Prepared for

Blue Print Services Company
149 Second Street
San Francisco, California 94105

**CITY BLUE EXTRACTION/
TREATMENT SYSTEM
TREATMENT PROCESS SPECIFICATIONS
OAKLAND, CALIFORNIA**

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1.0 DEFINITIONS AND PROCESS DESCRIPTION

1.1 Definitions

The following definitions apply to this document in its entirety.

- "Project Site" means the site of City Blue, 1700 Jefferson Street, Oakland, California.
- "Owner" means Blue Print Services Company and its designated agent or representative.
- "HLA Engineer (HLA)" means party and its designated agent or representative selected by Owner to review and observe construction activities.
- "Construction Manager" means party and its designated agent or representative selected by Owner to manage construction activities. Construction Manager is Harding Construction Services (HCS).
- "Contractor" means the person or persons, firm, or corporation under consideration and/or accepted by the Owner and Construction Manager.
- "Subcontractor" means a person or persons, firm, or corporation approved by the Owner and Construction Manager that enters into an agreement with the Contractor to perform part of the work.
- "Instrumentation Shop" means the person or persons, firm, or corporation that supplies instrumentation and process controls.
- "Work" means the scope of activities performed by the Contractor as described in this Agreement.
- "Agreement" means this document in its entirety, and any other contractual documents as required by the Owner for the execution of the Work.

1.2 Process Description

Groundwater containing elevated concentrations of petroleum hydrocarbons is to be collected from two existing extraction wells at the Project Site. Maximum and average system flow rates are 5 and 2 gallons per minute (gpm), respectively. Air pumps are to be installed in the wells and extracted water will be conveyed through aboveground and underground piping to the treatment system. The treatment system will be comprised of three modules: pretreatment (oil/water separation), treatment (biotreatment), and post-treatment (filtration and carbon bed polishing modules). The pretreatment module is a vapor-tight oil/water separator; the treatment module consists of a bioreactor, a vapor phase carbon adsorption unit, and the associated nutrient and caustic feed systems. The post-treatment module consists of a sand filter and two liquid phase carbon beds. Effluent from the carbon bed is discharged to the sanitary sewer drain onsite. Vapor from the bioreactor is passed through the vapor phase carbon adsorption unit before being released to the atmosphere.

The treatment system will be operated by the Owner.

1.3 Construction Drawings

The following drawings present equipment details and information for the construction and installation of the groundwater remediation system.

Drawing Number	Title
G-1	Cover Drawing
C-1	Site Plan
M-1	Mechanical Equipment Plan and Sections
PID-1	Piping Instrument Diagram

2.0 SCOPE OF WORK TO BE PERFORMED BY CONTRACTOR

2.1 General

The Contractor shall provide all labor, materials, and equipment required to install all components of groundwater conveyance and treatment system as shown on the drawings. The following summarizes the work to be performed by the Contractor.

A. Procure major equipment (i.e., oil/water bioreactor, separator nutrient and caustic systems), process equipment (pumps, filters, carbon beds, etc.), interconnecting pipes, pneumatic groundwater recovery pumps, valves, fittings, instrumentation, and controls. Any deviation from specification shall be approved by HLA before procurement.

B. Fabricate skid as shown on mechanical and instrumentation design drawings. Shop drawings shall be sent to HLA for approval prior to fabrication.

C. Provide electrical control diagram for groundwater treatment system to HLA for approval two weeks before installation.

D. Be responsible for installing groundwater pumps in existing extraction wells, installing connecting piping from extraction wells to treatment system and discharge line from treatment system to nearest East Bay Municipal Water District (EBMUD) sewer onsite. Connect existing potable water supply to treatment system.

E. Provide manpower and equipment necessary to install all equipment, interconnecting piping, valves, fittings, and instrumentation as shown in drawing PID-1. Install all electrical connections to all necessary equipment. HLA will provide consulting services to assist Contractor during installation.

F. Procure and install all underground/aboveground piping, including valves, fittings, and vaults for groundwater remediation system, as specified in this specification and shown on drawings. Piping includes underground and aboveground groundwater recovery piping from Wells MW-1A and MW-4 (existing) to treatment system area. Perform necessary pipe trench work, including backfilling and compaction, for installation of underground piping, as shown on drawings. Supply and install required pipe supports for all aboveground piping.

G. Provide successful startup and troubleshooting of treatment system. HLA will provide consulting services to assist Contractor during these activities.

H. Provide documents identified in Section 2.13 to Owner within 2 weeks following successful startup of treatment system.

I. Provide Operation and Maintenance manual suitable for safe operation of treatment system by Owner personnel.

J. Provide all necessary electrical service to treatment system and equipment from Owner-supplied power drop.

K. Soils and groundwater contain elevated levels of hydrocarbons (mostly gasoline), where earthwork operations are to be performed. Workers shall be safety trained according to OSHA 29 CFR 1910.120, provide air monitoring equipment, and monitor air during trenching activities.

L. Provide construction site safety plan, on site, that complies with all applicable regulations under 29 Code of Federal Regulations (CFR) 1926, Construction Industry, and National Institute for Occupational Safety and Health (NIOSH) publication No. 85-115.

2.3 Owner Supplied Equipment

A. Power drop from existing production facility using a standard NEMA 3R fuse disconnect switch, 3 pole, 240 VAC, 60 amp rated for 3-phase, 4-wire service, mounted on outside wall adjacent to existing ammonia tank.

B. 3,000-gal polycal tank to be used as bioreactor (BR-1).

C. 250 gal recovered product tank. See Section 4.8.

D. 55 gal drum for sludge collection.

2.4 Equipment

A. Equipment, piping, or conduit shall be properly supported and braced to withstand seismic forces defined by City of Oakland building codes.

B. Skid-mounted equipment, conduit, and piping shall be securely fastened to skid or rigid support structure. Skid shall be provided with mounting lugs designed to provide secure mounting of skid to a concrete foundation to withstand seismic zone 4 loadings. Concrete foundation to be supplied by Contractor.

C. Skid shall be fabricated from structural steel members; solid surface plates shall be constructed of steel or aluminum. Skid shall be painted using primer and two finish coats of corrosion-resistant epoxy paint.

D. Eye-wash fountain (for emergency flushing of eye) shall be mounted on the treatment skid.

2.5 Installation

Contractor shall be responsible for complete installation of the groundwater conveyance and treatment system at the City Blue site. All costs for installation, permits, and taxes shall be paid by Contractor. All work shall be done to the satisfaction of Owner and HLA.

2.6 Startup Services

Contractor shall provide up to one week (five consecutive working days) of startup assistance at the Project Site. All costs for such startup assistance shall be paid by Contractor.

2.7 Delivery

Contractor shall submit a firm delivery schedule within five working days after award of contract. Contractor shall notify Owner of any changes in equipment delivery schedule.

2.8 Shipping

A. Contractor shall be responsible for all costs associated with shipping equipment to Project Site and all costs associated with return or exchange of process units or components during warranty period.

B. Equipment shall be shipped in sealed, weathertight, enclosed conveyances and protected against damage during transport.

C. Damage shall be corrected to like-new condition. Contractor shall bear costs arising out of dismantling, inspection, repair, and reassembly.

D. Contractor shall pick up 3,000-gallon polycal tank from Project Site and transport tank to his fabrication facility for mounting on skid at his own expense.

2.9 Submittals

Contractor shall submit the following information to HLA and Owner for approval prior to fabrication or purchase of all equipment, instruments, valves, and piping:

A. Equipment list itemizing each piece of mechanical equipment and instrumentation, including manufacturer's make and model.

B. Fabrication and installation layout drawings showing all electrical and piping connection locations.

C. Any recommendations for modifications to system as shown and specified.

D. Detailed testing procedure.

E. Detailed list of spare parts necessary for one year of operation.

2.10 Product Data

Contractor shall provide the following product data after selected equipment has been approved:

A. Manufacturers' operation and maintenance information, including startup and shutdown, troubleshooting, responses to alarms, and maintenance schedules.

B. One-year warranty on materials and workmanship.

C. Detailed operation and maintenance manual for the treatment system.

2.11 Unit Responsibility

Equipment, material, and instrumentation supplied for this system shall be compatible to the extent that equipment can be interconnected as shown on Drawing PID-1 and shall operate as specified without the addition of supplemental components.

Contractor shall take unit responsibility for all equipment supplied under this contract. Contractor is responsible for detailed design and testing of entire system. After system installation, Contractor shall be present along with specific equipment manufacturers' representatives, if required. These representatives shall direct the testing and startup of the system.

2.12 Special Warranty (Guarantee)

Contractor shall warrant the performance of the groundwater treatment system as described in Process Design Specifications (Section 3.0).

Manufacturer shall warrant the materials and workmanship of the system for a period of one year if the system is operated and maintained in a manner consistent with the recommendations of the Operations and Maintenance Manual supplied with the unit.

2.13 Documents

No later than two weeks after successful installation and startup of the treatment system, Contractor shall provide the following documents to Owner:

A. As-built drawings of treatment system and equipment layout.

B. Six copies of the operation and maintenance and troubleshooting manuals.

C. Detailed spare parts list.

2.14 Quality Assurance

A. Work shall conform to quality control requirements stated in the Drawings and Technical Specifications.

B. Work shall be done accurately and neatly to conform to performance requirements, in accordance with the best trade practices.

C. Owner and/or HLA have right to inspect Contractor's work for compliance with Contract Documents.

2.15 Contractor's Use of Premises

A. Contractor shall exercise extreme care and precaution during construction of conveyance and treatment systems so as to minimize disturbances to adjacent structures and their occupants, property, public thoroughfares, etc.

B. Contractor shall coordinate all phases of construction activities through Owner and/or HLA. Contractor shall give a minimum one-week notice of scheduled construction activities prior to starting work.

3.0 PROCESS DESIGN SPECIFICATIONS

A. Influent groundwater contains free phase organic liquids.

B. Treatment system is designed to remove free phase and dissolved petroleum hydrocarbons from influent groundwater.

C. Groundwater treatment will comprise pretreatment (to remove free phase liquids), biotreatment, and filtration and liquid phase carbon bed polishing.

D. Treatment system is designed to operate continuously, 24 hours a day, 365 days a year, excluding normal downtime for incidental maintenance.

E. Treatment system is designed to treat groundwater over a flow range of 2 to 5 gpm.

F. Treatment system is capable of accommodating varying concentrations of hydrocarbons in influent groundwater.

G. Offgas from bioreactor is to be collected and treated using vapor phase carbon to achieve emission rate of less than 1 lb/day hydrocarbons.

H. pH of water in the bioreactor will be automatically adjusted to between 6 and 8 as required.

I. Treatment system shall be equipped with necessary instrumentation for process monitoring, performance evaluation, and control required for effective treatment of groundwater.

J. Motors, switches, starters, controls, and other electrical equipment shall comply with applicable National Electric Codes and shall be designed for NEMA 3R and 7 installation to meet Article 500 of the NEC requirements.

K. Treatment system safety features shall comply with existing local, state, and federal safety regulations.

L. Treatment system shall be designed for continuous automatic operation and control and shall require only periodic operator attendance.

M. Sampling points for periodic monitoring of treatment system are indicated on Drawing PID-1.

N. Utilities available at site:

1. 240 volt, 3 phase, 60 Hz
   120 volt, 1 phase, 60 Hz

2. Sanitary sewer

3. Water supply

4. Recovered product tank (OT-1)

5. Compressed air is <u>not</u> available at the site.

4.0 EQUIPMENT SPECIFICATIONS

Drawing PID-1 is a detailed process and instrumentation diagram prepared for the project. Specifications for the major equipment are given in the following section.

4.1 Extraction Well Pumps (WP-1A and WP-4)

A. Pneumatic, pulse-type pump, top inlet for total fluids and floating layer; complete with PVC inlet screen, well cap, liquid level control module (PLC) for each pump, Teflon-coated exhaust valve, nylon air and water tubing, and integrated master control module (PC) common to both pumps. Design groundwater flow rate for each pump is 5 gpm (maximum) and 0.25 gpm (minimum).

B. Supplier: QED Environmental Systems (Model LP1001) or approved equal.

4.2 Compressor (AC-1)

A. 11 scfm, 90 psig minimum, continuous duty, vertical configuration, compressor unit having accessories listed below.

B. Air preparation system, air cooler, and air dryer.

1. Oil removal: less than 10 ppm oil
2. Particle filtration: 10 micron
3. Refrigerant air drying: 35 degree F dew point
4. Pressure regulator: 20-120 psi, adjustable

C. 30 gallon air receiver having motor, motor starter, pressure indicator, and pressure controls.

D. Voltage: 240 volts, 3 phase, 60 Hz.

E. Air compressor shall be a vertical configuration.

F. Supplier: Hydraulic Controls, Model CS4103, or approved equal.

4.3 Oil/Water Separator (S-1)

A. Coalescing plate-type separator having removable medium packs and capable of handling hazardous fluids.

B. Fiberglass or steel construction with standard coatings.

C. Maximum flow rate: 10 gpm.

D. Recovered oil gravity feeds to recovered product tank.

E. Level switches control effluent water levels.

F. Solid, gasketted, fixed cover totally encloses separator tank. Vapor-tight construction meets Bay Area Air Quality Management District (BAAQMD) Regulation 8, Rule 8, Wastewater (oil-water) Separator.

G. Electrical components to comply with Article 500 of NEC.

H. Supplier: Wemco Model CFSP (5-10) or approved equal.

4.4 Bioreactor (BR-1)

A. Cross-linked HDPE 3,000-gallon polycal tank (SP-276-U) at Project Site.

B. Contractor shall transport tank to his fabrication facility at his own cost and test tank for leaks.

C. Contractor shall make necessary changes to conform to the design requirements shown in PID-1 and M-1.

D. Tank shall be secured to skid per manufacturer's seismic restraint system Model BP-1.

E. Manufacturer: Poly-Cal Plastics Model SP-276-U.

4.5 Sand Filter (SF-1)

A. Filter will be constructed of 304 grade stainless steel and hold 200 lbs of sand.

B. Equipped with pressure gage and 1-1/2-inch inlet and outlet ports. Maximum pressure drop is 15 psig at flow rate of 20 gpm.

C. Multi-port selector valve shall be used to alternate between normal and backwash flows. Selector valve shall be 1-1/2-inch NPT 6-position multi-port valve having connections to match filter side ports.

D. Maximum pressure rating: 50 psi.

E. Supplier: Swimquip Model HRS16 and multi-port valve model 14964-0014, or approved equal.

4.6 Aqueous Phase Carbon Beds (CB-1, CB-2)

A. Two carbon beds each containing a minimum of 200 lbs. of 12 x 40 mesh, Anthracite coal carbon in each vessel.

B. Each bed rated at maximum water flow rate of 10 gpm and pressure of 12 psig. Maximum pressure drop through each carbon bed shall be less than 5 inches of water at flowrate of 5 gpm.

C. Inlet and outlet ports of 1 inch NPT. Provisions shall be made for easy replacement of spent carbon canisters.

D. The carbon beds shall be complete with suitable inlet and outlet connections and a flow distributor for uniform distribution of groundwater inside the carbon bed.

E. Supplier: Westates ASC-200 or approved equal.

4.7 Vapor Phase Carbon Bed (CB-3)

A. Carbon bed containing 200 lbs of activated carbon shall be used to remove the contaminants volatilized in air vented from the bioreactor.

B. Design air flow rate is 15 cfm. Inlet and outlet ports on the canister shall be 2 inch NPT. Maximum pressure drop through the carbon bed shall not exceed 1 inch of water at a design flowrate of 15 cfm.

C. All wetted parts of carbon bed shall be constructed of epoxy-lined carbon steel. All internal parts to be constructed of either PVC or polyethylene.

D. Supplier: Westates VSC 200 or approved equal.

4.8 Recovered Product Tank (OT-1)

A. Above ground, double contained type having 250-gallon capacity.

B. Unit shall be supplied with leak detector high level alarm, and pumpout package.

C. Pipe from oil/water separator to recovered product tank shall be double contained (1" in 3" PVC). Piping to be furnished as part of this contract.

D. Supplier: Convault. Furnished and set by Owner.

4.9 Nutrient Tank (NT-1)

A. HDPE tank, 200-gallon capacity with weatherproof cover, equipped with level gauge and low level switch.

B. Manufacturer: Ryan Herco (Model #7106/7107-040) or approved equal.

4.10 Metering Pumps (P-1 and P-2)

A. Metering pumps, 316 SS/Teflon wetted parts, with manual (dial) control of stroke frequency (4-100 strokes/min) and stroke length (3-100%). Design flowrate of liquids is less than 1 gph (gallon per hour) with a total head of 150 psi, 115 VAC, 60 Hz.

A. Caustic feed pump (P-1).

B. Nutrient feed pump (P-2).

C. Supplier: Cole Palmer 07132-62 or approved equal.

4.11 Caustic Feed Drum (D-1)

A. Polyethylene tank, 55 gallon capacity with weatherproof cover.

B. Level indicator and low level switch.

C. Manufacturer: Ryan Herco (Model #7106/7107-011) or approved equal.

4.12 **Recirculation Pump (P-3)**

A. Centrifugal with 115 v, 1 phase, continuous duty thermal protected motor, 5 gpm at 35 psi minimum flow range.

4.13 **Effluent Pump (P-4)**

A. Centrifugal with 115 v, 1 phase continuous duty thermal protected motor, 10 gallons per minute at 40 psi *minimum* flow range.

4.14 **pH Element and Indicator Controller (pHE, pHIC)**

A. Indicator controller shall be microprocessor based with high/low set points for turning metering pump on and off.

B. Sensor submersible type with 25 feet of cable general purpose CPVC body.

C. Manufacturer: Harrington (Model MK 710A/P71230-3G) or approved equal.

4.15 **Materials**

A. External materials (non-wetted) shall be steel with corrosion-resistant coating (primer and finish coats).

B. Groundwater extraction piping shall be Black Premo Flex Class A modified nitrile hose, rated for 200 psig, compatible and resistant to petroleum products with quick disconnect double hydraulic shutoff connectors at each wellhead.

C. Groundwater process piping, and materials shall be PVC, Schedule 80, unless specified otherwise. Containment pipe shall be Schedule 80.

D. Air tubing shall be nitrile Class C hose, rated at 200 psig with quick disconnect single hydraulic shutoff connectors at each wellhead.

E. All seals and gaskets shall be made of materials resistant to intended petroleum hydrocarbons service.

4.16 **Equipment Skid**

A. Materials: Structural carbon steel, ASTM A-36 type.

B. Steel or aluminum plate surfaces.

C. Paint with chemical and weather resistant epoxy paint.

D. Containment lip 9 inches high shall be constructed around the surface of the skid.

E. Electric motors and pumps shall be mounted above and/or outside of containment lip.

F. Joints on interior of skid containment shall be made water tight and resistant to petroleum hydrocarbons.

G. Skid and hold-down anchors shall be of adequate design to withstand anticipated loading for seismic zone 4 condition.

H. Contractor shall provide design for any necessary footings to prevent overturning and/or sliding of skid.

I. Prior to fabrication, Contractor shall submit to HLA, shop drawings and calculations for skid and/or footings stamped and signed by registered civil or structural engineer.

4.17 Lighting

A. Contractor shall install two 300-watt quartz lighting fixtures and conduit as shown on Dwg. C1. One light shall be aimed at control panel and other for general illumination of skid and area. Switch shall be mounted on wall inside gate.

B. Lights shall be mounted on weatherproof junction box at height of 10 feet.

C. Manufacturer: Dayton Model No. 2V776 with bulb or approved equal.

4.18 Eductor

A. Material: bronze.

B. 3/8 npt pressure x 3/4 suction/discharge ports rated for 400°F at 125 psig.

C. Supplier: McMaster Carr (Model 4979K11).

4.19 **Rotometer**

A. Material: acrylic body, brass valve.

B. 0.3 to 3 cfm range with needle valve 1/8 NPT ports, 4 inch scale. To be mounted on control panel.

C. Supplier: Dwyer (Model VFB-90BV)

4.20 **Pressure Safety Valve PSV-1**

A. Material: Iron.

B. Back pressure valve adjusted to 1 psig.

C. Supplier: McMaster Carr (Model 4675K11).

4.21 **Pressure Safety Valve PSV-2**

A. Material: Brass.

B. Pressure relief valve 3/4 NPT ports stainless steel spring.

C. Relief pressure: 30 psi

D. Supplier: McMaster Carr (Model 4780K63).

5.0 INSTRUMENTATION

5.1 General

A. Work shall consist of furnishing all labor, materials, tools, and equipment incidental to instrumentation and process control. Contractor shall install instrumentation and process control in accordance with drawings and specifications. Contractor shall coordinate with work of all other trades.

B. Work required consists of but is not necessarily limited to:

1. Process control for groundwater collection and conveyance system.

2. Process control for groundwater treatment system.

C. Acceptable Suppliers: Work required and equipment provided shall be furnished by one Contractor. Although various manufacturers may furnish equipment for this project, system coordination shall be Contractor's responsibility.

D. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for sound, secure, complete and compatible installation shall be furnished and installed as part of Work. Contractor is responsible for providing all necessary conduit and wiring required for a complete installation.

E. Coordinate instrumentation equipment with other applicable sections to ensure complete operational system, complete with interconnecting wiring diagrams. Instrumentation and control includes metering, sensing, status indication, alarm, interlocking, switching.

F. Startup Services. Employ and pay for services of equipment manufacturer's field service representatives fully commissioned and authorized by manufacturer to:

1. Inspect equipment covered by these specifications.

2. Supervise adjustment, calibrations and installation checks and full commissioning.

3. Conduct initial startup of equipment and perform basic operational checks. Verify system operation in accordance with these specifications.

4. Provide HLA with a written statement that manufacturer's equipment has been installed properly, commissioned, and calibrated and is ready for operation by Owner.

G. Detailed References: Refer to following detailed specifications for component descriptions and requirements:

1. 5.5 - Primary Elements

2. 5.8 - Control Auxiliaries

5.2 Quality Standards

A. Standard Reference. For purposes of conciseness and identification, refer to following abbreviated standards when specified:

1. ISA - Instrument Society of America

2. NEMA - National Electrical Manufacturers Association

3. NBS - National Bureau of Standards

4. U/L - Underwriters Laboratories

B. Manufacturer's Products: Furnish and coordinate instrumentation items through single instrumentation shop. The Instrumentation Shop shall take full responsibility for functional operations of all systems, performance of control system engineering, supervision of installation, final connections, calibrations and satisfaction of Startup and Demonstration, preparation of drawings, operation and maintenance manuals, commissioning and training and all other aspects of control system. Ensure that Shop is fully authorized, has financial capacity, maintains qualified technical staff and design capability, has physical plant and fabricating personnel, and has competent service, startup, and authorized training personnel.

C. Standards: Instrumentation items to comply with recommended practices of ISA for performance and UL standards for specific atmospheric application. Enclosures to comply with NEMA standards for the specific application.

D. Electrical Requirements

1. Power Supplies. Provide power to control panel from existing electrical service.

2. Ensure operation of instruments from plant supply of 120 volts, 60 Hz, single phase service with voltage variations limited to + or - 10 percent of 120 volts.

3. Instrumentation Wire and Cable. Furnish instrumentation cable and control wire required for instrumentation cable specified. Install instrumentation cable and wire in its own conduit system. Do not install in power or lighting conduit systems.

E. Transient Protection. Furnish control panel protected against electrical surges on input.

1. Install surge arrestor and connect to equipment ground.

5.3 Submittals

A. Submittals for instrumentation and control system shall be one complete submittal (no partial submittals).

B. Provide all drawings on reproducible sepia plus one set of blue lines. Size of drawings shall match project drawings showing:

1. Name and description of project.

2. Series identification of process or building area.

3. Revision block.

4. Certification block for "as-recorded" verification.

C. Drawings, systems, and other elements are represented schematically. Nomenclature and tag numbers, equipment numbers, panel numbers, and related series identification shown on the drawings shall be employed exclusively throughout shop drawings, submittals, equipment records, loop drawings, loop descriptions, point-to-point wiring diagrams, panel layouts, operation and maintenance manuals, parts listings, field tagging commission documents and any interface components. Any other symbols, designations, and nomenclature unique to the manufacturer-supplier shall not replace those standard methods prescribed previously unless specific acceptance in writing is obtained.

D. Wiring diagram showing point-to-point terminations for each item in each control loop. Prepare drawings to show all circuit devices and circuit interrelationships and insure completeness. Include detailed contact and terminal assignments.

E. Panel layout with panel wiring and associated details.

5.4 Installation

A. Furnish and install instrumentation in accordance with highest standards recognized in industry and in full accordance with ISA. Ensure installation, calibration and commissioning of instrumentation elements fully recognized and authorized by manufacturer. Pleas of ignorance will not be permitted relative to installer qualifications and factory authorization. In addition to installation of equipment, provide the following:

1. Test Equipment. Provide equipment for calibration of control loops. Equipment certification will be valid for one year and will be provided upon request.

2. Startup. Control loops must meet HLA's acceptance before project will be considered complete. Verify in writing that control loops are operating as specified.

5.5 Primary Elements

A. Items in project include but are not necessarily limited to the following:

1. Flow Elements/Flow Indicator

2. Pressure Elements/Pressure Switch/Level Indicator

3. Level Elements/Level Switch

4. pH element and pH indicator controller

B. Submittals

1. Provide cut sheets and specifications indicating mounting types and details for all primary elements.

5.6 Pressure Elements

A. Pressure Gage: Furnish and install pressure gages at locations indicated on drawings. All components shall be suitable for service to 150 psi rated as manufactured by U.S. Instrument or approved equivalent.

1. Construct case, ring, bourdon tube, socket, and connection tube of stainless steel. Connection tubing shall be 1/4-inch NPT.

2. Calibrate gages at job site for pressure in accordance with manufacturer's instructions.

3. Unless otherwise required by codes, provide 3-1/2 inch diameter dial units, stem mounted. Equipped with white face, black numerals, and black pointers.

B. Pressure Switch: Furnish and install pressure switches at locations indicated on drawings and specifications. Each switch shall have adjustable differential and trip point reference dial visible through window in housing. Switches shall be set at 10 psi and have two single-pole, double-throw contacts.

Enclosure: Type NEMA 7
Repeatability: ± 1% of range
Pressure Rating: 2 - 60 psi
Acceptable Manufacturers: Mercoid or United Electric Control Co.

5.7 Level Elements

A. Unit shall consist of single one-piece, multi-sensored probe with required sense points and 60 feet of cable, one 1/4-inch diameter copper ground conductor for full length of tank with exposed end grounded to skid. Mount control relays inside control panel and wire per manufacturer's instructions. Above is manufactured by Multi Trode Control System or approved equal. Distributed by Ponton Industries, Inc. Phone (213) 945-1621. To be installed in bioreactor tank (BR-1) only.

B. Unit shall consist of a vertical mounting reed type float switch where magnets in float activate magnetic switch in the stem. Switch body shall be molded of polypropylene with heavy-duty switch inside. Manufacturer for above is Ryan Herco or approved equal. This switch to be used in chemical tanks (D-1), (OT-1), and (NT-1).

5.8 Control Auxiliaries

A. Items required in project include but are not necessarily limited to the following:

1. Switches and Push buttons

2. Indicating Lights

3. Control Panel

B. Quality Standards

1. Ensure that particular control auxiliaries selected are applicable to entire project. Advise and coordinate selected manufacturer and type with applicable equipment suppliers.

2. Acceptable Manufacturers. Subject to compliance with these specifications, following manufacturers are acceptable:

a. Switches
   - aa. Cutler Hammer
   - bb. Allen Bradley
   - cc. Honeywell Microswitch
   - dd. General Electric

b. Indicating Lights
   - aa. Cutler Hammer
   - bb. Allen Bradley
   - cc. General Electric

C. Control Auxiliaries

1. Switches:

a. Selector Switches. Furnish heavy-duty, oil-tight selector switches as specified. Provide rotary cam units conforming to NEMA ICS 2-216.22. Supply switches having number of positioners required with contact blocks to fulfill functions shown and specified. Provide maintained contact type switches.

Provide knob type operators for all selectors. Color of operator shall be black. Include appropriately marked legend plate.

b. Push buttons. Furnish heavy-duty, oil-tight Push buttons conforming to NEMA ICS 2-216.22. Provide single or multi-function Push buttons backed by oil resistant Buna N rubber diaphragm.

aa. Single Function Push buttons. Provide Push buttons to perform functions shown on drawings and as specified. Provide momentary contact Push buttons with necessary contact blocks. Furnish units with molded, solid color buttons. Provide standard Push buttons with full shroud. Provide black colored buttons for START or ON and red color for STOP or OFF. Provide jumbo mushroom style push-button for emergency shutdown. Equip each button with appropriately engraved legend plate.

2. Indicating Lights:

a. Furnish and install heavy-duty, oil-tight indicating lights to locations shown on drawings and specified. Provide lights which allow replacement of bulb without removal from control panel. Furnish units conforming to following requirements.

b. Furnish transformed push-to-test indicating lights to locations shown and specified to perform required functions. Provide heavy-duty lights with glass lens. Color code lights as follows:

Red: Alarm
White: Power On

Provide appropriately engraved legend plate for each light. Include contact blocks as required.

4. Control Panel (for groundwater treatment system):

a. Furnish units constructed in compliance with following standards:

NEMA - OCS - (1970) - Industrial Controls
SAMA - RC12 - Panel Cut-Out Dimensions
SAMA - RC20 - Measurement and Control Terminology
ISA - RP8.1 - Instrument Enclosures for Industrial Environment
JIC - Joint Industry Council EGP-1-1967
NEC - National Electric Code

b. Coordination. Ensure design of panel required for this project meets specifications. Ensure panel supplied under this specification section is provided by single manufacturer. Ensure completely matching color tones for any individual color specified.

c. Panel Construction: Instrument Shop shall provide a preliminary set of drawings showing proposed component arrangement, front panel layout and internal wiring as required by these specifications and drawings to be reviewed and accepted by HLA prior to final assembly. Provide control panel constructed from #14 gauge steel minimum suitable for stand mounting.

aa. Provide units of welded NEMA 4 construction completely enclosed, with gasketed dust-tight doors with mounting pan.

bb. Unit shall have front access. Provide full-length door with full-length stainless steel piano hinges rated for 1.5 times door plus instrument weight. Furnish door with locking handle. Provide appropriate wiring, and instrument routing space in accordance with good panel design. After cutouts have been made, finish opening edges to smooth and true surface condition.

cc. Panel shall have main disconnect breaker rated for service required with minimum short circuit interrupting capacity of 10,000 RMS and an external operating handle.

dd. Pump motor shall have combination magnetic, full voltage, nonreversing motor starter with two auxiliary contacts and 120 VAC coil and be rated for voltage and motor load that they will control. Unit shall be mounted on submounting pan with elapsed run time meter connected to starter.

ee. Install and connect power on pilot light on front door; indicator to illuminate whenever power is on in panel.

ff. Install and connect 15-amp duplex receptacle on subpanel of control enclosure for miscellaneous needs.

gg. Provide and connect minimum 100-watt panel heater with fan and thermostat for internal panel moisture control.

d. Panel Wiring:

aa. Wire components to terminal blocks equipped with screw type lugs. Insure instrument and panel wiring conforms to National Electric Code and Standards herein referenced.

bb. Arrange circuits on terminal blocks plus any spare conductors on adjacent terminals. Install all wiring in plastic raceways, sized so that fill does not exceed requirements of NEC. Provide separate raceways for shielded or coaxial cables. Provide raceways with removable covers. Splicing of wires in raceway is not permitted.

cc. Provide necessary power supplies or transformers for control equipment.

dd. Ensure each panel mounted device is bonded or otherwise grounded to panel or panel grounding system by means of locknuts or pressure mounting methods. Equip panel with grounding terminals.

ee. Arrange wiring with sufficient clearance for all leads and tag numbers. Wiring to subpanels or swing doors shall be individually bundled and installed with "flexible loop" of sufficient length to permit component to be removed from panel for maintenance without disconnecting wiring.

ff. Provide full permanent wire identification system compatible with submittals with verification of tag numbers and circuit number. Identify function and polarity. Provide wiring according to color code as follows:

Color of Insulation	Wire Color & Service
Black	120 VAC Power
Red	120 VAC Control
Blue	DC Control
White	Neutral
Brown	Annunciator Common
Orange	Annunciator Signal
Green	Ground

gg. Control wiring inside of panel shall be #16 gauge, stranded, Type MTW or THHN 600v, copper conductors except for power wiring which will be #12 gauge.

e. Panel Nameplates and Identification: Identify each item on control panel with rectangular minimum 3/32-inch-thick plastic nameplates. Provide nameplates with white letters on black background. Insure minimum letter height is 3/16 inch for instrument description and 1/4 inch height for instrument number.

f. Panel Finish Schedule: Prime control panels with rust inhibitive shop applied primer and paint with two coats of epoxy color to be selected by Owner. Finish interior of panel with epoxy white.

6.0 CONTROL

The system shall be designed fail safe; any major treatment system malfunction, such as high level in the Recovered Product Tank (OT-1) or Bioreactor (BR-1) will shut down the groundwater extraction wells. A relay contact will close to illuminate an alarm light indicating which component shut down the system. The following control features shall be built in the main control panel of the treatment system.

6.1 Extraction Wells (MW-1A, MW-4)

The pumps are pulse type driven by compressed air. The air supplied to the pump controller and level control for each pump controls how the pumps operate via a bubbler tube extending into each well. The pump level control sends measured air pressure to its particular well. If the water level in that well drops below a preset level (to be field adjusted by the Contractor, the pump level control stops pulsing the pump until the water level rises to the set point. If the system shuts down because of a high level in Bioreactor Tank BR-1 or Product Recovery Tank OT-1, solenoid valve SV-1 will close, causing the well pumps to shut off.

6.2 Oil/Water Separator (S-1)

Oil/water separator S-1 has the following devices and should operate as follows:

A. Slop oil gravity feeds to the Product Recovery Tank (OT-1).

B. LSL-3 closes SV-2 when level in separator is below level switch.

C. LSH-3 opens SV-2 when water level in separator rises beyond a set point.

6.3 Holding Tank

Bioreactor tank BR-1 is equipped with the following controls and device location and should operate as follows.

A. Mount LSL-4 level switch 18" below top of the tank.

LSL-4 will stop Pump P-4 and close solenoid valve SV-3 when water level is below switch setting.

B. Mount LSH-4 level switch 10 inches below top of the tank.

LSH-4 will start Pump P-4 and open SV-3 solenoid valve when water level reaches switch.

C. Mount LSHH-4 level switch 6 inches below top of tank.

LSHH-4 will stop all extraction wells and initiate high-level alarm light on alarm panel when water reaches this level.

D. PSV-1 Pressure Safety Valve will relieve pressure in BR-1 when pressure exceeds 1 psig.

6.4 Recirculation Pump (P-3)

Pump P-3 is controlled by an on/off selector switch on the control panel and is interlocked to chemical metering pumps P1 and P2 so they run when P3 runs.

6.5 Effluent Pump (P-4)

A. P-4 is activated to run by any one or a combination of the following logics:

1. Manual selector switch is placed in hand position.

2. Water level reaches LSH-4 in Tank BR-1 when selector switch is in auto position.

B. P-4 is deactivated to stop by any one or a combination of the following logics:

1. Manual selector switch is placed in off position.

2. Water level is below LSL-4 in Tank BR-1 when selector switch is in auto or hand position.

3. PSH-1 (set at 10 psig) after SF-1 is tripped when hand switch HS-4 is in auto position.

6.6 Caustic Feed Pump (P-1)

A. P-1 is switched on by a combination of the following:

1. Hand switch HS-1 is placed in auto position.

2. Hand switch HS-3 is placed in on position.

3. pH indicator controller pHIC indicates that pH in BR-1 is below 6.

4. pH controller can be over ridden by placing HS-1 in on position if HS-3 is in on position.

B. P-1 is switched off by any one or a combination of the following:

1. Hand switch HS-1 is placed in off position

2. Hand switch HS-3 is placed in off position

3. pH controller pHIC indicates that pH in BR-1 is above 8.

4. LSL-1 indicates low level condition in D-1.

a. Mount LSL-1 3" above the intake suction level for caustic feed pump P-1.

b. LSL-1 will stop P-1 and indicate low level alarm condition on alarm panel.

6.7 Nutrient Feed Pump (P-2)

A. P-2 is switched on by a combination of the following conditions:

1. Hand switch HS-2 is placed in on position.

2. Hand switch HS-3 is placed in on position.

B. P-2 is switched off by any one or a combination of the following:

1. Hand switch HS-2 is placed in off position.

2. Hand switch HS-3 is placed in off position.

3. LSL-2 indicates a low level condition in NT-1.

   a. Locate level switch LSL-2 at 3" above suction intake for pump P-2.

   b. LSL-2 will stop pump P-2 and indicate low level alarm condition NT-1 on alarm panel.

6.8 Air Compressor (AC-1)

Air Compressor AC-1 may be switched on or off by manual switch. In the on position, the compressor will run whenever the AC-1 pressure switch is below operating pressure.

6.9 Sand Filter (SF-1)

Sand filter SF-1 is equipped with the following controls and devices and should operate as follows:

A. Pressure indicator on influent.

B. Pressure indicator on effluent.

C. Pressure switch PSH-1 will stop pump P-4 and close SV-3 when the influent pressure exceeds 10 psi. PSH-1 has priority over LSH-4.

6.10 Recovered Product Tank (OT-1)

Recovered product tank OT-1 is equipped with the following controls and devices and should operate as follows:

A. Place level switch LSH-1 at 6" below the overflow line.

Level switch LSH-1 will close SV-1.

6.11 Liquid Phase Carbon Beds (CB-1, CB-2)

Each liquid phase carbon bed (CB-1, CB-2) is equipped with a pressure differential indicator PDI to measure the pressure across the carbon drum with a range of 10" of water.

6.12 Pressure Safety Valve (PSV-1)

PSV-1 will relieve whenever pressure in BR-1 exceeds 1 psig. Relieved air will be vented to CB-3.

6.13 Pressure Safety Valve PSV-2)

PSV-2 will relieve whenever P-4 discharge pressure exceeds 30 psig. Relieved water will be routed to the suction side of P-4.

7.0 ELECTRICAL

7.1 General

A. Work shall consist of furnishing all labor, equipment, supplies, and materials, unless otherwise specified, necessary for installation of complete electrical systems as required by specifications and as shown on drawings. Work shall also include completion of those details of electrical work not mentioned or shown which are necessary for successful operation of all electrical systems.

B. Demonstrate the operation of all electrical systems for the Owner at a time as directed by HLA.

7.2 Standards

A. Electrical installation shall meet requirements of local and state codes and NEC Standard of Installation.

B. Electrical materials and equipment shall be new and meet requirements of applicable standards of UL if UL standards exist for such materials and equipment. UL-authorized listing mark is acceptable evidence that materials meet this requirement.

C. Provide materials and equipment that are products of manufacturers regularly engaged in the manufacture of the products and are the latest standard design.

D. Finished surfaces of new facilities that are marred, scratched, or damaged shall be refinished to match original condition.

E. Material shall be as specified unless prior written acceptance has been obtained from HLA.

7.3 Submittals

A. Prior to submission, shop drawings, material lists and catalog cuts or manufacturer's printed data shall be thoroughly checked for compliance with contract requirements, compatibility with equipment being furnished, accuracy of dimensions, coordination with work of other trades, and conformance with sound and safe practice as to erection of installation. Each submittal shall bear Contractor's signed statement evidencing such checking.

B. Clearly mark each shop drawing as follows for purposes of identification:

C. Clearly mark printed material, catalog cuts, pamphlets or specification sheets, and shop drawings with the same designation shown on the contract document schedules. Identify specific item proposed, showing catalog number, recess openings, dimensions, capacities, electrical characteristics, etc. Incomplete submittals will be returned to Contractor without review.

D. Contractor agrees that submittals processed by Owner/HLA are not change orders; that the purpose of submittals is to demonstrate to the Owner/HLA that the Contractor understands the design concept; and that the Contractor demonstrates this understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

E. Preserve one copy of reviewed shop drawings for delivery to Owner upon completion and acceptance of project.

F. Maintain one copy of shop drawings at project field office until completion of project, and make this copy available, upon request, to representatives of HLA and Owner.

7.4 Guarantee

A. Replace any work or material installed or furnished under this contract which develops defects, except from normal wear, within one year after completion.

7.5 Equipment

A. For treatment control panel description, see Instrumentation Section, Division 5.8.

B. Motors: Terminology used is defined in ANSI/NEMA MG-1-78.

1. Motors shall be rated for operation at 60 hertz.

2. Motors Less Than 1/2 Horsepower: 115 volts, single-phase, with built-in thermal overload.

3. Motors 1/2 Horsepower and Larger: 240 volt, single phase with built-in thermal overload.

4. Voltage Ratings: ANSI C84.1-82. Motor nameplate voltage shall correspond to the system voltage available at the motor locations.

5. Horsepower: As shown. Brake horsepower of driven equipment shall not exceed motor nameplate horsepower.

   Service Factor: Both open drip-proof and totally enclosed fan-cooled motors shall have 1.15 service factor.

   Classification: General purpose squirrel cage induction motors.

   Insulation: Class F insulation on totally enclosed fan-cooled motors, Class B on other motors. Insulation shall be rated for continuous duty at 40 degrees C ambient.

6. Design: Design B.

7. Locked Rotor KVA Per Horsepower: In accordance with NFPA 70-84, NEC Table 430-7(b), Code F or G.

8. Bearings: Double shielded ball type, prelubricated.

9. Housing: Where exposed to weather or spray, motor shall be totally enclosed, fan-cooled. Other motors shall have open, drip-proof housing.

10. RPM: Motor speed shall be 1,800 RPM (synchronous speed) unless otherwise shown or specified.

11. Efficiency: Motors shall be energy efficient type. Minimum efficiencies shall not be less than that allowed under ANSI/NEMA MG-1-78, Paragraph 12.53b.

7.6 Conduits

A. All conduits used on treatment skid module shall be minimum size of 1/2" or larger, rigid galvanized steel type with NEMA 7 or weatherproof fittings and liquid tight flex conduit when making connections to control devices, motors or instrument devices.

B. Install conduit seals in conduit where required by NEC Article 500.

7.7 Wire

A. All wire used shall be type THHN-THWN, 600 volt rated, stranded copper.

B. Wire size shall be per NEC Table 310-16. Minimum wire size to be #14 for controls and larger for motor loads.

7.8 Grounding

A. Electrical equipment and devices shall be grounded per NEC requirements and have common ground lug in control panel for future external ground.

7.9 Service

A. Incoming power to treatment control panel will be as required. Control circuits shall be 115 VAC, single phase, 60 cycle and shall be provided as integral part of treatment system.

B. Incoming service shall be protected by surge arrestor inside of treatment control panel.

8.0 SITE IMPROVEMENTS

8.1 Trenching

8.1.1 Trench Depth

Minimum depth to top of pipe in trench shall be 18 inches.

8.1.2 Bedding Material

Bedding material shall consist of sand around the pipe(s). Bedding material shall be placed in horizontal, uniform layers not exceeding 6 inches in thickness before compaction, and shall be brought up uniformly. Each layer of backfill shall be compacted to a relative compaction* of not less than 90 percent.

8.1.3 Backfill Material

Material for use as backfill shall be Class 2 aggregate base.

Backfill material shall be placed in horizontal, uniform layers not exceeding 8 inches in thickness, before compaction*, and shall be brought up uniformly. Each layer of backfill shall be compacted to a relative compaction of not less than 95 percent.

8.1.4 Base Layer

The surface for the pipe trench shall match existing grade and shall be covered with asphalt or concrete to restore to its original condition.

The asphalt shall be placed on crushed aggregate base which shall be at least 6 inches thick and which shall be compacted to a relative compaction of no less than 95 percent. Pavement shall be saw cut at a neat, straight line prior to trenching.

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* Nuclear density gage ASTM D2922

8.1.5 Asphalt

The top layer shall consist of "Hot Mix" asphalt concrete (I-C-AR4000) at least 6 inches thick and a minimum of 12 inches wider than the trench on either side.

8.1.6 Tack Coat and Seal

A tack coat of liquid asphalt shall be applied between the aggregate base and the asphalt concrete, and around the edges of the saw-cut pavement. All resurfacing shall be sealed after allowing asphalt to cure.

8.1.7 Concrete

Concrete shall have a minimum compressive strength of 3,000 psi at 28 days. Surfacing shall match existing surface conditions and grade.

DISTRIBUTION

**CITY BLUE EXTRACTION/
TREATMENT SYSTEM
TREATMENT PROCESS SPECIFICATIONS
OAKLAND, CALIFORNIA
October 24, 1991**

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QUALITY CONTROL REVIEWER

Don Mitchell, P.E.
Associate Engineer

APPENDIX

CITY BLUE CONTRACT SPECIAL CONDITIONS

CITY BLUE CONTRACT SPECIAL CONDITIONS

1. Owner operates between 8:00 am and 6:00 pm Monday through Friday. Owner's business will be in full operation during the entire construction phase of the project. Owner's business seldom operates on weekends.

2. Seventeenth Street is one way in an easterly direction. Project Site can only be approached from 17th Street. Return to the freeway is made from 16th Street, which is a one-way toward I-980. The closest freeway exit to the site is the 14th Street exit from I-980 West.

3. No reserved parking is available at the site. The one parking spot needs to be reserved as a drop-off area and faces the cyclone fence that protects the Project Site. Parking on the street is metered with a two-hour duration. The closest parking facility is on the corner of 17th Street and San Pablo Avenue and costs approximately $3.50 per day. Owner's employees park offsite.

4. Owner owns both adjoining buildings. The northern building is leased to a dentist, and is closed on Fridays. Owner does not have keys available for this building. The second building is leased. Owner does not have keys readily available for this building either. Second building has a 3/4-inch hose bib on the east corner.

5. Contractor can work in City Blue building during regular working hours. Construction debris and waste must be cleaned up immediately. Lot needs to be left in good housekeeping/swept condition daily. Sweepings with bags, etc. can be placed in dumpster. Masonry, cement, and debris conduit must be hauled away daily by Contractor and will not be placed in Owner's dumpster.

6. Sewer/water/phone/gas are well marked in the sidewalk and utilities/building are apparent. Well locations are marked and covered. Underground utilities, if existent, are not marked in this area. There is an apparent storm drain at the treatment site and appears to be part of a demolished structure. It could be a sewer drain. Both water and sewer are just inside City Blue Building wall closest to the treatment skid.

7. Wells MW-1A and MW-4 are approximately 90 and 118 feet from the treatment system on the northwest side of City Blue building. MW 1-A is located out of doors and Well MW 4 is located 12 feet inside City Blue building.

8. The 7-foot high cyclone fence needs to be extended as part of this contract to the south approximately 5 feet to accommodate treatment system. This will still leave one parking spot currently located south of the cyclone fence. Use existing fence gate and hardware.

9. Groundwater occurs approximately 25 feet below grade. There is as much as 30 inches of floating gasoline on the water table.