

PROJECT SPECIFICATIONS

ITB 10-0031

CONSTRUCTION OF A GROUNDWATER REMEDIAL SYSTEM
AT THE ASTATULA REFUELING FACILITY

AIR STRIPPER

Part 1: General

1.1 General Information

This bid specification package details the remedial system's air stripper and appurtenances. The Contractor shall supply all materials and labor for the installation of the air stripper and appurtenances, and shall locate them inside the equipment shed, as directed by the Owner's Engineer, which will be approximately as shown on the construction drawings.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Scope

Components are defined as individual units combined to comprise the air stripper.

2.2 Equipment Specifications

2.2.1 General

Contractor shall provide low-profile air stripper with the following specifications and appurtenances. The unit shall be preassembled and entirely self-contained on a carbon steel skid suitable for movement by a forklift. The low profile air stripper shall be of Carbonair Model STAT 400 with six (6) aeration trays or of other make and model **only** if prior approval from the Owner's Engineer has been obtained.

2.2.2 Materials of Construction

Air Stripper: The low profile air stripper (trays, sump, & demister section) shall be manufactured using 304 series stainless steel.

Gaskets: The tray gasket shall be a foam neoprene or G207N silicone material that is gasoline resistant material.

Demister: The demister shall be fabricated using a polypropylene material capable of removing 95% of droplets 5 microns or larger and 99.5% of the droplets 10 microns or larger at a face velocity of 7 feet per second.

2.2.3 Design

Flanged Inlet & Outlet: The air stripper shall be equipped with a flanged ANSI Class 125 inlet and outlet configuration to maximize the integrity of piping connections and minimize head losses due to flow restrictions.

Anti-Bypass Valve: The air stripper shall be equipped with an anti-bypass valve to eliminate the need for priming prior to system start-up. This provision is required to minimize the possibility of contaminated water by-passing the system and to simplify the system start-up procedures.

Downcomer: A weir type square downcomer flow distribution system shall be employed to ensure uniform distribution of water over each aeration tray and shall run over the entire length of each tray. The downcomer flow distribution system shall also be designed to minimize back pressure on influent piping systems as well as minimize head losses as the water passes through each tray.

Sieve Trays: The air stripper shall be equipped with six (6) 304L series stainless steel sieve trays. Each tray shall be no higher than 12+1/2 inches and maintain an optimum water height to maximize the effective residence time and subsequent treatment performance.

Tray Alignment Buttons: Alignment buttons shall be permanently installed on the sieve trays to ensure proper alignment when reinstalled after maintenance and/or trouble shooting operations.

Tray Fastening- The sieve trays shall be connected using over-center latching stainless steel clips.

Collection Sump: The collection sump shall be designed to minimize pump cycling requirements while maintaining sufficient turbulence to prevent solids from settling and collecting at the bottom of the sump.

2.2.4 Appurtenances

Pump-Out: A pump-out system shall be incorporated with outside level controls to ease access and minimize the level of effort required for maintenance activities. A clear PVC sight glass shall be mounted outside the low-profile air stripper collection sump to allow for visual monitoring of the sump level and for insertion of the stainless steel, fouling resistant level controls. The transfer pump shall consist of a 10HP, 230/460VAC, three-phase, TEFC motor direct-coupled to a transfer pump with a minimum flow rate of at least 100 gpm @ 115 feet of total discharge head and a maximum flow rate of at least 300 gpm at 80 feet of total discharge head.

Pressure Gauge: A pressure gauge shall be installed on the sight glass to monitor collection sump pressures for trouble shooting system operations.

Low Pressure Switch: A low pressure switch shall be included with air tubing mounted in the blower discharge piping to shut down influent pumping when blower operation is discontinued.

High Pressure Switch: A high pressure switch shall be included with air tubing mounted in the blower discharge piping to alert the operator of a need to perform maintenance of the air stripper due to high pressure across the trays.

Blower: The low profile air stripper shall be equipped with a 25HP, 230/460VAC, three-phase, TEFC motor direct-coupled to a centrifugal pressure blower capable of 2,100 CFM at 45" WC pressure and an appropriate blower silencer.

Airflow: An integral flow indication meter shall be provided with the STAT 400 air stripper for monitoring of the airflow rate of the system.

2.2.5 Modeling Support

A copy of the modeling data must be included to support system performance specifications if an alternate model/manufacturer is submitted for consideration.

2.2.6 Manufacturer's O&M Manual

A comprehensive operation and maintenance manual shall be provided for the low profile air stripper and appurtenances. The manual shall include detailed procedures for installation, start-up, operation, trouble

shooting, and maintenance. The manual shall also include safety precautions, spare parts listing, design curves, drawings, and a list of specific operating parameters

Part 3: Execution

3.1 Air Stripper Installation

The air stripper and all components listed here shall be mounted to a common skid by the manufacturer. The common skid shall be mounted to the concrete slab, located as shown on the construction drawings. Shop drawings of the mounting hardware and hardware installation shall be submitted to and require approval from the Owner's Engineer before they are installed. The air stripper shall be plumbed and wired into the treatment system as described in the Compound Piping and System Electrical Installation sections of this document.

BAG FILTER HOUSINGS

Part 1: General

1.1 General Information

This bid specification package details the bag filter housing units, of which there shall be two (2). The Contractor shall supply all materials and labor for the installation of the bag filter housings, and shall locate them inside the equipment shed, as directed by the Owner's Engineer, which will be approximately as shown on the construction drawings.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Bag Filter Housings

The Contractor shall supply two (2) FSI model BFNPO012B0150N03F03F02A1N bag filter housings, size 2, made of 304 stainless steel, with 3-inch side influent flange, 3-inch bottom effluent flange, and rated for at least 150psi working pressure. The bag filter housing shall be American Society of Mechanical Engineers (ASME) code approval.

2.2 Differential Pressure Switch/Gauge

The Contractor shall supply two (2) Dwyer Capsu-Photohelic Differential Pressure Combination Switch and Gage units. The units shall have dual adjustable setpoints, high differential pressure notification capable of being routed through the system control panel's auto-dialer, and high high differential pressure alarm capable of being routed through the system control panel's shut-down alarm and its auto-dialer.

Part 3: Execution

3.1 Bag Filter Housing Installation

The bag filter housings shall be mounted to the concrete slab, located as directed by the Owner's Engineer,

which will be approximately as shown on the construction drawings. Shop drawings of the mounting hardware and hardware installation shall be submitted to and require approval from the Owner's Engineer before they are installed. The bag filter housings shall be plumbed into the treatment system as described in the Compound Piping section of the bid documents.

3.2 Differential Pressure Switch/Gauge Installation

The Contractor shall install the differential pressure switch/gauge such that it reads the pressure immediately before and immediately after the bag filter units, as shown on the construction drawings. The high differential pressure signal shall be routed through the system control panel's auto-dialer, such that the system will notify, by telephone, to a changeable phone number of the Owner's Engineer's choosing (chosen at time of installation), when differential pressure has exceeded the changeable setting of the unit. The high high differential pressure alarm signal shall be routed through the system control panel's shut-down function and alarm, as well as sending a message through the auto-dialer to notify that the high high differential pressure alarm has gone off, and that the system has been shut down because of it.

LIQUID-PHASE CARBON ADSORBERS

Part 1: General

1.1 General Information

This bid specification package details the liquid-phase carbon adsorbers, of which there are two (2). The Contractor shall supply all materials and labor for the installation of the liquid-phase carbon adsorbers and associated plumbing and equipment. They shall be located within the equipment shed, as shown on the construction drawings.

1.2 Warranty

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Liquid-Phase Carbon Adsorber

2.1.1 General

The liquid-phase carbon adsorber shall be of Carbonair model MPC-28, or equal only with prior approval from the Owner's Engineer. Contractor shall provide liquid phase carbon vessel with the following specifications and appurtenances. The unit shall be preassembled and entirely self-contained on steel skids that can be moved by forklift.

2.1.2 Materials of Construction

Vessel: The liquid phase carbon vessel shall be constructed from epoxy coated carbon steel.

Internal Paint (steel vessels): Paint used on internal components shall be of the following type with two coats: Sherwin Williams Macropoxy 626.

External Paint (steel vessels): Paint used on external components shall be of the following type: One coat Sherwin Williams Macropoxy 626 and Sherwin Williams Acrolon 218 Acrylic Polyurethane final coat.

2.1.3 Design

Backwashable: The units must have the capability of being backwashed. The unit(s) shall be designed to accommodate a 20% bed expansion during backwash procedures.

Manways: Manway access ports are to be provided for inspection and maintenance activities of steel vessels.

Pressure Drop: The unit(s) shall have a maximum pressure drop of 20 PSI across the vessel during normal operation.

2.1.4 Appurtenances

Connections: The carbon vessel(s) shall have appropriately sized NPT or flanged inlet and outlet connections. Flanges shall be 150# ANSI.

Air Relief Port: An air inlet port shall be provided to bleed excess air from vessel(s) prior to operation.

Distribution: PVC distribution and collection systems to ensure even flow across the carbon bed.

2.1.5 Modeling Support

If requested, manufacturer must supply verification calculations to support system performance modeling.

2.1.6 Manufacturer's O&M Manual

A comprehensive operation and maintenance manual shall be provided for the liquid phase carbon vessels and appurtenances. The manual shall include detailed procedures for installation, start-up, operation, trouble shooting, and maintenance. The manual shall also include safety precautions, spare parts listing, design curves, drawings, and a list of specific operating parameters.

Part 3: Execution

3.1 Installation

The Contractor shall install mount the liquid-phase carbon adsorber cells to the concrete slab of the equipment compound, located as shown on the construction drawings. Shop drawings of the mounting hardware and placement shall be submitted to the Owner's Engineer, and approval shall be required from the Owner's Engineer before said hardware is installed.

The liquid-phase carbon adsorbers shall be plumbed into the treatment system as described in the Compound Piping section of this document.

VAPOR-PHASE CARBON ADSORBER(S)

Part 1: General

1.1 General Information

This bid specification package details the installation of the vapor-phase carbon adsorber, of which there is only one (1) expected to be required. The Contractor shall supply all materials and labor for the installation of the vapor-phase carbon adsorber and associated plumbing and equipment. It shall be located outside the equipment shed on a protrusion of the shed's concrete pad, as shown on the construction drawings.

1.2 Warranty

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Vapor-Phase Carbon Adsorber

2.1.1 General

The vapor-phase carbon adsorber shall be of Carbonair model GPC-50R, or equal only with prior approval from the Owner's Engineer. Contractor shall provide a rental vapor phase carbon vessel with 3,000 pounds of reactivated vapor phase carbon with the following specifications and appurtenances. The unit (s) shall be preassembled on skid type base that a forklift can maneuver the unit.

2.1.2 Materials of Construction

Vessel: The vapor-phase carbon vessel shall be constructed from epoxy coated carbon steel.

Internal Paint (steel vessels): Paint used on internal components shall be of the following type: Tnemec Series 20 primer and final coating.

External Paint (steel vessels): Paint used on external components shall be of the following type: Tnemec Series 20 primer and final coating.

2.1.3 Design

Pressure Drop: The unit shall have a maximum pressure drop of 10" wc. or less across the vessel.

Air Plenum: The carbon vessel shall be equipped with a sufficient air plenum at the base of the unit to equalize flow through the entire carbon bed.

Drain: The unit shall be equipped with a drain to facilitate the removal of condensed moisture from the air plenum at the base of the unit.

Access Port: The unit shall be equipped with one or more 16" diameter or larger access port for carbon change out and inspection.

Grate: A fiberglass grate shall be used to support the entire weight of the granular activated carbon in the unit.

Screen: A stainless steel screen shall be mounted on top of the fiberglass grate to prevent granular activated carbon loss into the air plenum.

2.1.4 Appurtenances

Discharge Stack: A discharge stack shall be provided by the Contractor to dissipate vapor discharge. The discharge stack must be incorporate the following design features: constructed to a minimum height of 15 ft above surface grade, adequately secured by guy wires at a minimum of three directions, have a Tee or suitable device of low flow resistance to prevent rain, debris, and other fouling agents out of the stack, constructed of material resistant to oxidation and UV decomposition.

2.1.5 Modeling Support

If an alternative model/vender is requested, contractor must supply verification calculations to support system performance modeling.

2.1.6 Booster Blower

A booster blower (New York Pressure Blower (or approved equal) – 2,100 cfm @ 45" WC) shall be provided with low blower pressure switch and skid mounted that will be wired to the main system control panel. The blower will be provided with a damper valve on the discharge side of the blower. The blower will increase the temperature of the airstream by approximately 22 degrees if operated properly which will decrease the relative humidity of the airstream to approximately 50% which will optimize the performance of the vapor phase carbon adsorption process.

Flexible ducting shall be provided (50' maximum) to contain the off gas vapors from the air stripper discharge to the suction of the booster blower and from the discharge of the booster blower to the inlet of the GPC-50R adsorber.

2.1.7 Manufacturer's O&M Manual

A comprehensive operation and maintenance manual shall be provided for the vapor phase carbon vessel and appurtenances. The manual shall include detailed procedures for installation, start-up, operation, trouble shooting, and maintenance. The manual shall also include safety precautions, spare parts listing, design curves, drawings, and a list of specific operating parameters.

Part 3: Execution

3.1 Installation

The Contractor shall install the vapor-phase carbon adsorption cell to the exterior portion of the concrete slab of the equipment compound, located as shown on the construction drawings. Shop drawings of the mounting hardware and placement shall be submitted to the Owner's Engineer, and approval shall be required from the Owner's Engineer before final installation of the unit.

The vapor-phase carbon adsorber shall be plumbed into the treatment system as described in the Compound Piping section of this document. Contractor shall be prepared to obtain a second unit if required, which will meet all requirements set herein (including installation), and install it as directed by the Owner's Engineer. The booster blower shall be mounted inside the equipment shed, as shown on the construction drawings.

COMPOUND PIPING

Part 1: General

1.1 General Information

This bid specification package details the installation of the piping inside the compound. The Contractor shall supply all materials and labor for the installation of the piping and associated components and equipment, and shall locate them as directed by the Owner's Engineer, which shall be approximately as shown on the construction drawings.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Piping

All piping, unions, valves, and other appurtenances interior to the equipment shed shall be of Schedule 80 PVC construction, unless otherwise specified. Unless noted otherwise, all water conveyance piping shall have true union couples just prior to entering/exiting every remedial component so the unit can be taken out service without cutting piping.

2.2 Inlet Manifold

The inlet manifold shall be fabricated as shown in the construction drawings of 304 or 304L stainless steel. All filler rod used in welding shall be of 308 or 308L stainless steel, respectively.

Part 3: Execution

3.1 General

All horizontal piping between components shall extend across the floor as depicted on the construction drawings to aid in movement about the compound. Piping extending along the floor shall have 1+5/8 inch

Unistrut hold-downs fastening them to the floor at four feet intervals. The piping shall be routed according to the Owner's Engineer, which shall be approximately as shown on the construction drawings.

All threaded, wetted joints shall use Teflon tape, used per industry standard, to ensure a leak-free seal. All socket-type joints shall be installed using Rain-R-Shine PVC Cements and Primers, according to the recommendations of the PVC cement manufacturer.

3.2 Inlet Manifold and Piping

All HDPE lines shall have installed an electrofusion elbow fitting, then extend vertically through the compound slab approximately six inches from its edge, and transition to PVC approximately one foot above the top of the slab. The piping from the recovery wells shall pass through the concrete such that there is approximately six inches between each pair of pipes, and such that the pipes progress, from left to right as viewed from the center of the compound, as follows: RW-1i, RW-1d, RW-1dd, RW-2i, RW-2d, RW-3i, RW-3d, RW-4i, RW-5i, and RW-5 d. The piping shall extend up through the concrete in such a way as to facilitate approximately straight piping into the manifold. The inlet manifold shall be connected such that only PVC male threads connect to stainless female threads; no connections shall be made using stainless male threads into PVC female threads.

Each inlet pipe from transition of HDPE to PVC shall be constructed as follows: a true union fitting, check valve, ball valve and variable area flow rater meter of Dwyer Instruments Model VFC-143. The flow meters shall be supported from behind by a common piece of Unistrut, which shall then be mounted to the manifold's vertical supports. The contractor shall coordinate construction of the manifold assembly with the Owner's Engineer to ensure the unit is functional. The manifold itself shall have an all-stainless steel, glycerin-filled pressure gauge, with a full-sweep read-out from 0-100psi.

3.3 Inlet Manifold to Bag Filters

Piping from the manifold to the bag filter units shall be constructed as directed by the Owner's Engineer, which will be field determined so that frictional losses are minimized, functionality is enhanced and will be in general accordance with industry practices.

3.4 Differential Pressure Switch/Gauges

The differential pressure switch/gauges shall be supplied by the Contractor, and shall be of Dwyer Instruments Model 43030 Capsu-Photohelic Switch/Gage. Each unit shall be installed by the Contractor on one bag filter housing. The high side of each unit shall connect to the tee immediately before the inlet flange for each bag filter housing, and the low side of each shall connect to the tee immediately following the outlet flange of each bag filter housing. They shall each be wired into the control panel as described in the Wiring and Conduit section of this document. Each gage unit shall be mounted to a vertically-mounted piece of 1+5/8" Unistrut, which shall be located as directed by the Owner's Engineer, which will approximately as shown on the construction drawings.

3.5 Air Stripper Connections

The four inch piping from the bag filter units shall extend across the floor until it reaches the air stripper inlet flange, then extend straight up to the air stripper inlet flange. The pipe shall then transition to six inch PVC, then a companion flange shall join it to the air stripper inlet flange. The vertical rise of the piping must be secured using Unistrut or approved equal to prevent movement in any direction. Support for the horizontal section of the pipe may require support with will be determined in the field by the Owner's Engineer.

The off-gas of the air stripper shall be connected to the rental booster blower and vapor carbon adsorber initially. After the booster blower and vapor carbon adsorber are removed, it shall be plumbed as follows. The 18" off-gas port shall be reduced to 10" using a Fernco-style coupling, then 10 inch PVC pipe shall be extended

horizontally through the wall of the equipment shed, then extend vertically approximately fifteen feet, terminating in a Tee fitting to keep rainwater out of the pipe. The hole in the equipment shed shall be protected from water intrusion by an overhang, sealed to the wall of the shed. During the rental period, the booster blower shall be mounted to the concrete slab inside the shed, and connected as shown on the construction drawings to the vapor carbon adsorber, using the same overhang previously mentioned.

REMEDIAL SYSTEM PAD

Part 1: General

1.1 General Information

This bid specification package describes the installation of the concrete pad on which the remedial system compound shall be built. The Contractor shall supply all labor and materials for installation, and install the conduits and pipes through the concrete slab, as shown on the construction drawings.

1.2 Submittals

The Contractor shall submit drawings and/or quality assurance of the mix design which depicts the materials and proposed construction method. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods described herein shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 General

All concrete used shall be of at least a standard rated 4ksi cured strength fibermesh concrete.

2.2 Reinforcement

Reinforcement using welded wire mesh shall be required; any submittal not containing steel reinforcement to industry standard will be rejected.

Part 3: Execution

3.1 Site Preparation

The area to be covered by the slab shall be excavated to approximately four inches below land surface, and compacted according to the direction of the Owner's Engineer, which shall be approximately 98% of a modified Proctor test. No organics or otherwise deleterious material shall be at the base of slab prior to pouring concrete.

If the soil is deemed by the Owner's Engineer to be too dry, water shall be applied to the area generously to bring the soil moisture to an acceptable level before construction may commence.

3.2 Footers

Footers shall be required; any submittal not including appropriate footers for the size and weight of the remedial structure will be rejected.

3.3 Concrete

Concrete shall be mixed and poured in a continuous manner, with a slight drainage slope. Slab surface shall be uniform, without high or low ponding areas. Concrete shall not be poured on a Friday, unless otherwise directed by the Owner's Engineer, or unless the Contractor will be working on the following day (Saturday). It shall be the Contractor's responsibility to be aware of weather conditions prior to pouring concrete. Contractor is responsible for repair, up to and including replacement, of any concrete damaged by inclement weather. Concrete shall be mechanically worked with a standard concrete vibrator after placement, and prior to finishing. Finish shall be coarse broom type.

SYSTEM CONTROL PANEL

Part 1: General

1.1 General Information

This bid specification package details the remedial system control panel. The Contractor shall supply all materials and labor for the installation of the control panel and associated equipment, and shall locate it inside the remedial system compound shed, as directed in the field by the Owner's Engineer, which shall be approximately as shown on the construction drawings.

The Contractor shall be fully licensed and insured to perform the work described herein, and shall only use personnel experienced and certified by way of education, training, or certification to perform the work as required by federal, state, and local regulation.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed control panel layout and installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Control Panel

The Contractor shall supply a NEMA 4 weatherproof enclosure containing the system automatic motor control panel. The control panel shall be built for operation on 230VAC, three-phase, three-wire, fused incoming service. It shall be designed to provide constant speed motor control for two 20HP blower motors, one 10HP transfer pump, digital "required" DC signal control for the ten (10) remote well pumps described in the Submersible Pumps section of this document, all with automatic programmable logic control and alarm dial out logic. The control panel shall be housed in the NEMA 4 weatherproof enclosure, with mounting feet attached, with sub-panel and "dead front" hinged inner door approximately 30 inches high, 24 inches wide, and 12 inches deep, having a hinged, padlockable outer door.

Additionally, the control panel shall include these specifications:

- Incoming power, 200 amp rated non-fusible disconnect switch, inner door-mounted, padlockable rotary operator

- Power distribution block
- 2 – IEC UL Type F Manual Motor Protector / Contactor, 65 amp, for air stripper blower and booster blower
- IEC UL Type F Manual Motor Protector / Contactor, 32 amp, for air stripper transfer pump
- Incoming power and motor ground lugs
- 460/240 to 120VAC control power transformer with primary and secondary fusing
- 7 – Alarm indicator lights, red, LED, inner door-mounted, and labeled as to their respective component monitored
- 3 – Illuminated “Hand-Off-Auto” motor selector switch with integral green LED run indication, inner door-mounted, labeled as to their respective component controlled
- 1 – “Off-Auto” well pump selector switch, inner door-mounted, for master control of the remote well pumps, and labeled accordingly
- Alarm reset pushbutton, inner door-mounted
- PLC, modular smart relay and expansion with 24 digital inputs and 16 relay outputs
- Power supply, 24VDC, 1.2 amps
- Telephone alarm dialer, four channel with power/phone line transient arrestor
- Terminal blocks for external connections and fusing as required
- Color-coded control wiring with printed routing information
- UL508A “Enclosed Construction” Industrial Control Panel label
- Fully documented, assembled, wired, and pre-shipment tested

Part 3: Execution

3.1 Control Panel Installation

The Contractor shall mount the control panel securely using 1+5/8” Uni-Strut, following NEC and other appropriate governmental codes, as well as industry standards and accepted practices. The location shall be inside the remedial system compound shed, as directed by the Owner's Engineer, which shall be approximately as shown on the construction drawings. The Contractor shall wire the panel appropriately, marking wires at each junction and connection in a permanent fashion as approved by the Owner's Engineer. The Contractor will not be responsible for coordinating telephone service connection but shall coordinate this activity with the Owner’s Engineer to avoid conflict. The control panel shall be installed according to this document, National Electric Code, and per industry and accepted practice.

EQUIPMENT SHED

Part 1: General

1.1 General Information

This bid specification package provides information pertaining to the equipment compound shed. The shed shall protect the remedial equipment from the environment, as well as unauthorized entry into the compound. The shed will cover the 20 foot by 35 foot remedial compound concrete slab that contains the treatment equipment. The Contractor shall supply all materials and labor for the installation of the equipment shed, as shown on the construction drawings.

1.2 Warranty

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products **attach cut sheet**

2.1 Equipment Shed

The Contractor shall procure an equipment shed of TNT manufacture or approved equal. Alternate design/manufacturer shall be certified in the state of Florida to be meet applicable codes. The shed shall be 20 feet by 36 feet to cover the concrete slab properly, and shall be 14 feet tall at the lowest point of the roof. The shed shall be constructed of 12-gauge, 2.25" by 2.25" box steel frame members, and braced at each bend by the same box steel tube. The sides and ends shall be totally enclosed, and the ends gabled, with steel. A roll-up door measuring no less than 10 feet by 10 feet shall be installed on each end, centered in the width of each end. Above each door, a vent without fan, equipped with horizontal slats to keep rain intrusion to a minimum, shall be placed, and measure at least four feet by four feet.

Part 3: Execution

3.1 Equipment Shed Installation

The shed shall be installed such that its footprint matches the concrete slab, and so that the beams along the bottoms of the walls attach vertically to the slab with concrete anchors that meet Florida codes, including those specifying resistance to winds. The shed installation shall be completed per industry standard and accepted practice. Shop drawings shall be submitted to the Owner's Engineer for approval of the construction of the shed and its concrete mounting anchors before placing orders for such equipment.

3.2 Permitting

Contractor shall be responsible for applying for and obtaining all applicable permits, as well as paying any permitting-related fees and costs. All permits shall be submitted to the Owner's Engineer prior to commencement of such work.

3.3 Stamped Drawings

Five original, stamped copies of the certified drawings shall be supplied to the Owner's Engineer upon completion of construction.

SYSTEM ELECTRICAL INSTALLATION

Part 1: General

1.1 General Information

This bid specification package describes the installation of electrical service to and distribution of electrical service within the remedial system. The Contractor shall supply all labor and materials for installation, install and connect the conduits, wiring, switches, meters, and other electrical equipment, as shown on the construction drawings. Contractor shall also coordinate electrical supply to the remedial compound with the appropriate service provider and the Owner's Engineer.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods described herein shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 General

All products used in the installation of the remedial system shall meet all applicable portions of the National Electric Code (NEC), and shall be UL-Listed.

2.2 Above-Ground Conduit

All above-ground non-flexible conduits shall be of Schedule 40 galvanized steel, and all fittings thereon shall be water-tight. All flexible above-ground conduits shall be of standard steel-reinforced, water-tight flexible conduit, approved for use in outdoor locations. All above-ground conduits shall be type UA or LA as manufactured by Liquatite, Sealtite, or similar. Flexible conduit shall be spirally-wound, square, locked, hot-dipped galvanized steel strip with a continuous copper ground built into the core. Conduit shall have a continuous, liquid-tight, flame-resistant PVC jacket. Connectors and fittings shall be grounding type and shall be so designed to clamp the PVC jacket of the conduit so as not to allow it to pull away from the connection and expose the conduit metal.

2.3 Below-Ground Conduit

All below-ground conduits shall be of HDPE4710 material, and conform to the ASTM F2160 *Standard Specification for Solid Wall High Density Polyethylene Conduit Based on Controlled Outside Diameter*.

2.4 Wire Sizing

All wire installed shall be of proper size for the current that it will convey, according to NEC.

2.5 Shielded Wire

Any wire that shall be carrying any type of control waveform shall be shielded for its entire length, and the shield shall be grounded. Standard, power-only lines need not be shielded, unless a control waveform is overlaid on the power wave, such as in the case of the wires from a CU-300 unit to its well pump.

Part 3: Execution

3.1 General

All electrical installation personnel shall be properly licensed for the work they are to take part in, according to NEC. The electrical service shall be more than adequate to operate the specified equipment and controls. The electrical service shall be complete with meter, mast, and grounding rod. As-built wiring diagrams of all work to be furnished upon completion by contractor.

3.2 Securing Conduit within the Compound

All above-ground, horizontal conduit between components shall be across the floor, to aid in the safe movement of personnel and materiel about the compound. Conduit extending along the floor shall have properly-sized Unistrut hold-downs fastening them to the floor at a minimum of every four feet. The piping shall be routed as shown on the construction drawings or as directed by the Owner's Engineer.

3.3 Testing

All electric motors, switches, interlocks, and hand and remote controls shall be fully tested for correct rotation, safety, and proper operation by the Contractor before this work scope shall be considered complete.

The Contractor shall be held liable for any damages to remedial equipment, city, county, state, or federal property, any third party personal property, and any personal injuries pertaining to or resultant from improper materials or installation on the part of the Contractor, the Contractor's personnel, or any subcontractors hired by the Contractor.

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

Part 1: General

1.1 Description

1.1.1 Scope

This section specifies high density polyethylene (HDPE) pipe and fittings, including acceptable fusion technique and practice, and safe handling and storage.

1.1.2 Pipe Description

Contractor shall furnish high density polyethylene (HDPE) pipe and fittings conforming to all applicable standards and procedures as referenced in this specification, and meeting all applicable testing and material properties as described by the applicable standards referenced in this specification or as required within this specification.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.2 Quality Assurance

1.2.1 References

This section contains references to the following documents. They are a part of this section to the extent referenced in this specification. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of a conflict between the requirements of this section and those of the referenced documents, the requirements of this specification shall prevail.

Unless otherwise specified, references to documents shall mean the latest published edition of the referenced document in effect at the time of construction.

Reference	Title
ANSI/AWWA C901	Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm) for Water Service
ANSI/AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission
AWWA M55	Manual of Water Supply Practices, PE Pipe—Design and Installation
ASTM D1603	Standard Test Method for Carbon Black in Olefin Plastics
ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM D4218	Standard Test method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
ASTM F585	Standard Practice for Insertion of Flexible Polyethylene Pipe Into Existing Sewers

Reference	Title
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F1055	Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
ASTM F1290	Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings
ASTM F2164	Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
ASTM F2620	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
NSF/ANSI 61	Drinking Water System Components—Health Effects
PPI TR-4	PPI Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength Ratings for Thermoplastic Piping Materials for Pipe

1.2.2 Manufacturer Requirements

High density polyethylene (HDPE) pipe and fittings shall be manufactured in accordance with the following standards:

- ASTM D3035 – ½ in through 24-in pipe
- ASTM F714 – 3-in through 54-in pipe
- AWWA C901 – 1/2 In. (130mm) through 3 In. (76 mm) pipe and tubing
- AWWA C906 – 4 In. (100 mm) through 63 In (1,600 mm) pipe and fabricated fittings
- ASTM D3261 – butt fusion fittings, saddles and flange adapters
- ASTM F1055 – electrofusion couplings and saddles.

1.2.3 Fusion Technician Requirements

Each Fusion Technician shall be separately qualified to make each type of fusion joint. Permissible type of fusion joint type is electrofusion. Qualification to make one type of fusion joint shall not qualify a Fusion Technician to make a different type of fusion joint.

Each Fusion Technician making saddle fusion joints shall be qualified to make saddle fusion joints in accordance with ASTM F2620. Qualification shall have occurred not more than 12 months before performing on-site fusion joining in accordance with this specification. Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F2620 that are proved to be satisfactory by destructive testing in accordance with ASTM F2620.

Each Fusion Technician making electrofusion fitting joints shall be qualified to make electrofusion fitting joints in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure. Qualification shall have occurred not more than 12 months before performing on-site fusion joining in accordance with this specification. Qualification shall be a documented demonstration of proficiency by making joints in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure that are proved to be satisfactory by destructive testing in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure.

1.2.4 Approved Suppliers

Pipe and fitting suppliers shall be approved by the Owner's Engineer. WL Plastics is approved as a pipe manufacturer. Friatec and Central Plastics are approved as fitting manufacturers.

1.2.5 Warranty

Pipe and fitting suppliers shall provide a one-year warranty covering defects in product material and workmanship. A successful pressure test or pressure leak test prior to the expiration of the warranty period shall not relieve the supplier of warranty responsibility for the full warranty term.

Fusion providers shall provide a one-year warranty from the date of installation acceptance covering defects in fusion joining workmanship that shall provide for remaking defective butt fusion, saddle fusion or electrofusion joints. A successful pressure test or pressure leak test prior to the expiration of the warranty period shall not relieve the installer of warranty responsibility for the full warranty term.

1.2.6 Submittals

The following information shall be submitted by pipe and fitting suppliers:

- Name of the pipe manufacturer and a list of the piping and quantities to be provided by manufacturer.
- Name(s) of fitting manufacturer(s) and lists of fittings and quantities to be provided by manufacturer.
- Pipe and fitting product data indicating conformance with this specification, applicable standards, and warranty provisions, including written documentation regarding any intended variance from this specification and applicable standards.
- At the time of shipment, the supplier shall provide certified documentation of pipe and fitting conformance with this specification and applicable pipe and fitting standards specified herein.

The following information shall be submitted by Fusion Providers.

- Documentation that each Fusion Technician has met requirements for joining proficiency for each type of fusion joint performed by the Fusion Technician under this specification.
- Documentation of conformance with this specification and applicable standards, including written documentation regarding any intended variance from this specification and applicable standards. This will include fusion joint warranty information and recommended project specific fusion parameters, including criteria logged and recorded by data logger.
- The following AS-RECORDED DATA is required from the Contractor and/or Fusion Provider:
 - Fusion reports for each fusion joint performed on the project, including joints that were rejected.
 - Submittals of the Fusion Technician's joint reports are required as requested by the Owner or Engineer.
 - Specific requirements of the Fusion Technician's joint report shall include pipe or fitting size and DR or pressure class rating, fusion equipment size and identification, Fusion Technician Identification, job identification number, fusion number, fusion joining parameters, and ambient temperature

Part 2: Products

2.1 PE4710 Pipe and Fittings for Pressure Non-Potable Water Service

2.1.1 PE4710 Pipe and Fitting Material Compound

PE4710 material compound shall conform to material requirements specified in ASTM D3035 or AWWA C901 or ASTM F1055 as applicable for the pipe or fitting. PE4710 material shall meet the requirements of ASTM D3350 and shall meet or exceed a cell classification of 445474 per ASTM D3350.

PE4710 material compound shall have a hydrostatic design stress (HDS) rating for water at 73°F (23°C) of not less than 1000 psi that shall be documented in the name of the pipe manufacturer in PPI TR-4.

PE4710 material compound shall have a hydrostatic design basis (HDB) rating at 140°F (60°C) of not less than 1000 psi that shall be documented in the name of the pipe manufacturer in PPI TR-4.

PE4710 pipe and fitting material compound in PE4710 pipe and fittings shall contain color and ultraviolet (UV) stabilizer meeting the requirements of Code C or E per ASTM D3350. Code C material shall contain 2 to 3 percent carbon black to provide indefinite protection against UV degradation when material from the pipe is tested in accordance with ASTM D1603 or ASTM D4218. Code E material used for coextruded OD color stripes or a coextruded ID color layer shall contain sufficient UV stabilizer to protect the pipe against UV degradation for at least 24 months of unprotected outdoor exposure. Coextruded color PE compound material shall be PE4710 pipe material compound, varying only by color and UV stabilizer.

Clean rework materials derived from pipe production by the same manufacturer are acceptable as part of a blend with virgin material for the production of new pipe or tubing provided that the rework material is the same PE4710 material designation as the virgin material compound to which it is added. Finished products containing rework material shall meet the requirements this specification.

2.1.2 PE4710 pipe and butt fusion fittings shall have plain ends for fusion.

2.1.3 PE4710 Pipe

Nominal straight lengths of 3 inch and larger pipe shall be 40 ft. or 50 ft.

Nominal coil lengths of 4-inch and smaller pipe shall be 500 ft. Longer or shorter coils such as 800 ft for 4-inch pipe, 1000 ft for 3-inch pipe, or 2000 ft for 2 inch or smaller pipe shall be acceptable. Pipe shall be black. Coextruded lavender or purple stripes or a coextruded lavender or purple layer shall be an acceptable option.

Pipe shall be permanently marked using heated indent printing in accordance with ASTM D3035 or ASTM F714 or AWWA C901 or AWWA C906 as applicable for the pipe size including:

- Nominal size and sizing system, e.g., IPS or DIOD
- PE4710 material designation
- DR or SDR
- Standard Designation, e.g., ASTM D3035 or ASTM F714 or AWWA C901 or AWWA C906
 - The Standard Designation marking on the pipe shall serve as the manufacturer's certification that the pipe has been manufactured, sampled and tested and has been found to comply with the requirements of the standard.
- Extrusion production-record code
- Manufacturer's Trademark or trade name

2.1.4 PE4710 Fittings

PE4710 electrofusion fittings shall be manufactured from PE4710 material compound in accordance with this specification.

PE4710 fittings shall comply with shall comply with ASTM F1055 for electrofusion fittings.

PE4710 fittings shall comply with the marking requirements of ASTM F1055 for electrofusion fittings.

PE4710 fittings shall have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.

2.2 Fusion Joints

Unless otherwise specified, PE4710 pipe and fittings shall be assembled in the field with electrofusion joints. ASTM F1290 and the electrofusion fitting manufacturer's recommended joining procedure shall be observed for electrofusion joints.

Field electrofusion joints shall be made by Fusion Technicians that are qualified in accordance with this specification to make the specific fusion joint type.

Field fusion joints shall be recorded and documented in accordance with this specification.

2.3 Connections and Fittings for Pressure Applications

2.3.1 General

Connections shall be defined in conjunction with the linking of project piping, as well as the tie-ins to other piping systems. Connection methods other than electrofusion shall only be used when transitioning from PE4710 pipe to another type of pipe; connections made from PE4710 pipe to PE4710 pipe shall be made using electrofusion.

2.3.2 Mechanical Fittings

Acceptable mechanical fittings for use with PE4710 pipe and fittings shall be mechanical fittings that are qualified by the mechanical fitting manufacturer for use with PE4710 pipe and fittings.

Mechanical fittings for use with HDPE pipe shall provide restraint against longitudinal separation that is inherent to the design of the joint. Mechanical joints that do not provide restraint against pull-out or push-off are prohibited.

Mechanical connections to non-HDPE devices and appurtenances shall be by bolted flange adapter or MJ adapter. Flange adapter and MJ adapter connections shall be assembled and tightened in accordance with flange adapter or MJ adapter manufacturer's instructions.

2.3.3 Gasketed, Push-On Fittings

Gasketed push-on fittings shall be fitted with external mechanical restraints that span across the joint and are assembled in accordance with restraint manufacturer's instructions. Thrust blocking does not provide acceptable restraint and is prohibited. Where plain-end PE4710 pipe is assembled with push-on fittings, the PE4710 pipe end shall be fitted with electrofusion restraints so that external mechanical restraint may be secured to the PE4710 pipe.

Where PE4710 pipe is connected to gasketed mechanical joint fittings or appurtenances, the connection shall be made by butt fusing a PE4710 MJ Adapter to the PE4710 pipe and connecting the PE4710 MJ Adapter to the mechanical joint fitting or appurtenance.

2.3.4 Sleeve-Type Couplings

Sleeve-type mechanical couplings shall be manufactured for use with PE4710 pipe, and shall be restrained according to the coupling manufacturer's recommendations and these specifications. Unrestrained sleeve-type couplings are prohibited.

2.3.5 Expansion and Flexible Couplings

Expansion-type mechanical couplings are prohibited.

2.3.6 Connection Hardware

Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

Part 3: Execution

3.1 Delivery and Off-Loading

All piping shall be bundled or packaged for transportation by commercial carrier to the site.

Before off-loading, pipe shall be inspected for damage. Any pipe damaged in shipment shall be assessed and either accepted or rejected as directed by the Owner's Engineer, and the pipe supplier shall be notified of rejected pipe within 7 days of delivery at the site. Rejected pipe shall be quarantined for disposition. Each pipe shipment shall be checked for quantity and proper pipe size, color and type.

Pipe shall be off-loaded and handled in accordance with the pipe manufacturer's instructions and AWWA M55.

3.2 Handling and Storage

Pipe lengths should be placed and stored on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way. Use of hooks, chains, wire rope or any other handling device which creates the opportunity to damage the surface of the pipe is strictly prohibited.

Covering or shading of PE4710 pipe and fittings against exposure to ultraviolet light from sunlight is not required.

3.3 Fusion Process

3.3.1 General

Electrofusion of PE4710 pipe and fittings shall be performed in accordance with ASTM F1290 and the electrofusion fitting manufacturer's recommended procedure.

PE4710 pipe and fittings shall be fused by qualified fusion technicians, as documented by the fusion provider. Training records for qualified fusion technicians shall be available to the Owner's Engineer upon request.

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine. Joint data shall be submitted as part of the As-Recorded information, in accordance with this specification.

Other equipment specifically required for fusion processes shall include the following:

- A protective enclosure that provides for full machine motion of the clamps, heat plate, fusion assembly and carriage shall be provided for fusion in inclement and/or windy weather. Pipe ends shall be covered or blocked where open pipe ends could allow prevailing winds to blow through the pipe.
- Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

3.3.2 Joint Recording

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine that shall register and/or record the parameters required by the manufacturer and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

3.4 Installation

The PE4710 pipe and fittings will be installed such that PE4710 pipe curvature is not less than the minimum bending radius recommended by the pipe manufacturer.

Direct burial installation of PE4710 pressure pipe shall be in accordance with ASTM D2774 and the pipe manufacturer's recommendations.

Installation of PE4710 pipe by sliplining or insertion within a casing or host pipe shall be in accordance with ASTM F585 and the pipe manufacturer's recommendations.

3.5 Making Connections to Non-PE4710 Piping Systems

Approximate locations for non-PE4710 piping systems are shown on the drawings or detailed in the specifications. Prior to making connections into existing piping systems, the Contractor shall:

- Verify the actual field location, size, piping material and service of non-PE4710 piping systems.
- Obtain all required non-PE4710 piping manufacturer(s) approved fittings (i.e., saddles, sleeve type couplings, flanges, tees, etc., as shown).
- Have installed all temporary pumps and/or pipes in accordance with established connection plans.
- Have on hand pipe stoppers, blind flanges or other devices to seal a valve or appurtenance that fails to seal properly. When applied to pressure rated valves or appurtenances, all such devices shall be pressure rated equal to or greater than the pressure rating of the valve or appurtenance to which they are attached.

Where PE4710 pipe connects in-line to unrestrained piping, the end of the PE4710 pipe shall be anchored in-line within 10 ft of the connection to prevent longitudinal movement of the PE4710 pipe.

- The PE4710 pipe shall be fitted with a PE4710 wall anchor or electrofusion flex restraints.
- The PE4710 wall anchor or electrofusion flex restraints shall be encased in reinforced concrete that is sufficient to withstand Poisson effect longitudinal loads in accordance with AWWA M55 In-Line Anchoring.

Unless otherwise approved by the Owner's Engineer, new piping systems shall be completely assembled and successfully tested prior to making connections to non-PE4710 piping systems.

3.6 Pipe System Connections

Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations and as indicated on the drawings. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's recommendations.

3.7 Tapping for Potable and Non-Potable Water Applications

Tapping shall be performed using electrofusion saddle fittings designed for use on PE4710 piping. Tapping by threading directly into the PE4710 pipe wall is prohibited.

Branching connections requiring a larger diameter shall be made with saddle electrofusion, branch saddle fittings or mechanical branch connection fittings as specified and indicated on the drawings.

Equipment used for tapping shall be made specifically for tapping PE4710 pipe:

- Tapping bits shall be slotted "shell" style cutters, specifically made for PE4710 pipe. 'Hole saws' made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
- Manually operated or power operated drilling machines may be used.

Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap), or when the pipeline is not filled with water and not under pressure ('dry' tap).

3.8 Testing

3.8.1 General

Testing shall comply with all local building codes, statutes, standards, local jurisdiction, and laws.

Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the Owner and Engineer.

3.8.2 Hydrostatic Leakage Testing for Pressure Piping

Hydrostatic leakage testing shall comply with ASTM F2164. If the test section fails the test for excessive leakage, the Contractor shall repair or replace all defective materials and/or workmanship at no additional cost to the Owner.

Pneumatic (compressed air) leakage testing of PE4710 pressure piping is prohibited.

SUBMERSIBLE PUMPS AND CONTROL MODULES

Part 1: General

1.1 General Information

This bid specification package details submersible pumps, their control modules, and appurtenances. The Contractor shall supply all materials and labor for the installation of the submersible pumps, their control modules, and all related equipment, and shall locate them as shown on the construction drawings.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Groundwater Pumps

2.1.1 Intermediate Aquifer Pumps

Contractor shall provide five (5) Grundfos submersible pumps, model RediFlow3 10REDI-FLO3-220, with 3/4HP, 230V, single-phase motors, 70-foot Teflon motor leads, and 0-30psi 316 stainless steel submersible pressure transducers with 80-foot vented cables.

2.1.2 Deep Aquifer Pumps

Contractor shall provide four (4) Grundfos submersible pumps, model RediFlow3 22REDI-FLO3-210, with 1HP, 230V, single-phase motors, 90-foot Teflon motor leads, and 0-30psi 316 stainless steel submersible pressure transducers with 100-foot vented cables.

2.1.3 Deep-Deep Aquifer Pumps

Contractor shall provide one (1) Grundfos submersible pump, model RediFlow3 10REDI-FLO3-220, with 3/4HP, 230V, single-phase motors, 110-foot Teflon motor leads, and 0-30psi 316 stainless steel submersible pressure transducers with 120-foot vented cables.

2.2 Control Modules

The Contractor shall supply ten (10) control modules, which shall be of Grundfos model CU300, as well as two remotes of Grundfos model R100. The remotes shall be delivered to the Owner's Engineer upon completion of this installation.

2.3 Control Module Enclosures

The Contractor shall supply ten (10) NEMA 4 weatherproof enclosures, each with well pump disconnect and control panel. Each shall be for 230V, single-phase, two-wire incoming service. There shall be a means for disconnecting power to its enclosed CU300 control module, thereby shutting down the well pump it is attached to. The enclosure shall have mounting feet attached, with sub-panel and inner door approximately ten inches high, eight inches wide, and six inches deep, having a hinged door.

Additionally, each shall include:

- Incoming power fusible disconnect switch, inner door mounted, rotary, and pad-lockable operator
- Incoming and motor ground lugs
- Relay, SPDT, 24VDC powered from main power source
- Terminal blocks for external connections and fusing as required
- Color-coded control wiring with printed routing information
- UL508A "Enclosed Construction" Industrial Control Panel label
- Fully documented, assembled, wired, and pre-shipment tested

These enclosures shall be of custom design by Carbonair as a specially-produced product, or approved equal only with prior approval from the Owner's Engineer.

Part 3: Execution

3.1 Submersible Pump Installation

The ten submersible pumps shall be installed by the Contractor into the recovery wells as shown on the construction drawings. Flexible hosing of the same size as each pump's discharge shall be used exclusively inside the recovery wells themselves, to transition to rigid piping no sooner than at the top of the recovery well casing. A stainless steel king nipple shall be used to connect the hose to the pump. An expansion plug-type seal shall be used to seal the two aquifers from each other in wells with two pumps. The Contractor shall supply and use only shielded cables for the motor leads; at no junction and for no length shall the motor leads be without shielding.

The correct leads and safety/hanging cables and clamps, as recommended by the pump manufacturer, shall be supplied by the Contractor and installed as shown on the construction drawings, according to National Electric Code, and per industry and accepted practice. The control modules shall also be supplied by the Contractor, and installed according to this document, National Electric Code, and per industry and accepted practice.

3.2 Control Module and Bollard Installation

The Contractor shall install the control modules into the enclosures and wire appropriately with color-coded wires. The enclosures shall each be mounted onto a four inch by four inch wood post, whose final installed height shall be approximately five feet above land surface. Each wooden post shall be installed by the Contractor to at least three feet below land surface (BLS), and have at least two 94 lb bags of standard aggregate concrete, poured into the bore hole to hold the post in place. Additionally, the Contractor shall supply and install four bollards, placed around each recovery well vault, as shown on the construction drawings. Each

bollard shall be constructed of four inch nominal diameter steel pipe, installed to a depth of four feet BLS and with four feet above land surface, and filled with concrete through its entire length. The borehole for each bollard shall be two feet wide to total depth plus six inches, and filled with standard aggregate concrete as mixed from the bag, with no additional aggregate added. Concrete shall be mixed using approximately five and a half gallons of water per bag of concrete or as directed by the Owner's Engineer to achieve the proper strength. Each bollard shall be in the approximate center of its borehole. Each bollard's finishing shall be a bright yellow color, using an epoxy type paint, and not to cause undue painting of other natural or installed surfaces. All concrete used shall be rated for a standard 3.5ksi fully-cured strength.

TRENCHING

Part 1: General

1.1 General Information

This bid specification package details the trenching installation of the below-ground piping and conduits. All below-ground piping, unless otherwise specified, shall be of high-density polyethylene (HDPE) of PE4710 grade. The Contractor shall supply all materials and labor for the installation and testing of the piping and associated equipment, as shown on the construction drawings.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

A submittal detailing the method to be used by the Contractor for installing the piping in the trenches shall be required, and approval from the Owner's Engineer shall be required prior to beginning trenching activities. Contractor should be advised that rolled HDPE piping can be difficult to place in trenches.

A submittal detailing the method and product(s) to be used by the Contractor for marking the pipes shall be required, and approval from the Owner's Engineer shall be required prior to beginning trenching installation.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 Piping

All piping shall be of PE4710 material, as specified elsewhere in this document, unless otherwise specified. Additionally, due to pressure requirements, all water conveyance PE4710 piping shall be of DR9 aspect ratio. The HDPE piping shall be supplied in rolls of the longest length available to minimize the number of joints required.

Part 3: Execution

3.1 Trenching

The Contractor shall be responsible for all utility locates and shall coordinate with the utilities for any conflicts.

If a utility conflict is encountered based on the proposed remedial system piping, the contractor shall notify the Owner's Engineer immediately so adjustments in the piping alignment can be made. No deviation in the proposed piping alignment as depicted on the construction drawings is allowed unless approved by the Owner's Engineer.

Piping shall be installed by the Contractor no less than approximately 24 inches below land surface or at a depth commensurate with the manufacturer's recommendations, whichever is deeper. Trench width shall be approximately 24 inches, as a minimum. Backfill of the trenches shall be with native soil which shall consist of nonconsolidated soil free of rocks, sticks or other obstacles that compromise the integrity of the pipe. It is the contractor's responsibility to visually screen the backfill material for deleterious material. Backfill shall be placed in one-foot lifts and compacted with a plate compactor of sufficient size to ensure a 95% Modified Proctor density (ASTM D1557-09) is achieved. Pipes shall be installed in trenches approximately as shown in the attached construction drawings, but may be field adjusted with the Owner's Engineer's approval. Each pipe shall be labeled every 20 feet with a permanent marking, indicating its unique purpose/routing in the system, for example "RW-1i". Engraving, or other means which may reduce the strength of the pipe, shall not be acceptable means for permanent marking. Where any roadway is passed underneath, whether of dirt or of a paved surface, an external casing shall be installed per the piping manufacturer's recommendations, and shall extend at least five feet on either side of the edge of the roadway.

WELL INSTALLATION

Part 1: General

1.1 General Information

This bid specification package details the purchase and installation of the recovery wells. The Contractor shall supply all materials and labor for the installation of the recovery wells, vault boxes, and associated equipment, and shall locate them as directed by the Owner's Engineer, which shall be approximately as shown in the construction drawings.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 General

Well casings shall be of Schedule 40 PVC construction, and all well screens shall be of standard, 0.01" slot size. All wells shall be finished with a 6-20 sand filter pack. Well seals shall be constructed of 30/65 fine sand, topped with Type-I Portland Neat Cement, finished to the bottom of the well vault.

Part 3: Execution

3.1 Well Installation

The Contractor shall install ten (10) total recovery wells (RWs), in six individual vaults, referred to as RW-1i, RW-1d/RW1dd, RW-2i/RW-2d, RW-3i/RW-3d, RW-4i, RW-5i/RW-5d. The Contractor shall be responsible for obtaining any and all permits required to perform this work and obtaining utility clearance for below grade activities. Any associated costs and/or permitting fees shall be paid by the contractor. All wells shall be cleared to at least five feet below land surface (BLS) using a hand auger, to clear for underground utilities and other hazards. Soil cuttings generated during hand-clearancing shall be drummed, and either disposed of or spread on

site, at the direction of the Owner's Engineer. All recovery wells shall be installed using the rotary sonic drilling method. The following is a list of the six wells to be drilled, by name:

- RW-1i – Installed to 60 feet BLS, with 15 feet of screen at the bottom
- RW-1d/1dd – Installed to 100 feet BLS, with 10 feet of screen at the bottom and 15 feet of screen from 65 feet BLS to 80 feet BLS
- RW-2i/2d – Installed to 80 feet BLS, with 10 feet of screen at the bottom and 15 feet of screen between 45 feet BLS and 60 feet BLS
- RW-3i/3d – Installed to 80 feet BLS, with 10 feet of screen at the bottom and 15 feet of screen between 45 feet BLS and 60 feet BLS
- RW-4i – Installed to 60 feet below land surface (BLS), with 15 feet of screen at the bottom
- RW-5i/5d – Installed to 80 feet BLS, with 10 feet of screen at the bottom and 15 feet of screen between 45 feet BLS and 60 feet BLS

Each recovery well shall be constructed of five inch (nominal) Schedule 40 PVC well casing and sealed at the bottom. Well screens shall be of Schedule 40 PVC well screen with 0.01" slot size. The filter pack around the well screen shall be of 6-20 sand to a depth of one foot above each lower well screen, with two feet of 30/65 fine sand seal above it, and with Type I Portland Cement finished up to two feet below the beginning of the upper well screen, or finished up to the bottom of the well vault, whichever the case may be. In wells with two screened sections, the first cement annulus shall be topped by one foot of 30/65 fine sand seal, the top of which shall be one foot below the bottom of the upper well casing. The upper well casing shall have a filter pack consisting of 6-20 sand from one foot below the well screen to one foot above the well screen. The upper screen filter pack shall be sealed by two feet of 30/65 fine sand and then finished to the bottom of the recovery well vault with Type I Portland Cement. The recovery wells shall be developed by purging, surging or other acceptable method until the recovered water is relatively clear and free of turbidity.

3.2 Vault Boxes

Each recovery well shall be finished by the Contractor with a vault box and concrete pad that the Contractor shall supply. The vault boxes shall be H-20 traffic-rated, measure two feet by two feet, and measure two feet to the bottom of the side walls. Steel shall be coated with a black epoxy paint to prevent rust and corrosion. All incoming piping shall be installed **beneath** the walls of the vault box, so that no holes are created in the walls of the vault boxes. The vault box pads shall be finished with concrete of a standard rating of at least 4ksi cured strength to approximately 6 inches laterally beyond the edge of the vault box. Around the skirt of the vault box, approximately six inches of said concrete shall surround the steel for support, all the way to the depth of the skirt. The Contractor shall supply the hoses, fittings, gauges, and other appurtenances shown in the well vaults in the attached construction drawings or as directed by the Owner's Engineer.

3.3 Piezometer

The Contractor shall install one (1) total piezometer wells (PZ), into the Terminal Box vault, which is discussed in detail the Infiltration Gallery section of this document. The Contractor shall be responsible for obtaining any and all permits required to perform this work, as well as paying any associated permitting fees and costs. The piezometer's borehole shall be cleared to at least five feet BLS using a hand auger, to clear for underground utilities and other hazards. Soil cuttings generated during piezometer installation shall be drummed, and either disposed of or spread on site, at the direction of the Owner's Engineer. The piezometer shall be installed using the rotary sonic drilling method. The piezometer shall be installed to a total depth of ten feet BLS, and shall be screened from three to ten feet BLS.

The piezometer shall be constructed of two inch (nominal) Schedule 40 PVC well casing and sealed at the bottom. The well screen shall be of Schedule 40 PVC well screen with 0.01" slot size. The filter pack around the well screen shall be of 6-20 sand to a depth of one foot above the well screen, with six inches of 30/65 fine sand seal above it, and with Type I Portland Cement finished up to the bottom of the vault.

3.3 Lithology, Logging, and Testing

The site lithology is generally assumed to be various silty sands near the surface, and limestone at depth. OVA testing will not be conducted, due to the use of sonic drilling methods. Lithology logging will also not be conducted.

3.4 Drill Cuttings

The Contractor shall supply 45 drums, and be prepared to supply additional drums as required during the course of work, for the containment of drill cuttings extracted during well installation. Soil and water cuttings obtained during drilling activities shall be either disposed of by the Owner or spread on site, at the direction of the Owner's Engineer. The Contractor shall place the drum(s), if generated, at an on-site location specified by the Owner's Engineer.

SYSTEM ELECTRICAL INSTALLATION

Part 1: General

1.1 General Information

This bid specification package describes the installation of electrical service to and distribution of electrical service within the remedial system. The Contractor shall supply all labor and materials for installation, install and connect the conduits, wiring, switches, meters, and other electrical equipment, as shown on the construction drawings. Contractor shall also coordinate electrical supply to the remedial compound with the appropriate service provider and the Owner's Engineer.

1.2 Submittals

The Contractor shall submit drawings and/or catalog cut sheet depicting the materials and proposed installation method. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications. Submittal of any and all permits required for this scope shall be the Contractor's responsibility, and shall be obtained prior to commencing work. The Contractor shall submit proof of permit approval as applicable to the work described herein.

Any substitutions to the materials and or methods described herein shall be submitted in triplicate to the Owner's Engineer for approval. The Owner's Engineer will review the alternative and render a decision to accept as approved equal or reject the submittal.

1.3 Warranty

All products shall be covered by a one year warranty from manufacturers' defects. All services rendered shall be warranted for one year to be free of defects in craftsmanship. The Contractor shall be responsible for all warranties of craftsmanship, both for work that the Contractor performs and work performed by any subcontractors hired by the Contractor.

Part 2: Products

2.1 General

All products used in the installation of the remedial system shall meet all applicable portions of the National Electric Code (NEC), and shall be UL-Listed.

2.2 Above-Ground Conduit

All above-ground non-flexible conduits shall be of Schedule 40 galvanized steel, and all fittings thereon shall be water-tight. All flexible above-ground conduits shall be of standard steel-reinforced, water-tight flexible conduit, approved for use in outdoor locations. All above-ground conduits shall be type UA or LA as manufactured by Lique-tite, Sealtite, or similar. Flexible conduit shall be spirally-wound, square, locked, hot-dipped galvanized steel strip with a continuous copper ground built into the core. Conduit shall have a continuous, liquid-tight, flame-resistant PVC jacket. Connectors and fittings shall be grounding type and shall be so designed to clamp the PVC jacket of the conduit so as not to allow it to pull away from the connection and expose the conduit metal.

2.3 Below-Ground Conduit

All below-ground conduits shall be of HDPE4710 material, and conform to the ASTM F2160 *Standard Specification for Solid Wall High Density Polyethylene Conduit Based on Controlled Outside Diameter*.

2.4 Wire Sizing

All wire installed shall be of proper size for the current that it will convey, according to NEC.

2.5 Shielded Wire

Any wire that shall be carrying any type of control waveform shall be shielded for its entire length, and the shield shall be grounded. Standard, power-only lines need not be shielded, unless a control waveform is overlaid on the power wave, such as in the case of the wires from a CU-300 unit to its well pump.

Part 3: Execution

3.1 General

All electrical installation personnel shall be properly licensed for the work they are to take part in, according to NEC. The electrical service shall be more than adequate to operate the specified equipment and controls. The electrical service shall be complete with meter, mast, and grounding rod. As-built wiring diagrams of all work to be furnished upon completion by contractor.

3.2 Securing Conduit within the Compound

All above-ground, horizontal conduit between components shall be across the floor, to aid in the safe movement of personnel and materiel about the compound. Conduit extending along the floor shall have properly-sized Unistrut hold-downs fastening them to the floor at a minimum of every four feet. The piping shall be routed as shown on the construction drawings or as directed by the Owner's Engineer.

3.3 Testing

All electric motors, switches, interlocks, and hand and remote controls shall be fully tested for correct rotation, safety, and proper operation by the Contractor before this work scope shall be considered complete. The Contractor shall be held liable for any damages to remedial equipment, city, county, state, or federal property, any third party personal property, and any personal injuries pertaining to or resultant from improper materials or installation on the part of the Contractor, the Contractor's personnel, or any subcontractors hired by the Contractor.