



1. GENERAL

1.1. DESCRIPTION

2. The scopes of work discussed below are intended to capture all tasks necessary to allow for bidding and construction of the proposed projects. However, the potential does exist for necessary tasks to be omitted from the scope of work provided. **Proposers are encouraged to identify in their proposal any additional tasks (incl. pricing) they feel would be necessary to complete the project.**

3.

- A. Work included: Provide irrigation system where shown on the drawings and as specified herein complete in place, tested and approved, including, but not necessarily limited to:
1. Required Demolition, Removals, and Excavation, off-site disposal, and dust mitigation per **Exhibit J**.
 2. All irrigation supplies per Exhibit K which includes but not limited to Sprinklers, Valves, Pipe, Flow sensors, Wire and Decoders, Controller and Pedestal, PVC fittings, Misc. Glue and Primer, Quick Couplers, Filter House/Screens Per **Exhibit F, G and H**
 3. Pump House Per **Exhibit F and G**
 4. Electrical Munro Pump Station Per **Exhibit C, F, G**
 5. Sediment Box per **Exhibit H**
 6. Boring per **Exhibit J, Section 2.3 Trenching and Backfilling**
 7. General Conditions
 8. Mobilization/Mobilization
 9. Contractor Overhead and Profit as a percentage
 10. Owners allowance 10% of bid
- B. Site Control
Provide fencing and signage to protect the construction site and to protect the community from hazards that may exist during construction.

3.2. QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are entirely familiar with the specified requirements and the methods needed for the proper performance of the work of this Specification.

3.3. SUBMITTALS

- A. Product data: After the Contractor has received the Owner's Notice to Proceed, submit:
1. Materials list of items proposed to be provided under this Specification.
 2. Manufacturer's specifications and other data are needed to prove compliance with the specified requirements.
 3. Manufacturers' recommended installation procedures used on the work.
 4. Record drawings of the complete system.



1.4 TIMELINE

- i. Project Start Date: February 1st, 2022
- ii. Pump and Intake Completion Date: April 30th, 2022
- iii. Pump House Completion Date: May 15th, 2022
- iv. Removal of Old System Completion Date: May 15th, 2022
- v. Project Completion Date: September 21st, 2022
- vi. Test Date: October 1st, 2022

1.5 DEMO

1. Work included: Carefully demolish and remove from the site those items scheduled to be demolished and removed.
2. Comply with all applicable local, state and federal requirements regarding materials, methods of work and disposal of excess and waste materials.
3. Obtain and pay for all required inspections, permits and fees. Provide notices required by governmental authorities.
4. Locate, protect and maintain benchmarks, monuments, control points and project engineering reference points. Re-establish disturbed or destroyed items at Contractor's expense.
5. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks and other adjacent facilities.
6. Obtain governing authorities written permission when required to close or obstruct street, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities.
7. Protect existing buildings, paving and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items at Contractor's expense.
8. Protect and maintain street lights, utility poles and services, traffic signal control boxes, curb boxes, valves and other services, except items designated for removal. Remove or coordinate the removal of traffic signs, etc. with the applicable governmental agency. Provide for temporary relocation when required to maintain facilities and services in operation during construction work.

1.5.1 Execution

- A. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed.
- B. Visit the site with Owner and verify the extent and location of selective demolition required.
 1. Carefully identify limits of selective demolition.



2. Mark interface surfaces as required to enable workmen also to identify items to be removed and items to be left in place intact.
- C. Prepare and follow an organized plan for demolition and removal of items.
 1. Shut off, cap and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction.
 2. Completely remove items scheduled to be so demolished and removed, leaving surfaces clean, solid and ready to receive new materials specified elsewhere.
 3. In all activities, comply with pertinent regulations of governmental agencies having jurisdiction.
- D. Demolished material shall be considered to be property of the Contractor and shall be completely removed from the job site unless otherwise specified.
- E. Use means necessary to prevent dust becoming a nuisance to the public, to neighborhoods and to other work being performed on or near the site.

1.5.2 Replacements

- A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the approval of the Owner at no additional cost of the Owner.

1.6 Bid Documents

1. Bid documents include Exhibit A (Construction Contract Template, Exhibit B (Bid Tab), Exhibit C (Final Irrigation Design), Exhibit D (Turf Specification), Exhibit E (Irrigation details and specifications), Exhibit F (Pump House drawings), Exhibit G (Pump Drawings), Exhibit H (Sediment Box) and Exhibit J (Standard Irrigation Scope).

2. PRODUCTS

A. Substitution of Materials and or Methods

1. Any substitution in materials or methods to those specified shall be approved by the Owner prior to use. Any requests for substitution shall be provided in writing to the Owner. The request shall clearly state the rationale for the substitution.
2. Submit to the Owner product data and samples of all materials to be considered as an alternate.
3. Product data shall consist of manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, material safety data sheets (MSDS) and other standard descriptive data. Submittal data shall be clearly marked to identify pertinent materials, products or models and show performance characteristics and capacities. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product or material with integrally related parts and attachment devices.



4. No work shall begin which requires submittal for approval until the consultant has "approved" or "approved as noted" the submittal.

5. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.
 - a. Damaged or deteriorating materials shall not be used and shall be removed from the premises.

B. PIPE

1. Main Line Pipe four inches (4") and larger shall conform to ASTM D2241 for SDR 21 Class 200 PVC 1120-1220. PVC resin compound shall conform to ASTM D1784, and rubber gaskets shall conform to ASTM D1869 and F477 and be provided by the pipe manufacturer. The pipe shall be 20' 0" nominal lengths.

2. Lateral Lines two inches (2") through three inches (3") shall conform to ASTM D2241-73 for SDR 21 Class 200 PVC 1120-1220 belled end solvent weld and conforming to ASTM D2241-73.

3. All pipe from supply to backflow assembly shall be proper size PVC 1120-1220 SCH40 conforming to ASTM D-1785 & D-2672.

4. Pump Pipe shall:

- A. Be at least one size larger than the outlet of the pump.
 - B. Have an inlet that is free of obstructions, excluding the foot valve
 - C. Have a suction hose made with EPDM rubber and equipped with a Cam Lock female fitting on the pump side of the hose. Hose length shall not exceed pump manufacturers' recommendations.
 - D. A suction hose shall be installed to limit the amount of silt and debris in the system.
- vii. E. Velocity-Water velocity in 1/2" through 3" PVC piping shall be designed and installed so as not to exceed a flow of 5 ft. per second. 4" and larger PVC piping shall be designed and installed so as not to exceed a velocity of 3 ft. per second unless specified otherwise by the Owner.

b. FITTINGS

i. Fittings for ALL PVC Pipe:

- A. All fittings for PVC pipe shall be SCH40 PVC manufactured by Spears, Dura, or similar unless otherwise specified by the Owner.
- B. Per manufacturer recommendations, all pipe threads, excluding risers, swing joints, and sprinklers, shall be taped with polytetrafluoroethylene (PTFE) film tape.



- C. Threaded PVC Nipples shall be SCH80 as manufactured by Spears, Dura, or similar.
- ii. The fitting of the pump shall be SCH40 Iron conforming to ASTM A 53 Grades A and B, A 501, and A 589 Type II. All pipe threads conform to ANSI B1.20.1. Couplings comply with ASTM A 865.
- c. RISERS
 - i. Swing Joints shall be RainBird TSJ-12 and are required on all sprinkler heads and quick couplers valves with a 1" inlet or larger unless otherwise specified by the Owner. Both ends of the swing joint shall be male threaded, and no gluing of any component or attachment to piping is acceptable. (EXHIBIT E FIGURE 1 & 2)
 - ii. Sprinkler heads with 3/4" inlets and smaller shall be installed with 3/4" polyethylene tubing (SEE EXHIBIT E FIGURE 3).
- d. VALVES
 - Gate Valves shall be Smith Cooper Ductile Iron Flanged AWWA C515 Gate Valve with Op Nut - Series 10FN. Unless otherwise specified by the Owner. Ball Valves shall be an Apollo 94A series or approved similar unless otherwise specified by Owner
 - i. Quick coupler valves shall be RainBird 44-RC. Key shall be RainBird 44-k. The Contractor shall provide one (1) key for every four (4) quick coupler valves unless otherwise specified by the Owner.
 - ii. Electric Control Valves shall be Rain Bird 2" PESB series valve unless otherwise specified by Owner. Drip systems may use a smaller PESB series valve.
 - A. Each Electric control valve shall have a gate valve installed upstream of the valve, and each valve assembly shall be installed in a valve box independent of any other item.
 - B. Each Electric control valve shall have a union installed downstream of the valve.
 - C. All Electric control valve box lids shall be hot-stamped (branded) with the station number.
- e. VALVE BOXES
 - i. All valve boxes shall be a MacLean Highline, injection-molded from a combination of polyolefin and fibrous inorganic components or an approved similar.



- ii. A MacLean Highline 10" round box shall be used on all valves when the valve is used as an isolation valve. Sufficient lengths of 10" polyethylene culvert pipe, such as manufactured ADS or similar, shall be used to install the valve box at the proper grade.
- iii. All Electric control valve assemblies shall be housed in a MacLean Highline Standard valve box with sufficient extensions to attain proper height. A 3/4 washed gravel base of at least 3 inches shall be placed on undisturbed earth at the bottom of the valve box. Unless otherwise specified by Owner
 - A. Bricks shall be used on undisturbed earth at the bottom of the valve box for support. Only one valve assembly per Standard Valve box is allowed. (EXHIBIT E FIGURE 4 & 5)
- iv. Unless otherwise specified by the Owner, all grounding rods, wire connections, and wire splices shall be installed in a MacLean Highline 10" Round valve box.
- v. Quick coupler valves shall be installed in a 10" Round MacLean Highline valve box with a cover. The valve shall have an accepted stabilizer unit affixed securely to it (EXHIBIT E FIGURE 2).
- f. **SPRINKLER HEADS**
 - i. Rotor Driven:
 - A. K-Rain Pro Sport (1")
 - B. K-Rain RPS 75i (3/4")
 - ii. Fixed Spray Turf & Bed Areas
 - A. Rainbird 1800 series with R-VAN style nozzles
 - iii. Drip Emitters
 - A. All perennial plants shall have 2 drip emitters per plant.
 - iv. Heads shall be installed on the same size swing joint assembly as the inlet size of the head.
- g. **AUTOMATIC CONTROLLER**
 - i. 23 stations or more: Controller shall be a Rainbird ESP-LXD Series Two-Wire Decoder Controller with locking outdoor cover unless otherwise specified by Owner.
 - A. The controller must include a cellular card to connect to I.Q.
 - B. Controllers outside a building or shelter shall be installed in a stainless steel lockable, vandal-resistant cabinet.
 - C. The Contractor is responsible for providing fabricated cabinets.
 - D. Two-wire systems shall be installed in a Star configuration (EXHIBIT E FIGURE 6)
 - E. The maximum distance for the Critical Path is 1.65 miles for 14 AWG cables and 2.63 miles for 12 AWG cables.



- F. The distance between the field decoder and the solenoid (valve) for secondary wire run cannot exceed 450 feet (137 meters) using 14 gauge wire. (EXHIBIT E FIGURE 7)
- G. The 2-Wire path shall be surge protected and grounded with one LSP every 500 feet or every 8 decoders, whichever is smaller.
 - a. Each installed grounding system shall maintain a maximum ground resistance of 10 ohms or less.
 - b. Refer to the Rain Bird Grounding Recommendations document for proper specifications on Grounding System Installation and Grounding System Design.
- h. CONTROL CABLE
 - i. Use only Maxi Wire for all 2-Wire path applications based upon the following factors:
 - A. Wire Size: 2.5mm², 12 or 14 AWG
 - B. Dual conductor - solid core
 - C. Double isolation
 - D. Use only 3M DBR/Y splice kits for all electrical wiring connections to the 2-Wire path.
 - ii. Wire Coloring schedule
 - 1. Specialty Valves 24v.: ORANGE
 - 2. Extra/Spare 24v.: RED
 - 3. Neutral 120v. Power Wire: WHITE (min. 12ga.)
 - 4. "Hot" 120v. Power Wire: BLACK (min. 12ga.)
 - 5. Grounding Wire: GREEN or BARE
 - 6. Tracer Wire: BROWN
- B. All wiring shall conform to all federal, state, and local laws.
 - i. Pump House
 - A. All Pump houses sizes and designs shall be specified in the project scope.
 - B. Pump houses finished floor elevation shall be one foot above the FEMA 100 year base flood elevation.
 - C. All Pump houses shall be painted Tan outdoor paint with a green R-panel metal roof.
 - D. All Pump houses shall be constructed with concrete blocks.
 - E. Pump houses shall be designed to prevent water from contacting any electrical components in the event of a water line break.
 - F. Pump houses shall have an adequate floor drain installed to state and local codes.
 - j. SUBMERSIBLE IRRIGATION PUMP SYSTEM



i. DESCRIPTION:

- a. The work under this special provision shall consist of furnishing all materials, equipment, and labor necessary to construct the pump system in conformance with the details on the Project Plans, in accordance with these special provisions, the plans and details and as directed by the Engineer.
- b. This Specification describes a variable frequency drive controlled Submersible pump station. The pump station is to provide water to the irrigation system while simultaneously maintaining a constant discharge pressure by using a prefabricated pump station with variable frequency drive for pressure regulation, under varying flow conditions up to the maximum specified capacity and will be UL QCZJ - "Packaged Pumping System." Design, manufacture, and testing are the sole responsibility of the pump station manufacturer.
- c. Pump system equipment, installation, startup, training, close-out packages, cleanup, and guarantees are a part of this item.

ii. GENERAL:

- A. The Pump System shall be constructed in accordance with the details shown on the project plans, except as specified herein.
- B. The prefabricated pump station has the volumetric flow rate, and pressure started in the technical specifications at the station discharge isolation valve. Submersible pumps shall be constructed on a manifold to enable a variable frequency drive to sequentially start the pumps to maintain the necessary flow volume at design pressure. The main pumps are to operate at no more than 3,600 RPM.
- C. The station shall be wired entirely, piped, hydraulically, electrically, and flow tested to total station capacity at the factory before shipment to the job site. Construction shall include a fabricated steel plate and skid assembly to support all components during shipping and serve as the installation mounting base.



iii. Technical Information:

Total Pump Station Design Requirements:

| Irrigation Zone | Design Flow Rate (GPM) | Design Pressure for pumps |
|-----------------|------------------------|---------------------------|
| | 240 | 80 |

Incoming pressure: 0 psig: Minimum
Total System Design Pressure: 80 PSI

Available Incoming Power:

| | Voltage | Amps | Phase | Hertz |
|------------------|---------|------|-------|-------|
| Service Entrance | 208/230 | 200 | 3 | 60 |

Motor and Pump Data:

| | Pump #1-2 | Units |
|---|-------------|--------|
| Motor Power | 10 | HP |
| Motor Jockey | N/A | HP |
| Motor And Pump Speed | 3600 | RPM |
| Motor Service Factor | 1.15 | - |
| Minimum Motor Efficiency | 68 | % |
| Motor Type | Submersible | |
| Motor Protector Setting | 40/13 | AMPS |
| Motor Starter Type | VFD | - |
| Altitude Deration Factor For Main Motors | 0 | % |
| Individual Pump Flow Rates | 120/120 | GPM |
| Pump Discharge Connection Size | 3 | INCHES |
| Check Valve Size | 3 | INCHES |
| Check Valve Maximum Pressure Rating | 200 | PSI |
| Check Valve Pressure Loss at Design Flow Rate | .43 | PSI |
| Pump Isolation Valve Size | 3 | INCHES |
| Pump Isolation Valve Maximum Pressure Rating | 200 | PSI |
| Pressure Relief Valve Size | N/A | INCHES |



| | | |
|---|-----|--------|
| Air Vent Valve Size | 1 | INCHES |
| Station Isolation Valve Size | 4 | INCHES |
| Station Isolation Valve Maximum Pressure Rating | 200 | PSI |

iii. MATERIALS:

- A. Materials shall conform to the requirements specified on the plans and these special provisions.
- B. The Contractor shall furnish complete copies, in triplicate, of the manufacturer's standard catalog data showing performance and construction materials for all components and materials supplied. Furnish shop drawings were indicated on plans and details.

iv. Submersible Pump Assembly:

- A. The pump shall utilize stainless steel impellers and diffusers.
- B. The pump shall utilize a heavy-duty stainless steel shell assuring permanent alignment of all components.
- C. The pump shall utilize a heavy-duty stainless steel shell assuring permanent alignment of all components.
- D. The pump shall utilize a PTFE floating wear ring, ceramic bearing journal, and Nitrile rubber fluted bearing.
- E. The pump shall be suited to operate in a vertical position.
- F. The pump shall utilize and include a built-in check valve to protect the pump against water hammers.
- G. The pump shall be capable of withstanding a maximum operating temperature of 140°F.

v. Motors:

- A. All motors shall be built according to the latest NEMA, IEEE, ANDI, and AFBMA standards where applicable. The motor shall have Class F



insulation with a temperature rise specified by NEMA standards and furnished with a 1.15 service factor.

- B. Have a double flanged NEMA mounting design and an S.S. splined shaft.
 - C. Motor shall incorporate a High-capacity, Kingsbury-type, water-lubricated thrust bearing and be filled with non-toxic water-soluble solution.
 - D. The motor leads shall be field replaceable.
 - E. Motor shall be rated at 3,450 Rpm.
 - F. The motor shall include an external sand slinger on the shaft and a mechanical face seal at the shaft exit.
 - G. All motors shall be variable frequency drive (VFD) compatible.
- vi. Station Base:
- A. The pump station base shall be designed and fabricated to provide proper structural support for all attached equipment. The base shall supply sufficient rigidity to withstand the stresses of reasonable and competent transportations to the site, off-loading, installation, and operation. Prominent structural members shall be constructed from heavyweight channel, tubing, or I-beam steel. The steel base shall create a flooring substructure when installation is per factory recommendations will aide in installation of pump station as per recommended Hydraulic Institute standards. Provisions shall be made in the station base for off-loading with a forklift. All bolts for the package assembly shall be plated to retard corrosion.
- vii. Piping:
- A. Piping shall be schedule 40 steel pipes (powder coated inside and out) or heavier as required to maintain a 3 to 1 pressure safety factor (including 1/16" corrosion allowance). All piping shall be hydrostatically tested to 150% of maximum shutoff pressure. Piping between pumping system suction and discharge connection shall be roll grooved for maximum flexibility and minimize vibration and transportation and operation stress.
 - B. Piping shall conform to ASTM specification for Steel pipe welded and seamless pipe. The piping shall be for connection to the mainline



- piping. The piping shall be of Schedule 40 steel and sized for depth and termination based on mainline piping requirements.
- C. Discharge piping shall be 4" powder coated.
 - D. The discharge outlet of the system shall be welded into the manifold and have an ANSI 150 PSI flange for connection to the irrigation system.
 - E. The pump shall be secured by means of a pitless adapter fitting. Pitless adapter shall be 3" weld-on style Manufactured by Maas Midwest model 8J3.
- viii. Flow Meter:
- A. A flow meter is to be installed, providing the pump station flow rate through the operator interface. The flow sensor is a Mag-meter, which provides a low impedance signal proportional to the flow. The accuracy shall be plus/minus 2% of the actual flow range. A flow meter run is included with a minimum of 5 pipe diameters straight run upstream and 2 pipe diameters downstream for proper meter accuracy. The diameter of the flow meter run pipe shall be sized per the installation Manual. The flow meter shall send an analog signal to the station logic controller and a pulse output signal to the baseline flow decoder. Flowmeter shall be Badger Meter brand model M2000.
- ix. Valves:
- A. Pump isolation valves shall be full lug-style butterfly valves for 3" and above. Valves body shall be of ductile iron, and valves shall be rated for 200 PSI operating pressure. Valve shall have an aluminum bronze disc, stainless steel shaft.
 - B. Check valve shall be wafer style and incorporate a center guided, spring-loaded disc with a short linear stroke that generates a flow area equal to the nominal valve size.
- x. Gauges:
- A. Pressure gauges shall be supplied for Discharge system pressures. All gauges shall be glycerin-filled, stainless steel, and bottom-mounted. The accuracy shall be within 1.5%. Gauges shall be 2-1/2" minimum



with pressure ranges at least 30% higher than highest-pressure attainable from pumps at shutoff head conditions.

xi. Filtration:

- A. Automatic self-flushing intake strainer. The filtration system shall consist of an automatic self-cleaning filter and a return connection.
- B. The strainer shall be 8" flanged.
- C. The strainer shall include a high-pressure sealed bearing.
- D. The filter screen element shall be 24 mesh in size.

xii. Electrical:

- A. Pump station electrical wiring is to conform to National Electrical Code Standards. All wiring from control panels to motors is to use U.L. listed, watertight, flexible conduit with copper conductors rated not less than 600 volts and of the proper size to carry the entire load amperage of the motors without exceeding 70% capacity of the conductor. A grounding cable sized to National Electrical Code requirements shall be included in the flexible conduit. There shall be no splices between the motor starters and the motor connection boxes. The flow sensors' wiring and pressure transducer is a multi-conductor, shielded cable suitable for Class II low voltage controls.

xiii. Main Electrical Disconnect:

- A. A three-pole main electrical disconnect is to be installed outside the control enclosure.

Third-Party Listing required for the following:

- | | |
|----------------------------|---|
| • Starting Equipment | U.L. Listed Industrial Control Device |
| • Controls | U.L. Listed Industrial Control Assembly |
| • Across the Line Starters | U.L. Listed Industrial Control Assembly |
| • Pump Station | U.L. Listed Packaged Pumping System |

Provide complete instrumentation and controls to start and stop the pumps automatically. Full alarms and safety features needed to protect the equipment and piping systems shall be included.

xiv. Control Enclosure:

- A. Controls shall be housed in a Type 1 enclosure with integral latches. The control enclosure shall be constructed of 12-gauge steel, and the backplate assembly shall be constructed of 12-gauge steel. All indicating lights, reset buttons, selector switches, and operator



interface shall be mounted on the panel door. All internal components shall be mounted upon and secured to the removable backplate assembly and rated UL508A.

- xv. Control Power:
 - A. Power for the controls shall be provided by a control power transformer, providing 120 Volt, single-phase power for the pumping system control operation. The control power transformer shall be protected on the primary side by control limiting fuses of adequate size and voltage rating. All control components shall be protected by time delay circuit breakers of adequate size.
- xvi. Starting Equipment:
 - A. Motor starting equipment shall be Variable speed drive with PWM
 - B. Activated by a drop in pressure or Pump Start Relay.
- xvii. Controls and Enclosure:
 - A. The pump station manufacturer shall build the complete control panel in accordance with the NEC and be so authorized under UL508A. All equipment and wiring shall be mounted within the enclosure, and each device shall be labeled for proper identification. All adjustments shall be performed from the front of the control enclosure. A complete wiring circuit diagram and legend with terminal components and wiring completely identified shall be provided. Disconnect mounted on outside of station enclosure.
- xviii. Individual Motor Alarms:
 - A. Individual motor phase failure and low voltage safety circuitry shall retire any pump that experiences low voltage, phase failure, or phase unbalance as monitored at the load side of each pump motor Variable Frequency Drive. Each pump motor shall have its individual protective devices and time delay to allow for transient low voltage during motor starting providing maximum motor protection.
- xix. Touch Screen:
 - A. Shall have the ability to read Munro standalone software and shall include the following features:
 - a. Individual pump run indication (digital readout)
 - b. Hand/Off/Automatic positioning indicator
 - c. Keypad Alarm reset button
 - d. 7" Screen
 - e. 64K color TFT



- f. CCFL with dimming
 - g. 24 Volts power require
 - h. Communication ports (10/100Mbit/ USB Host, USB Device, RS485/RS422 25 –pin D-sub and Ethernet using a static I.P. address Using DSL or Wireless connection. I.P. address to be provided by Owner before shipping.
 - i. Real-Time Clock
 - j. Powder Coated
- xx. 7 Variable Frequency Drive:
- A. Variable Frequency Drive shall be a Yaskawa A-1000 Industrial Type with the Munro Stand Alone Program embedded into the drive's software. All program parameters shall be accessible through the LCD operator, which makes the operation of the pump station simple and with clarity. The drive shall respond to the system pressure automatically using the P.I. control in the VFD without any special programming. The drive shall also have the ability to be started with Baseline PSR or pressure drop without any additional assistance from the factory.
 - B. Also to include the following:
 - a. Variable frequency drives with all features stored in Non-Volatile memory:
 - i. There shall be no derating:
 - ii. 480vac
 - iii. Service Factor Amps
 - iv. Up to 10000 feet elevation
 - v. Ambient temperatures to 120 degrees
 - b. Standard Features (adjustable):
 - i. Motor Parameters
 - ii. Acceleration and deceleration rates
 - iii. Maximum speed
 - iv. Set point settings for P.I. control four (4) each
 - v. Overload, over-temperature, ground fault, and phase loss protection
 - c. Munro Stand-Alone Software to include:
 - i. Sleep Activate Level
 - ii. Sleep on level
 - iii. Sleep de-activate level



- iv. Sleep de-activate time
 - v. Feedback detection level high
 - vi. Feedback high fault time
 - vii. Feedback detection level low
 - viii. Feedback detection level low on delay time
 - ix. Feedback detection hysteresis
 - x. PID Minimum speed
 - xi. Loss of Prime
 - xii. Loss of Prime Delay
- d. Every main motor on the pump station is started on the Variable Frequency in the following manner:
- i. The first pump cannot maintain system pressure at the set point, causing the second pump to start. #2 main pump starts through VFD and is brought up to speed to maintain system pressure at the set point.
- xxi. Surge Suppression:
- a. A surge suppressor is to meet or exceed the following criteria:
 - i. Minimum single impulse current rating: 80,000A per phase.
 - ii. Duty cycle testing: 2,500 10KA impulses with < 10% drift.
 - iii. Response time: <5ns.
 - b. Suppressors are to be constructed of solid-state components and operate bi-directionally. The minimum continuous operating voltage of the suppressor is to be greater than 110% of the nominal system voltage.
- xxii. Secondary Control Circuit:
- a. An appropriately rated single-pole secondary distribution circuit breakers or fuses supply power to pump starter coil circuits, the control system, and other circuits as specified
- xxiii. Pump Base and Piping:
- a. Structural steel and supports shall be grit blasted to a near-white metal condition. The clean steel surfaces shall immediately be powder coated to a thickness of no less than 3 mils. The color shall be Desert Tan.



xxiv. CONSTRUCTION REQUIREMENTS:

A. Testing Requirements:

- a. The complete Pump Station shall be fully assembled and tested to capacity. Any calibrations required shall be performed during this factory test. The operation manual test section shall record all electrical amp draws and calibration/control settings.
- b. The complete pumping system shall operate without undue vibration throughout the range of operating conditions. The unit shall be given a running test of normal start and stop conditions under load. The test shall be repeated until satisfactory results are obtained and operation is deemed satisfactory. Any defects shall be corrected and adjustments made at the expense of the manufacturer.

B. On-Site Pump Installation:

- a. The Contractor shall prepare the concrete pump base and the supply water lines with all required backflow units. The pump manufacturer shall deliver the pre-assembled and tested pump system to the project site. The Contractor shall provide equipment to off-load the pump system as approved by the pump manufacturer. The Contractor shall install the pump per plans, details, and these specifications. The Contractor shall notify the pump manufacturer one week before pump startup to allow the manufacturer to be on-site to start the pump and perform a complete system check to ensure that the pump is operating correctly.
- b. Technical startup procedures shall include the following:
 - i. Station startup and pressurization
 - ii. Pressure flow and programming adjustments to demonstrate that station delivers to specified flow and volume quantities
 - iii. Demonstration of pump safety features
 - iv. Operation from the irrigation controller

C. Training Requirements:



- a. The pumping system manufacturer shall provide three (1) training sessions for the end-user on the proper operation of the pumping system. The training shall be performed on the actual installed equipment after the installation has been completed.
- D. Clean-Up:
- a. The Contractor shall remove all debris created and completely clean up the site.
- E. Close-Out Items:
- a. Operation and maintenance manuals: One (1) set of operation and maintenance manuals shall be furnished at the time of acceptance.
- F. Tools and Spare Parts:
- a. Before acceptance of the project, supply to the Owner the spare parts indicated in the construction documents. Spare parts shall include but not be limited to the following:
 - i. operating keys
 - ii. servicing tools
 - iii. test equipment
 - iv. Other items indicated on the drawings
- G. Other Materials:
- a. Install other materials or equipment shown on the drawings or installation details to be part of the pumping system, even though such items may not have been referenced in these specifications.
- H. Guarantee/Warranty and Replacement:
- a. The purpose of this guarantee/warranty is to ensure that the Owner receives materials of prime quality, installed and maintained thoroughly and carefully.
 - i. The manufacturer shall warrant the pumping system to be free of defects and product malfunctions for two years from the startup date.
 - ii. Failures caused by lightning strikes, power surges, vandalism, flooding, operator abuse, or acts of God are excluded from warranty coverage.



- iii. Repair damage to the premises caused by a defective item. Make repairs within seven days of notification from the Owner's Representative.
- iv. Contract documents govern replacements identically as with new work. Make replacements at no additional cost to the contract price.

I. MEASUREMENT:

- a. The item Irrigation Booster Pump System shall be measured as per Lump Sum complete and in place.

A. 2.11 All systems utilizing irrigation water shall have a Netafim Sandstorm Epoxy Coated Double Chamber Sand Media Filter unless otherwise specified by the owner

1. Provide Netafim 3 tank 24" Double Chamber self-cleaning media filter as per the specification.
 - a. The Netafim Sandstorm Sand media filter shall be comprised of components as outlined in this specification in order to meet the hydraulic demands and requirements of the irrigation system it services.
 - b. Netafim Sandstorm Sand Media filter specifications include but are not limited to:
 - i. Filter shall be manufactured from engineered Epoxy coated carbon steel for maximum durability and resistance to rust and corrosion.
 - ii. Filter shall be a double chamber configuration consisting of an internal lower plate baffle. Inlet, Outlet and backflush manifolds should be epoxy coated with Victaulic grooved type connections. Backflush valves should be iron Victaulic grooved solenoid valves. All connections shall be supplied in with the sandstorm sand media filtration system.
 - iii. Filtration media shall consist of #16 crushed silica sand only. No gravel base.
 - iv. During automatic backwash, media should be lifted for a period of 45-90 seconds depending on the quality of the water being filtered.
 - v. Solids expelled from the media tank shall be evacuated by the discharge manifold.
 - vi. Filtration shall automatically resume upon closure of the backflush valves in flushing mode to filtration.
2. Sandstorm Sand Media tanks will be warranted for a period of 5 years. All other equipment shall be guaranteed for twelve (12) months from date of delivery, against any defects in workmanship or materials.
3. Backflush controller should be Netafim branded electronic backwash controller shall monitor and activate cleaning cycles.
4. Controller shall be capable of activating a backwash cycle by each of the



following: time, differential pressure, and manual activation.

5. Controller shall be operable on: rechargeable 12V battery, 4xD Size alkaline batteries, or 24 VAC external power supply.
6. Output voltage shall be 24 VAC (for 24 VAC solenoids) or 12 VDC (for DC latching solenoids).
7. Controller shall be modular, capable of supporting up to 10 stations.
8. Controller shall feature LCD and keyboard for easy reading and adjustment.
9. Controller shall have an audio visual alarm that activates if predetermined number of continuous flush cycles is detected. Upon alarm, controller shall ignore pressure differential but continue to flush by time until serviced.
10. Controller shall log the number of flush cycles triggered by pressure differential, time, and manually.
11. Netafim Backflush control unit shall control and activate cleaning cycles.
12. Controller model shall support AC or DC power supply.
13. Controller shall be capable of activating a backwash cycle by each of the following: time, differential pressure, and manual activation.
14. Controller shall be located inside an electric cabinet with IP55 protection.



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15. Controller shall transform electric signal into hydraulic signal for operation of 3-wayvalve.
16. Controller shall be preassembled and delivered with all electric and hydraulic systemelements required to backflush system.

2.12 OTHER MATERIALS

- A. Provide other materials not specifically described, but required for a complete and proper installation, as selected by the contract and subject to the approval of the Owner's Representative.
- B. All wire connections and splices shall be contained in a valve box. Use only 3M DBR/Y splice kits for all electrical wiring connections to the 2-Wire path.
- C. Underground tracing wire shall be 14ga Brown UFUL solid copper wire. Tracer wire shall be installed in all MAIN line and SUB MAIN line trenches where 24 v. valve control wiring is not installed. All tracer wire runs shall be continuous runs with no wire splices under 500 feet. Splices over 500 feet shall use Rainbird WC20 series wire connectors or similar.

2. EXECUTION

2.1. SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of the section shall be performed. Correct conditions detrimental to the timely and proper completion of the work. Do not proceed until satisfactory conditions are corrected.
- B. Irrigation system installation shall not commence until all building foundations, field fencing, retaining wall, flower beds, etc., have been constructed and the finish grade has been established, unless approved by the Owner.

2.2. FIELD MEASUREMENTS

- A. Make necessary measurements in the field to ensure the precise fit of items in accordance with the approved design.

2.3. TRENCHING AND BACKFILLING

- A. Perform all excavations as required for installation of work included under this section, including shoring of earth banks, if any hazard of cave-ins exists, or if required by federal, state, or local codes or ordinances, if necessary.
- B. Restore all surfaces, existing underground installations, etc., damaged or cut due to the excavations to their original condition.
- C. Trenches left open overnight shall be barricaded to prevent the general public from entering.
- D. Definitions in this Section
 1. Mainline: Piping supplying an irrigation system between the potable water supply source and a backflow prevention device. Or piping between a non-potable supply and a pump, zone valve, quick coupler valve, or frost-proof hydrant.



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2. Sub Mainline: Piping in an irrigation system between a pump and a zone valve, quick coupler valve, or frost-proof hydrant.
 3. Lateral Pipe: All piping downstream of a zone valve.
 4. Zone Valve: A single valve controlling the operation of one or more irrigation heads.
- E. Trenches shall be of sufficient depth as follows:
1. Mainline and Sub Mainline piping shall have a minimum of 18" and a maximum of 24" cover from the top of piping to finished grade.
 2. The Owner's representative shall inspect all Mainline and Sub Mainline piping before backfilling.
 3. Lateral piping shall have a minimum of 12" and a maximum of 18" cover from the top to the finished grade.
 4. There shall be no more than one Mainline or Sub Mainline piping in a single trench.
 5. Where a Mainline or Sub Mainline and a Lateral are together in a single trench, 4" of separation is required between the two pipe runs.
 6. All piping installed in solid rock or 50% or more of ½" size and larger stone shall be backfilled with an alternate medium of sandy loam or clay loam free of rock ½" and larger.
 7. **Any trenching done within the drip line of a tree must use a hydro excavation method or boring not to harm the tree.**

2.4. INSTALLATION OF PIPING

- A. The irrigation system shall be installed beginning at the source of supply and proceed downstream towards flushing of lateral piping and ending with the installation of irrigation heads, quick couplers, etc.
- B. General: Layout the piping system in accordance with the arrangement shown on the drawings. Pipe bell-ends shall be installed upstream of the spigot end in all installations.
- C. Conduits and Sleeves:
 1. Furnish and install conduit where control wires pass under or through walls. Conduits shall be of adequate size to accommodate retrieval for the repair of wiring and shall extend one foot (1') beyond the edge of walls.
 2. Furnish and install sleeves for all pipes passing through or under walls, walks, and paving. Inside diameter of sleeve to be at least two times outside diameter of the pipe and adequate to accommodate retrieval of wiring or piping for repair and shall extend one foot (1') beyond the edge of paving or other construction.
 - a. Wires shall be in a separate sleeve.
 3. When piping is installed under pavement and walls via boring, install pipe in the sleeve when the total length of bore exceeds ten feet (10').
- D. Inspection of Materials: Carefully inspect pipe and fittings before installation, removing all dirt, scale, and burrs, reaming as required.
- E. Plastic Pipe:



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1. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings:
 - a. Store under cover until ready to install.
 - b. Transport only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.
2. Damaged pipe may only be used by cutting out and discarding the dented or damaged section and for necessary short sections.
3. In jointing, use only the cement rated for the specific class and size of pipe being connected and make joints in accordance with the manufacturer's recommendations as approved by the Owner's representative. All cement joints shall be primed with primer before applying cement.
 - a. Give solvent welds at least one (1) hour set-up time before moving or handling and 24 hours curing time before filling with water.
 - b. **The use of "Wet or Dry" or fast-setting cement is prohibited.**
4. Center load plastic pipe with a small amount of backfill to prevent arching and whipping under pressure.
5. For plastic-to-metal connections:
 - a. Work the steel connections first.
 - b. Use Teflon tape on the threaded fittings.
 - c. When tightening PVC threaded pipe, hand tighten then use a wrench to turn 1 ½ more turns. Do not over tighten. Fittings over 2" may need additional tightening
6. Threaded joints for plastic pipes:
 - a. Use Teflon tape on the threaded PVC fittings
 - b. Apply no more than two wraps of Teflon tape per fitting.
- F. Concrete Thrust Blocks
 1. Install thrust blocks of 3,000 psi concrete where the irrigation main changes direction at elbows and tees, where the mainline terminates, and under gate valves on all gasket joint and mechanical joint systems. (Exhibit E FIGURE 7)
 2. Size blocks for these mainline and placed in strict accordance with the pipe manufacture's specifications. Size shall be adequate and placed to take all thrust created by the maximum internal water pressure.
 3. Fittings shall be sufficiently wrapped in a plastic covering before thrust blocking, and no cement shall be allowed to harden on top of the fitting/valve.
 4. The Owner's representative shall inspect all thrust block installations before backfilling.
 5. Do not pressure test for a minimum period of 36 hours following the completion of pouring of blocks.
 6. All wiring, hydraulic tubing, and other piping shall be above the thrust block and shall not be allowed to be within the thrust block.



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2.5. INSTALLATION OF EQUIPMENT

A. Sprinkler Heads:

1. Install all full circle rotary and fixed-spray pop-up sprinkler heads with top of the head at finish grade after complete water soaking and packing of trenches.
2. Place Part-circle rotary, and fixed-spray pop-up sprinkler heads flush the final grade and six inches (6") from the edge and flush with the top of adjacent walks, curbs, and paved areas.
3. All sprinkler heads shall be installed to provide 100% overlap (head to head) of coverage unless otherwise specified by the Owner.
4. Set shrub heads on fixed risers above grade in-ground cover areas to clear ground cover six inches (6") or as required by the height of plant material and three inches (3") from the back of the curb or edge of the pavement.
5. All heads installed on swing joint risers shall be installed with 12" of sand below and around the head. (Exhibit E FIGURE 1)

B. Quick Coupling Valves:

1. Install on a swing joint assembly as detailed on the drawings. (Exhibit E FIGURE 2)
2. Quick coupler locations shall be located away from pedestrian walkways. When installed on sports fields, it shall be located in turf outside the infield area or area of play.

C. Automatic Controller:

1. Connect valves per local code and manufacturer's latest printed instructions.
2. Connect remote control valves to controllers in the sequence specified on drawings or the Owner's representative to correspond with station settings.
3. All valve boxes shall have the zone number engraved into the lid.
4. Affix zone map to inside of the door to the controller
5. Hardwire 120 volts, 20 amp breaker panel to the controller.
6. Install weatherproof tag as to name of installer and dates of warranty.
7. All controllers installed outdoors shall be installed in a stainless steel box and mounted to two 2" stainless steel posts utilizing steel unistrut unless otherwise specified by the Owner.

D. Control Wiring:

1. Install control wires with sprinkler mains and laterals in common trenches wherever possible.
 - a. Lay above the pipeline
 - b. Provide five feet (5') looped slack at valves and snake wires in the trench to contract wires.
2. Tie wires in bundles of ten feet (10') intervals.
3. Control wire line splices shall be allowed only on more than five hundred feet (500') runs. Splices to be made in valve boxes only with fifteen inches (15") of slack.



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2.6. TESTING AND INSPECTING

- A. Do not allow, or cause, any work of this section to be covered up or enclosed until it has been inspected, tested, and approved by the Owner's Representative.
- B. Thoroughly flush all main and sub-main piping before installing backflow preventer and zone valves. Thoroughly flush all lateral piping before installing heads and drain valves.
- C. Testing:
 - 1. Make necessary provisions for thoroughly bleeding the line of air and debris.
 - 2. Before testing, fill the line with water for at least 24 hours.
 - 3. After installing valves, test live water lines for leaks at static supply line pressure for two hours, with all fittings exposed and pipe sections center loaded. Water test only, no air.
 - 4. Provide required testing equipment and personnel.
 - 5. Repair leaks and retest until acceptance by the Owner's representative.
- D. Final Inspection:
 - 1. Clean, adjust and balance all system components. Verify that:
 - a. Remote control valves are correctly balanced.
 - b. Heads are correctly adjusted for radius and arc of coverage.
 - c. The installed system is workable, clean, and efficient.
 - d. Adjust valve flow control to design the operating pressure of the equipment.
 - e. Locate and expose covers of all valve boxes, splice boxes, and quick couplers installations and adjust the height to proper grade.
 - 2.

2.7. BACKFILL AND COMPACTING

- A. After the system is operating and required tests and inspections have been made, backfill excavations and trenches with existing excavated material unless otherwise specified by the Owner.
- B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to a minimum of 95% density under pavements, 85% maximum underplanted areas.
- C. Compact trenches in areas to be planted by thoroughly flooding the backfill. The jetting process may be used in those areas.
- D. Dress of all areas to finish grade and remove all excess soil & debris from the site.

2.8. RESODDING

- A. Sod a 6" collar around heads with like species of grass unless otherwise specified by the Owner's representative.
- B. Sod all trench lines.

2.9. INSTRUCTIONS

- A. Submit maintenance instructions on all items requiring the manufacturer's standard detail submittal.



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- B. Record drawings: Submit reproducible Autocad and PDF of completed facilities as installed. It shall show any changes from the original layout, location of all sprinkler heads, pipe sizing, and valve location.

2.10. CLEANUP

- A. Keep all areas of work clean, neat, and orderly at all times. Keep paved areas clean during installation. Clean up and remove all barricades and debris from the entire work area before final acceptance of the Owner's representative.

2.11. WARRANTY

- A. The Contractor shall guarantee 100% uniform coverage of the areas to be irrigated
- B. The Contractor shall guarantee trenches from future settlement and shall be responsible for the repair of any grading and sod damage in repairing a trench for one year after final acceptance of the project.
- C. All materials, equipment, and installation shall be fully guaranteed for one year from the date of final acceptance. The Contractor shall accomplish adjustments for proper operation at no cost throughout the guarantee period. The need for adjustments shall be at the discretion of the Owner.

3. Details

- 4.1 See Exhibit E (Details for Irrigation Specification)

End of Section