 3. Bind the written operating instructions, shop drawings, equipment catalog cuts and manufacturer's instructions into a single hard-backed binder where they can be accommodated into 8-1/2" x 11" size. Material to be assembled as follows:
 - a. First Page -- Title of Job, Pump Station name and location, Owner, Address, Date of Submittal, Name of Contractor and Name of Engineer.
 - b. Second Page -- Index.
 - c. Third Page -- Introduction to First Section containing a complete written description of the system.
 - i. First Section -- Written description of system contents, where actually located in building, how each part functions individually, and how system works as a whole. Conclude with a list of items requiring service and either state the service needed or refer to the manufacturer's data in the binder that describes the proper service.
 - ii. Second Section -- A copy of each Shop Drawing with an index at the beginning of the section.
 - iii. Third Section -- A copy of each manufacturer's operating instructions with an index at the beginning of the section.
 - iv. Fourth Section -- A list of all equipment used on the job. Contractor's purchase order numbers, supplier's name and address.
 - v. Fifth Section -- A copy of each wiring diagram utilized in the installation.
 - vi. Sixth Section -- Copies of all tests, recordings, contractor tabulations and vendors reports, etc. A report summarizing all tests and tabulations described in these specifications shall be submitted to the Engineer indicating results of all final checks and tests.
 - vii. Seventh Section -- Copies of all warranties, approvals, etc.
 - viii. Eighth Section -- Complete set of electrical contract specifications and electrical contract design drawings reduced to 1/16" = 1'-0" and the Contractors setting and installation drawings, (as-builts). To be provided by the Electrical Contractor.
 4. Deliver to the Owner all special tools and appurtenances for proper operation and maintenance of the equipment provided and request receipt for same, and attach to the Contractor's request for final payment.
 5. Special Tools: The Contractor shall furnish all special tools necessary for the maintenance and repair of the mechanical equipment in this section. Two (2) sets shall be provided to the County.
 6. Supply of Lubricants: One (1) year supply of greases and lubricants based on the manufacturer's recommendations shall be furnished.

3.0 MATERIALS. Each Item covered in this section of the specifications shall be provided with adequate protection from damage during shipment and installation and until the Engineer certifies in writing that the pump station is operable.

A. Base Bid Provisions.

1. Provisions for any specified equipment and materials to be provided shall supersede the specifications if they are conflicting.

B. Manufacturer's Products.

1. Equipment performing the same work and of the same type and class shall be of the same manufacturer in order to simplify operation, maintenance and stock of spare parts.

C. Materials and Workmanship. All materials, supplies and equipment used in the manufacturer of items covered in this section of the specifications shall be new and high quality and of the best workmanship and design as dictated by current engineering practice for the types of service involved.

1. The burden of proof as to comparative quality and suitability of alternative articles or materials shall be upon the Contractor and he shall furnish at his expense, all information necessary and related thereto as required by the Engineer; provided, that the Engineer shall be the sole judge as to the comparative quality and suitability of alternative articles or materials and his decision shall be final.
2. The Contractor shall furnish satisfactory evidence as to kind and quality of materials used. All work of assembly construction, and installation shall be done in a neat, first-class, workmanlike manner, and the best standard practices shall be followed for this type of work.
3. Only non-corrosive material shall be specified and supplied in the wet well.
4. Standard Products: The equipment to be furnished under this specification shall be essentially the standard products in regular production by manufacturers regularly engaged in the production of high quality equipment of this type, and shall essentially duplicate, mechanically in performance, equipment that has been in satisfactory and successful operation for a period of at least five (5) years.
5. Where items and materials required under this contract, unless noted as required for base bid, are designated by proprietary name, the purpose of such designation is to specify standards of quality, workmanship, and performance and does not indicate a preference for this particular manufacturer's equipment. The Contractor may substitute items or materials from other sources provided that the substituted items or materials are of equal or better quality and the Engineer approves the substitution in writing.
6. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the equipment need not be the products of the same manufacturer.

7. Capacities: Capacities of all equipment and materials shall not be less than indicated.
8. Name Plates: Provide name plates on all equipment of the type listed in the following schedule:
 - a. Fusible and Non-fusible Disconnect Switches, Main and Branch.
 - b. Control Panels to include pump control panel
 - c. Control Devices
 - d. Junction and Pull Boxes
 - e. Transfer Switches
 - f. Lighting Transformers and Circuit Breaker Panels.
 - g. Fuse holders (fuse sizes)
 - h. Conduits (what wire and cable feeds)
 - i. Conduits labeling at points entering and exiting below grade
9. Lettering shall include name of equipment, horsepower, voltage rating and service designation. Label all boxes and enclosures as to the highest voltage present.
10. Nameplates shall be laminated phenolic with a white surface and black core. Use 1/16" thick material for plates up to 2" by 4". For larger sizes use 1/8" thick material.
11. Lettering shall be condensed Century Gothic font. The space between lines shall be equal to the width of the letters. Use 1/4" minimum height for letters that occupy four to the inch. Increase letter size to 3/4" on largest plates.

D. Pump Motor Construction.

1. Each pump shall be of the sealed submersible type, model, as specified in the project appendix, as manufactured by Hydromatic Pumps or Meyers Pumps.
2. The pump volute, motor and seal housing shall be high quality gray cast iron,.
3. The pump discharge shall be fitted with a standard ASA 125 lb. faced and drilled flange, of the same size as the discharge base elbow specified in the project drawings.
4. All external-mating parts shall be machined and Buna N Rubber O-ring sealed on a beveled edge. Gaskets are not acceptable.
5. All fasteners exposed to the pumped liquids shall be 300 series stainless steel.
6. The pump shall be painted after assembly, but before testing, with zinc chromate base primer and a waterborne hybrid acrylic/alkyd paint finish coat.

E. Pumping Capabilities.

1. Present operating conditions for each pump shall be as indicated in the project appendix and drawings.
2. Future operating conditions for each pump shall be as indicated in the project appendix.
3. Each pump shall be capable of handling a 3" spherical solid. The pump shall be non-over-loading throughout the entire range of operation without employing service factor, and shall reserve a minimum service factor of 1.20. The performance curve submitted for approval shall state in addition to head and

capacity performance the pump efficiency, solid handling capacity, and reflect motor service factor.

- F. Power Cord:** Electrical power cord shall be STW-A, water resistant 600V, 60 degrees Celsius, UL and CSA approved and applied dependent on amp draw for size. All electrical work at the wet well is hazardous NEMA 7 per NEC.
1. The pump shall be triple protected with a compression fitting and two epoxy potted areas at the power cord entry to the pump. A separation between the junction box area of the pump and the motor by a stator lead sealing gland or terminal board shall not be acceptable.
 2. The power cable entry into the cord cap assembly shall first be made with a compression fitting. Each individual lead shall be stripped down to bare wire at staggered intervals, and each strand shall be individually separated. This area of the cord cap shall then be filled with an epoxy compound potting which will prevent water contamination to gain entry even in the event of wicking or capillary attraction.
 3. The power cord leads shall then be connected to the motor leads with extra heavy connectors having brass inserts with a screwed wire-to-wire connection, rather than a terminal board that allows for possible leaks. All cord sets shall contain a green carrier ground connector attached to the motor frame.
 4. The connection box wiring shall be separated from the motor housing wiring by stripping each lead down to bare wire at staggered intervals, and separating each strand. This area shall be filled with an epoxy compound potting. Fiberglass terminal boards which are subject to heat fatigue and cracking, and which may lead to possible leaks shall not be acceptable.
 5. The cord cap assembly where bolted to the connection box assembly and the connection box assembly where bolted to the motor housing shall each be sealed with a Buna N Rubber O-ring on a beveled edge to assure proper sealing.
- G. Motor:** The stator, rotor and bearings shall be mounted in a sealed submersible type housing. The stator windings shall have Class F insulation (155 degrees Celsius or 311 degrees Fahrenheit) and a dielectric oil filled motor, NEMA design. Thermal sensors on the windings shall provide further protection.
1. Pump motor shall be equipped with thermal sensors. The thermal sensor shall be a low resistance, bi-metal disc that is temperature sensitive. It shall be mounted directly on the stator windings and sized to open at 120 degrees Celsius and automatically reset at 30-35 degrees Celsius, differential. The sensors shall be normally closed and connected in series with the motor starter coil so that the starter shall stop the motor on unusually high winding temperatures. All actuated thermal sensors shall also send a signal to the telemetry I/O for transmission to the County's SCADA system.
 2. The pump and motor shall be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump shall not require cooling water jackets.

3. Each motor shall be suitable for operation at the voltage specified in the project appendix, 3-phase service.
4. Stators shall be securely held in place with a removable end ring and threaded fasteners so they may be easily removed in the field without the use of heat or a press. Stators held by a heat shrink fit are not acceptable. Stators must be capable of being repaired or rewound by a local motor service station.
5. Units, which require service only by the factory, shall not be acceptable. No special tools shall be required for pump and motor disassembly.

H. Bearings and Shaft. An upper radial bearing and a lower thrust bearing shall be required.

1. These shall be heavy-duty single row ball bearings that are permanently lubricated by the dielectric oil, which fills the motor housing.
2. Double row, sealed grease packed bearings shall not be acceptable. Bearings that require lubrication according to a prescribed schedule are not acceptable.
3. Bearings shall have an ANSI L-10 life of 40,000 hours for the impeller diameters supplied. Bearings shall be locally available.
4. The shaft shall be machined from a solid 400 series stainless steel forging and be a design which is of large diameter with minimum overhang. Shaft deflection shall be limited to 0.002" at the face of the stuffing box for the impeller diameters supplied.

I. Seals. The pump shall have two mechanical seals, mounted in tandem, with an oil chamber between the seals.

1. The rotating seal faces shall be carbon and the stationary seal faces shall be ceramic.
2. The lower seal shall be replaceable without disassembly of the seal chamber and without the use of special tools.
3. Pump-out vanes shall be present on the backside of the impeller to keep contaminants out of the seal area. Seals shall be locally available.
4. The pump shall be equipped with a seal leak detection probe and warning system. This shall be designed to alert maintenance personnel of lower seal failure without having to take the unit out of service for inspection or requiring access for checking seal chamber oil level and consistency.
5. There shall be an electric probe or seal failure sensor installed in the seal chamber between the two tandem mechanical seals. If the lower seal fails, contaminants that enter the seal chamber shall be detected by the sensor and send a signal to operate the specified warning device.
6. Units equipped with opposed mechanical seals are not acceptable.

J. Impeller. Impeller shall be of the two-vane, enclosed non-clogging design and have pump out vanes on the front and backside of the impeller to prevent grit and other materials from collecting in the seal area. Single vane design impellers are not acceptable.

1. Impeller shall not require coating. Attempts to improve efficiency by coating impeller shall not be acceptable.
2. Impellers shall be dynamically balanced.
3. The impeller shall be slip fit to a tapered shaft and key driven. A 300 series stainless steel washer and impeller bolt shall be used to fasten the impeller to the shaft. Straight end shafts and/or threaded shafts for attachment of the impeller shall not be acceptable .
1. A volute case-wearing ring shall be provided to minimize impeller wear. The wear ring shall be alloy 230 brass and held by 300 series stainless steel fasteners. The wear ring shall be easily replaceable in the field. Wear rings of any other material shall not be acceptable.

K. Serviceability: The complete rotating assembly shall be capable of being removed from the volute without disturbing the suction piping, discharge piping, and volute.

1. The motor housing, seal housing with seal plate and impeller still attached to the shaft shall be capable of being lifted out of the volute case from the top as one assembly.
2. A stainless steel lifting bale shall be provided for each pump.

L. Hatches. A double-leaf, channel-frame aluminum access door with size of minimum clear opening specified in the drawings, shall be provided for the wet well. The final size and location of the wet well access door shall be closely coordinated with the pump manufacturer so as to assure that the pumps supplied will have the ability to be pulled for maintenance.

1. Two (2) single-leaf, channel-frame aluminum access doors with minimum clear opening sizes specified in the drawings shall be provided for the valve vault.
2. The wet well and valve vault access doors shall be reinforced to support a minimum live load of 300 psf with a maximum deflection of 1/150th of the span.
3. Operation of the doors shall be smooth and easy with controlled operation throughout the entire arc of opening and closing. Operation of the door shall not be affected by temperature.
4. Entire door, including all hardware components, shall be highly corrosion resistant. 316 Stainless Steel hardware shall be provided for all doors. Stainless steel hardware shall include all parts of the latch and lifting mechanism assemblies, hold open arms and guides, and all brackets, hinges, pins and fasteners.
5. The cover shall be 1/4" (6.3 mm) aluminum diamond pattern.
6. The channel frame shall be 1/4" (6.3mm) extruded aluminum with bend down anchor tabs around the perimeter. A continuous EPDM gasket shall be mechanically attached to the aluminum frame to create a barrier around the entire perimeter of the cover and significantly reduce the amount of dirt and debris that may enter the channel frame.
7. Access doors may be required in contract drawings to be gasketed and watertight.

8. Hinges shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamper-proof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.
9. Provide a 1-1/2" (38mm) drain coupling located in the right front corner of the channel frame or at a location designated by the Engineer.
10. Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate.
11. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.
12. Stainless steel hinges, each having a minimum 1/4" (6.3 mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.
13. Cover shall be equipped with a hold open arm, which automatically locks the cover in the open position. Cover shall be fitted with the required number and size of compression spring operators. Springs shall have an electrocoated acrylic finish. Spring tubes shall be constructed of a reinforced nylon 6/6-based engineered composite material.
14. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover. Hardware shall be anticorrosion throughout. The guide rail shall attach to the access frame assembly with 300 series stainless steel fasteners.
15. Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
16. All access doors shall be pad-lockable. The contractor shall provide locks manufactured and keyed to the County standard locks.
17. Access frames and covers for the wet well and valve vaults shall be Type J as manufactured by the Bilco Company, New Haven, Connecticut, Type TPD by USF Fabrication or approved equivalent.
18. Safety grates over all hatch openings shall be provided. These shall be constructed of 6061-T6 aluminum, 300 psf rating, shall be powder coated safety orange, have a permanent hinge allowing grates to be locked in a 90° position, and shall provide fall protection that must be in place before access hatch can be closed. Additionally, the exposed perimeters of wet well and valve vault top slabs shall be painted with marking paint specified as specified herein.

M. Precast Concrete Wet Well and Valve Vault.

All precast reinforced concrete chambers shall be of the best quality of concrete, free from imperfections of any kind and shall have a smooth, dense finish. All enclosures shall be true in shape and dimension.

1. All protruding hardware/rings for handling/rigging shall be removed.
Remaining cavities and lift holes shall be plugged with non-shrink grout and smoothly finished to conform to surrounding concrete surface shape/profile.
2. The wet well is classified as a Hazardous Area and all electrical work and equipment shall be explosion-proof per NEC's Class I, Division 1 regulations.
3. The wet well and valve vault shall be sized as indicated on the contract drawings and include piping for pumps as indicated and specified.
4. All concrete shall have an ultimate compressive strength of 5,000 psi at 28 days, unless noted and conform to ODOT Section 511 for Class QC 1 concrete.
Reinforcing steel shall be deformed bars complying with ODOT Section 509 and minimum $F_y = 60,000$ psi.
5. Reinforced Precast Concrete structures are dimensioned in the detail drawings.
6. All joints shall be watertight. Inside joints shall be smooth. Details of pipe through manhole walls shall be submitted to the Engineer for approval prior to commencement of construction.
7. Tar strips meeting hydrostatic performance set forth in ASTM C-990 shall be installed at all manhole joints. Acceptable products shall be Con Seal CS-102 or approved equal.
8. The Contractor shall also apply an exterior joint sealer to each joint, meeting the requirements of ASTM C877. Acceptable manufacturers shall be MacWrap External Collar by Mar Mac Construction Products Co. Inc., EZ-wrap by Press Seal Gasket Corporation or CS-212 by Conseal Concrete Sealants, Inc. The Engineer shall approve the sealer installation after application and prior to backfilling.
9. Wet Well and Valve Vault Covers shall also be precast units as shown on the drawings and shall conform to the latest revision of the ASTM C478.
10. Bases shall be precast as a single unit and conform to the dimensions shown on the Contract Drawings. Bases shall be complete with a short riser section of the appropriate diameter concrete with embedded rebar anchors as indicated in the Contract Drawings.
11. Covers shall consist of a precast concrete slab to the dimensions shown on the Contract Drawings. The covers shall be cast so that they can fit over the wet well chamber and form a watertight seal.
12. Wet wells and valve vaults shall be pre-cast concrete and vented to the outside as shown on the contract drawings.
13. A flush, floor mounted davit/retrieval sleeve shall be installed on the wet well and valve vault per plan or as directed by the Engineer. Sleeve shall include a cap to seal off the receiver hole when not in use. The sleeve shall be model DSS-C1 as manufactured by Pelsue or approved equal through shop drawing review.
14. A steel D-ring anchor plate shall be provided and installed per plan or as directed by the Engineer. Anchor plate shall be model COP01 as manufactured

by Frontline, or approved equal. The type and location of anchor plate shall be submitted with the shop drawings.

N. Ductile Iron Piping and Fittings.

1. All ductile cast iron pipe and fittings, inside and outside the wet well and valve vault as shown on the contract drawings, shall be Class 52 minimum in thickness, in conformance with Item 11 "Ductile Iron Pipe and Fittings". All fittings supplied shall be compact body fittings.
2. A ductile iron spool piece and county approved fittings shall be installed in each force line between the check valves and the plug valves.
3. Use a 12-inch spool piece minimum for 4-inch diameter piping and an 18-inch spool piece minimum for 6-inch diameter or larger piping.

4.0 EXECUTION. The Contractor shall provide all labor, materials, equipment and tools necessary to provide and install valves as shown on all detailed drawings and specified herein.

A. Existing Wet Well (If Applicable).

1. The Contractor shall furnish all materials and equipment to properly take out of service the existing pump station and bypass all flow around the pump station to the existing sanitary system. The discharge of any water containing sanitary sewage to storm sewers or streams shall not be permitted.
2. When bypassing of the flow is required for the completion of the required electrical work, the Contractor shall maintain the flow bypass for up to 30 days after the completion of his work as part of this Item.

B. General Ancillary Considerations.

1. Water shall be removed from the excavation and the excavation maintained "dry" during construction of the pump station and during the time required for the concrete to develop sufficient strength to resist rupture by groundwater pressure.
2. Excavation and backfilling shall be in accordance with Item 1 of these specifications.
3. Compacted granular backfill per Item 6 shall be used where indicated on the drawings. Cost of granular material shall be included in Item 28 pump station.
4. Backfill and final grading shall be performed in such a manner that upon completion, there will be no ponding of water at the pump station site.
5. After completion of the pump station all debris and other loose material shall be removed from the basin.
6. All lifting holes shall be filled with a non-shrink grout conforming to the existing chamber wall. All protruding hooks or straps are to be removed prior to grouting. Any coatings applied to the enclosure shall be field applied to the repaired areas after they are properly set.

7. Drain from valve vault to wet well shall be fitted with an approved P-trap. The top of the trap shall be located below the elevation of the valve vault.

C. Pump Storage.

1. Pumps and their electrical components can become damaged and require frequent maintenance and/or their operating life may be shortened if pumps and pump cords are subjected to moisture prior to startup of the pump station. Therefore, pumps and their electrical components shall be stored indoors in dry conditions and not within the wet well.
2. Contractor shall not install pumps in the wet well until wet well construction or rehabilitation is complete, the new or existing wet well is dewatered, the wet well is cleaned, the pump station is ready for startup, and the Engineer has released, in writing, the pumps for installation.
3. Failure by the Contractor to obtain a written release from the Engineer in a timely manner will not constitute extension of the project's completion date.

D. Demolition.

1. All removed piping, valves, and pump-lifting systems shall be disposed of properly by the Contractor according to contract provisions. The removed pumps shall be cleaned and carefully stored for reinstallation or salvage by the County. Deliver salvaged pumps to the Engineer at 1701 Mahoning Road N.E., Canton, Ohio 44705.

E. Pump Station Conditions.

1. See Appendix 'A' to this item. Unless otherwise noted in the plans or appendix, the pumping arrangement is a parallel, duplex for conveying raw sewage at a liquid temperature of 0.50-25 degrees Celsius.
2. Future operating conditions for each pump shall be the same as existing. Contractor shall provide a spare pump, complete for current design conditions, for each lift station. The supplied spare pump will be ready for installation and include both cabling with connector as well as a compatible flange for connection with the station's pump base.

F. Access hatches.

1. Hatches shall be sized to fit in clear openings of structures as detailed in the contract drawings.

G. Guide Rails.

1. The guide rail used to direct the pump to set in proper alignment with the stationary discharge piping for all pumps is a two-rail guide. The two-rail system shall be a non-corrosive 2-inch diameter stainless steel guide rail system.
2. All guide rails shall be supported against the wet well wall with stainless steel bracing and hardware at spacing required by the manufacturer. Dual rail or single rail systems utilizing other metal materials such as galvanized piping are not acceptable.

3. The pump shall be automatically connected to discharge connection elbow when lowered into place, and shall be easily removed for inspection or service.
4. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a single down and in motion of the pump, with no need for personnel to enter the wet well. Where wet well is more than 9'-6" deep, intermediate rail braces shall be furnished.
5. The guide rail system shall be:
 - a. Metal-To-Metal (M-T-M) 2" stainless steel guide rail system as specified by Pentair/Hydromatic.
 - b. When head pressures exceed manufacturer's recommendations for MTM systems, rail system model TL44HH or approved equal shall be used.
 - c. Guide bracket and connector details:
 - i. A sliding guide connector shall be an integral part of the pump unit.
 - ii. No other carrier shall be required.
 - iii. The sliding guide connector shall be 300 series stainless steel wire formed.
 - iv. The downward sliding action of the rod shall clean the arms of any sewage debris & align the sealing flange.
 - d. Pump Lifting Provisions: Contractor shall supply for each pump a lifting lug/bracket assembly to provide method for pulling pumps in accordance with SCMSD operations.
 - i. Lifting bracket shall be manufacturer's standard model for pump supplied.
 - ii. Lifting bracket lug shall be stainless steel.

H. Support. Though the pump may not require feet to support the unit while installed, the pump volute must have feet to support the unit when removed for service. Units that do not have feet upon which the unit can be supported when removed for service shall not be acceptable.

I. Discharge Base Elbow.

A discharge base elbow shall be furnished. The discharge base elbow shall rest squarely on the floor of the pump well and be securely anchored to the floor. Units that require a separate concrete or fabricated structure in order to elevate the base elbow above the pump well floor are not acceptable.

1. The base elbow shall be equivalent to the steel pipe size as approved by the Engineer. The elbow shall be at 90 degrees with a standard 125-lb. flange faced and drilled on the outlet side and an inlet flange faced only.
2. The inlet side shall have the flange face sprayed with corrosion resistant and abrasion resistant molten zinc. The base elbow shall be painted with one coat of corrosion resistant zinc chromate enamel.
3. Ductile iron piping in valve vaults shall be centered 18" to 36" from floor of valve vault with the type of pipe stands shown in the Contract Drawings.
 - a. Manufacturers include Standon (Manufactured by Material Resources, Inc.), Model S92 or approved equal.

J. Access Frames and Doors. The Contractor shall furnish all materials, labor, and equipment necessary to completely install aluminum access frames and door hatches.

1. The access doors shall be pre-assembled from the manufacturer in accordance with project plans.
2. The Contractor shall check as-built conditions and verify the manufacturer's access door details for accuracy to fit the application prior to fabrication.
3. The Contractor shall comply with the access door manufacturer's installation instructions. The Contractor shall furnish mechanical fasteners consistent with the access door manufacturer's instructions.

K. Operation.

1. Under start up conditions on sump level rise, the low-level shutdown switch shall first be energized, then the lead pump off switch shall be energized, followed by the lead pump on switch. This action would start the lead pump.
2. With the lead pump operating, the sump level should lower to the lead pump off switch setting and pump should stop.
3. The alternating relay should index on stopping of the lead pump so that the lag pump will start on next operation. If level continues to rise, the lag pump on switch shall energize and start lag pump, which will pump to the lead pump turn-off setting. If one pump should fail for any reason, the second pump shall operate on the lead control.
4. All level switches shall be adjustable, for level setting, from the surface.

L. Valves.

1. Check valves and plug valves shall be provided as specified under Item 27 in these specifications. The cost of all valves shown within the wet well, valve vault or other vaults/structures proposed shall be included in the lump sum price bid for the lift station.
2. Valve vault pressure gauge taps & piping.
 - a. Pressure gauges (digital) are not part of this contract. However, 1/4" diameter black, NPT piping, brass ball valve, elbow, and pneumatic quick coupler and female plug end shall be installed for each force line in the valve vault.

5.0 ELECTRICAL. All pump station site electrical components and installation shall conform to Item 29. Specific pump related items are detailed below.

A. General. The Electrical Contractor shall install the pump control panels and level controls for pump operation. Furnishing and installing the electrical equipment rack and its equipment, electrical wiring, and on-site generator shall be the responsibility of the Electrical Contractor in accordance with other sections of these specifications.

B. Arc Flash.

1. Service equipment shall be legibly marked in the field with the maximum available arc fault current. The field markings shall include the date the fault current calculation was performed and be of sufficient durability to withstand the environment involved, NEC 110.24 Available Fault Current-(A) Field Marking & NEC 110.3 (A) suitability). A warning label per NFPA 70E latest version shall be applied showing the hazard level in cal/cm².
2. The working space flash boundary for each panel shall be delineated by a 3" wide latex acrylic paint application. The coating product shall be designed for asphalt surfaces and be applied per manufacturer's instructions. Acceptable products include M58 Safety & Zone Marking Latex by Benjamin Moore, Pro Park Waterborne Traffic Marking Paint by Sherwin Williams, or approved equal.

C. Outdoor Control Boxes.

1. Outdoor control boxes required in this section shall be part of the pump package provided by the Contractor and will be installed and wired by the Electrical Contractor. All outdoor control boxes shall be NEMA 4X Stainless Steel.
2. All outdoor boxes must be lockable and have a stainless steel hasp and hardware for a padlock to be mounted after box installation. The contractor shall provide padlocks manufactured and keyed to the County standard locks. All disconnects supplied must have the ability to be padlocked in all positions.
3. Maximum height of all working enclosures shall be 78" when mounted. No perforations are allowed in the top of any box. Provide a minimum 3' clear space around the installed control boxes. Provide Hoffman, Enviroline Series or equal, with 3-point latching mechanism, screwdriver latches, and padlocking handle.

D. Pump Control Panel.

1. The pump control panel shall be part of the pump package provided by the Contractor and will be installed and wired by the Electrical Contractor. The Pump control panel shall have a NEMA 4X stainless steel enclosure and shall be dead front with separate removable inside panel to protect electrical equipment.
2. Free space equal to at least 20% of the total interior area shall be provided for future upgrades or additional electrical equipment.
3. A lock hasp shall be provided on outside door.
4. Panel shall be a hand assembled panel of component parts by Custom Control Technologies, Hydromatic, Ohio Electric Control, USEMCO or approved equal. Solid State panels are not acceptable.
5. Removable/replaceable solid-state component parts of the panel are allowed. All relays in the control panel shall be 8-pin octal based. Mini-relays are not acceptable. Panel shall meet the requirements of UL 508 for explosion proof environments. One-line schematic shall be furnished with panel.

E. Main Circuit Breaker.

1. The control panel shall have a 600 VAC, 3-pole, thermal-magnetic main circuit breaker with a minimum 25,000 AIC rating of the amperage shown on the contract drawings.
2. The main breaker shall be operated by a flange-mounted handle and operating mechanism. Thermal/magnetic molded-case circuit breakers shall be Eaton FD, Square D HG series or approved equal.
3. The enclosure door(s) shall be mechanically interlocked with the main circuit breaker operating mechanism to prevent the door(s) from being opened with the main circuit breaker "on". A mechanical override of this interlock shall be provided for maintenance purposes. The operating mechanism shall be pad-lockable in the "off" position. All equipment furnished shall be NEMA rated. No I.E.C. rated components are acceptable.

F. Variable Frequency Drives.

1. A solid state Variable Frequency Drive (VFD) motor drive shall be furnished for each pump motor. Solid state drive shall be designed to provide capability to prevent excessive hydraulic and electrical surges.
2. Drive shall also be capable of adjustment of the ramp-up and ramp-down time period. Solid state motor starter shall be Yaskawa IQ Pump 1000 or approved equal.
3. Provide resettable circuit breaker overcurrent protection device for each individual pump and control device. Sizes shall be in compliance with the NEC and allow for motor in-rush and operation. An operating mechanism shall penetrate the control panel door, and a pad-lockable operator handle shall be secured on the exterior surface.
4. Provide harmonic filter and line reactors at the input of the drive as required to reduce harmonic distortion as required and to eliminate nuisance tripping. Line reactors rated for load conditions and supplied with appropriate integral-mounted terminal block or box lug terminations. Filter shall consist of a 5% impedance input reactor and passive filter tuned to the fifth harmonic.

G. Motor Circuit Protector (MCP) circuit breakers and 3-phase, ambient-compensated overload relays in accordance with the plans and applicable code requirements, shall be supplied for each pump.

1. All solid-state overload relays shall be NEMA rated, Class 14 as manufactured by Siemens & Furnas Controls, or approved equal. MCP circuit breakers shall be magnetic trip only.
2. Motor Circuit Protectors shall be ESP 100 Series full voltage starter Model No. 14ESF32AA as manufactured by Siemens-Furnas, or approved equal.
3. The panel enclosure shall use a Hoffman cooling fan model No. A4AXFN, grille model No. TG4SS, filter replacement package(Type 1), and shroud kit T4S3RSS over each enclosure opening or approved equal.

H. Pump Controls.

1. A solid-state alternating relay shall be provided in the pump control panel to alternate pumps on each successive cycle of operation. The alternating relay shall be Time Mark Model 261ST-120, or approved equal.
2. Level control shall be accomplished by an electronic programmable controller system, MPC Junior Pump Controller (MPCJR) manufactured by Mercoid/Dwyer.
3. For each pump in the pump panel, oil-tight switches and pilot devices shall be provided as follows:
 - a. one (1) three-position H-O-A switch labelled ("Hand-Off-Auto")
 - b. one (1) Running Time Meter Non-Resettable Type 0-99999.9 minutes,
 - c. one (1) green push-to-test run light
 - d. one (1) red push-to-test seal fail light
 - e. One (1) elapsed run time meter shall also be provided to indicate the amount of time all pumps have run concurrently.
4. Elapsed time meters supplied shall have a reading range from zero to 99999.9 minutes at an operating temperature range of -4 degrees Fahrenheit to 131 degrees Fahrenheit.
 - a. Run time meters shall be: Cramer Company Model 635G, 120V 60Hz non-resettable (Not resettable to zero.) or approved equal.

I. Relays.

1. All intrinsically safe relays shall be mounted on a painted steel back panel in a 12"x12"x6" minimum NEMA 4X stainless steel enclosure:
2. Hoffman A1212CHNFSS & A12P12, ISO-120-AFA by Diversified Electronics or approved equal
3. Enclosure is then to be mounted outside the panel enclosure. No intrinsically safe relay is required for the second high water float, which is connected directly to the telemetry panel. ISR's shall be identified by labels stating their function.
4. All relays in the control panel shall be 8-pin octal based. Mini-relays are not acceptable.

- J. Pump Control Panel Terminal Strips/Blocks.** Terminal strips/blocks as manufactured by Marathon Special Products or approved equal, shall be provided for connecting pump power and control wires. Additional contacts, control and time delay relays, and terminals shall be provided to connect alarm, heat sensors and seal failure wires; provide contacts and connections for "Pumps Failure" and "Power Failure" to the panel.

K. Pump Control Panel – Transformers.

Control power transformers shall be supplied to provide 115-volt control circuit power when using 480 or 575-volt service.

1. One (1) transformer shall be provided for use with the pump control circuits.
2. One (1) transformer shall be provided to the telecommunications radio.
 - a. Each transformer shall have: one fuse in each of the primary & secondary; side leads & the other secondary lead grounded.

- i. Approved manufacturers include; Micron, Emerson (EGS) or approved equal.

L. Pump Control Panel Phase Monitors. Two (2) Time Mark Octal Base Phase Monitors Model 258B, or approved equal, shall be provided;

1. One (1) Phase Monitor on incoming power for telemetry.
2. Separate fused disconnects are required for phase monitor on incoming power.

M. Pump Control Panel Surge Suppressors.

1. Two (2) transient voltage surge suppressors (TVSS) shall be installed (in the motor control panel and also per plan or as directed by the Engineer); as manufactured by Innovative Technology PTX Series, Surge Suppression Inc., SSM Series or approved equal.
2. Install as indicated on the electrical power distribution diagram. (Motor control panel is supplied by the pump supplier and includes the TVSS shown on the one line diagram.)

N. Pump Control Panel - Light And Box Heater.

1. A LED light equivalent in brightness to a 60-watt incandescent light shall be provided inside each control panel for visibility at night.
2. Provide a heater of adequate size with a thermostat control inside each motor control panel. Provide wiring and schematic diagrams for approval. Preferred manufacturers include; Hammond Manufacturing Model FLHTF200A115, or approved equal.

O. Pump Control Panel Receptacles, Fuses, And Wire. Specified GFCI receptacles are to be mounted outside the control panel in a weatherproof housing. The control transformer is not to be used for GFCI receptacle.

1. All fuse holders shall be labeled as to type and size rating of fuse.
2. All stranded wire must have the ends "tinned" for insertion into the connector blocks.

P. Power Supply Wiring . To be supplied by the Electrical Contractor on this Project. See Item 29.

Q. Sump Level Controls.

1. The method of controlling sump level shall be by an Ametek Level Model 575PB00115RLS-100 submersible level transmitter. The following shall be included:
 - a. surge protection,
 - b. 100 ft. of cable, cable supports with standard nut/cable electrical connection, relays, 4-20mA meter output.
2. One alarm float switch will hang in the wet well supported by a stainless steel float support bracket mounted near the top of the wet well and within easy access from wet well doors as shown on the detailed plans. The stainless float

support bracket shall be supplied as part of the pump package and shall be installed by the Contractor. The float shall be hung and positioned by the Contractor. The mounted stainless steel bracket shall be as manufactured by Conery Mfg., Inc. or approved equal per plan.

3. The (1) avocado style float switches, N.O., is as follows and marked at float bracket and at midget connector:

FLOAT	SIGNAL	WIRE COLOR CODE
One	Alarm control and Activate high water flasher	Two blue stripes

- a. Float shall be a redundant “unpowered” float switch supplied for high water alarm that shall be connected to the telemetry system and powered only by the telemetry system.
- b. This float will send alarm if all power is lost. (Telemetry System has a battery backup.)
- c. Float switches shall be Conery Manufacturing Mechanical Model #2900, or approved equal.
- d. Pump cords shall be loosely wrapped around float bracket per plan, in wet well. All pump and float cords must be labeled and identified.
- e. Pump and control cords shall use watertight pin and sleeve devices with locking rings rated for full load amps. These devices shall be Hubbell products or approved equals. The devices are listed below.

POWER CORD	DEVICE
0<60 amps	HBL460P7W HBL460R7W
>60 amps	HBL4100P7W HBL4100R7W
FLOAT CORDS	DEVICE
FLANGED INLET	HBL7467
MIDGET CONNECTOR	HBL7464V
CONTROL CORDS	DEVICE
PLUG	HBL520P7W
RECEPTACLE	HBL520R7W

4. Control/power pigtails/splices are not acceptable.
5. The Contractor shall verify with the Engineer the length of cord required. All excess cord shall be secured outside the wet well. Cord openings in wet well top shall be large enough to permit the removal of the largest connector without removing or damaging the other cords.

6. Cord strain relief shall be lace up type. Provide stainless steel Kellems type Grips & Anchors for all cables.
7. All equipment listed under sump level controls shall be supplied even when there is no work to be performed in the wet well.
8. All work and equipment entering/exiting the Wet Well shall be Explosion-proof per NEC's Class I Division 1 regulations.

R. Alarm.

1. A high water alarm light shall be supplied with a separate NEMA 4X stainless steel enclosure to be mounted above the pump station control panel.
2. The Alarm light shall be mast mounted at a height above the top rail of fence.
3. The Alarm light shall glow dim at all times except under alarm conditions.
 - a. Under alarm conditions, the light shall glow bright and flash.
 - b. Provide a red Flashing Alarm Light package including a 25-Watt lamp inside of a red flanged and gasketed Lexan lens, Model RL-3K, by Ohio Electric Control or approved equal.
4. The alarm light shall be supplied as part of the pump package and will be installed and wired by the Electrical Contractor.

6.0 QUALITY ASSURANCE.

A. Spare Parts. As part of this specification the Contractor shall provide to the Owner the following spare parts and/or equipment. All spare parts and/or equipment shall be included as part of the unit pricing as indicated below and NO separate payment shall be made for spare parts and/or equipment.

1. Pump. The Contractor shall supply one (1) additional pump complete, including hydraulic sealing flange and any other appurtenances necessary for pump installation/operation in accordance with all above material specifications.
 - a. In the event the specification covers multiple lift station sites/locations a spare pump "complete" shall be provided for each site as specified above in Section 03 "Materials"
2. Level Transducer. A spare transducer unit complete with cable for County inventory purposes for each wet well installation under this contract/project shall be provided.
 - a. In the event the specification covers multiple wet well sites/locations a transducer shall be provided for each site/location in accordance with the above material and installation specifications.
3. Steel D-Ring Anchor Plate. A spare steel D-ring anchor plate shall be provided for County inventory and placement purposes for valve vault and/or wet well purposes.
 - a. In the event the specification covers multiple wet well/vault sites and/or locations a steel D-ring anchor plate shall be provided for each location in accordance with the above material specifications.

B. Testing.

1. The completed pump station shall be adjusted and tested by both the electrical and general contractor in accordance with the recommendations of the equipment manufacturers' and the requirements of this Section. At least 48 hours advance notice shall be given to the Engineer prior to final testing of the station.
 - a. Testing of the station shall include determination of discharge pressure and pumping rate of each pump, including the spare, by timing the pump down (of clear water as determined by the Owner) between the specified turn on and turn off levels, measurement of the loaded current drawn by each pump motor and verification of all control and alarm functions.
 - b. The contractor shall provide an adequate supply of water in the shortest time possible for several pump cycle tests. Insulation resistance of each motor shall be measured at 500 volts DC and recorded.
2. The pump shall be visually inspected to confirm that it is built in accordance with the specification as to HP, voltage, phase and hertz.
3. The motor seal and housing chambers shall be meggered for infinity to test for moisture content or insulation defects.
4. Pump shall be allowed to run dry to check for proper rotation.
5. Discharge piping shall be attached; the pump submerged in water and amp readings shall be taken in each leg to check for an imbalanced stator winding. If there is a significant difference in readings, the stator windings shall be checked with a bridge to determine if an unbalanced resistance exists. If so, the stator shall be replaced.
6. The pump shall be removed from the water, meggered again, dried and the motor housing filled with dielectric oil.
7. Testing of the concrete shall conform to ASTM C478.
8. The pump manufacturer shall provide the services of a factory-trained representative to check installation, perform initial start-up, and instruct the Owner's personnel in the operation and maintenance of all the equipment included at the station for a minimum period of one (1) day per station.

C. Observation.

1. SCMSD designated representative will visually observe the work performed. The representative will notify the Engineer of any discrepancies with the contract documents in the course of the contractor performing the work. The progress observations by the SCMSD do not waive any rights or remedies, nor divest the Contractor of any responsibility for contract compliance or liability for damage.

D. Warranty.

1. Manufacturer shall guarantee hatches against defects in material and workmanship for a period of twenty-five (25) years from the date of purchase. Should a part fail to function in normal use within this period, the manufacturer shall furnish a new part at no charge.

2. The contractor shall guarantee in writing for one (1) year from date of start-up that all lift station equipment furnished by them shall be free from fault in design, material and workmanship. The Contractor shall furnish a replacement for any component, which proves defective during the guarantee period, except such items, which are normally used in service such as oil, grease and pump seals, without cost to the Owner.
3. In addition to the manufacturers standard warranty, a two-year warranty shall be provided covering the pump and control panel. The warranty period shall be two years from the date of shipment on all equipment including the control equipment. Warranty shall include but not be limited to the pumps': mechanical seal, impeller, pump housing, wear rings, ball bearings, rotor and stator, and power cord. All components of the control panel shall be included in this warranty.
4. The warranties shall be in printed form and apply to all similar units. Supply warranties with shop drawing submittal.

7.0 MEASUREMENT. The unit of measurement shall be the actual number of lift stations and all ancillary equipment specified herein and referenced in project specific appendices, except those as paid under other items.

8.0 PAYMENT.

The lump sum price stipulated for the Lift Station shall include furnishing and installing of all items described herein and/or shown on the contract drawings complete and ready for continuous operation.

<u>Item</u>	<u>Unit</u>	<u>Description</u>
28	LS	Lift Station, Complete

END OF SECTION