EXXON COMPANY, U.S.A.

POST OFFICE BOX 4032 • CONCORD, CA 94524-2032

ENVIRONMENTAL ENGINEERING

W. Y. WANG
SENIOR ENVIRONMENTAL ENGINEER

23 September, 1991

Exxon RAS 7-0104
1725 Park Street
Alameda, California

Ms. Katherine Chesick
Alameda County Health Agency
Division of Hazardous Materials
80 Swan Way, Suite 200
Oakland, California 94621

Dear Ms. Chesick:

Attached for your review and comment are three reports prepared by Harding Lawson Associates of Novato, CA related to the design and construction of a ground water extraction and treatment system at the above referenced Exxon station.

The report entitled **Work Plan, Groundwater Extraction and Treatment System Installation**, details treatment system design utilizing five (5) 4-inch diameter ground water extraction wells and an Envirex bioreactor treatment system. The report entitled **Construction Package, Groundwater Extraction and Treatment System**, details construction specifications related to the installation of the treatment system. In addition, a copy of the **Site Safety Plan** to be followed during system installation is attached as well.

As Exxon would like to start this project as soon as possible, please provide me with any comments at your earliest convenience. Should you have any questions or require additional information, please do not hesitate to call me at (510) 246-8768.

Sincerely,

William Y. Wang

WYW:hs
0559E
Attachment

c - w/attachment:
Mr. L. Feldman - San Francisco Bay Region Water Quality Control Board

w/o attachment:
Mr. D. J. Bertoch
Mr. P. J. Brininstool
Ms. G. DeMarzo
Mr. J. R. Hastings
Ms. S. M. Watson - Harding Lawson Associates

A Report Prepared for

Exxon Company, U.S.A.
2300 Clayton Road
P.O. Box 4032
Concord, California 94520

CONSTRUCTION PACKAGE
GROUNDWATER EXTRACTION AND TREATMENT SYSTEM
EXXON STATION #7-0104
1725 PARK STREET
ALAMEDA, CALIFORNIA

HLA Job No. 04167,390.02

SEP 1991

by

Charles E. Myrick, P.E.
Senior Engineer

Peggy Llewellyn for

Michael A. Sides
Senior Engineer

Michael L. Siembieda
Associate Geologist - RG 4007

Harding Lawson Associates
7655 Redwood Boulevard
P.O. Box 578
Novato, California 94948
415/892-0821

September 6, 1991

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LIST OF DRAWINGS

1.0 INTRODUCTION

This construction package presents Harding Lawson Associates' (HLA) specifications for the installation of a groundwater extraction and treatment system at Exxon Station #7-0104, 1725 Park Street, Alameda, California (site). A vicinity map and a site plan are presented on Drawing C1.

The scope of this construction package was presented to Exxon Company, U.S.A. (Exxon) in a letter dated April 18, 1991. The work was authorized by Exxon Contract No. 91064698, Change Order #1, dated May 8, 1991. HLA is preparing a work plan for the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, and the Alameda County Flood Control and Water Conservation District - Zone 7 (County) that will include a summary of activities and specifications presented in this document. HLA is also submitting an NPDES permit application to the RWQCB for disposal of treated groundwater to the local storm drain system. In conjunction with the NPDES application, HLA is preparing an application for a waste discharge permit to the East Bay Municipal Utility District (EBMUD) for discharge of treated groundwater to the sanitary sewer. If the County, the RWQCB or EBMUD requires any significant changes to the design of the extraction and/or treatment system, this document will be modified to reflect those changes before construction begins.

The specifications presented herein pertain to the installation of a complete groundwater extraction, treatment, and discharge system. A Contractor retained by Exxon (Contractor) shall install all components of the system. The Contractor shall provide all items shown on the plans as part of the system with the exception of three components: the extraction wells, extraction pumps, and a skid-mounted treatment system which will be purchased by Exxon and provided to the Contractor for installation. The Contractor shall supply all other components, including but not limited to well vaults and lids; conveyance piping and double-containment piping; trenching and paving; treatment system pad, fence, and gates; discharge piping and tie-ins; and electrical power conduit, wire, and tie-in.

2.0 SITE BACKGROUND

2.1 Site Description

Exxon Station #7-0104 is located at the western corner of Park Street and Eagle Avenue in Alameda, California (Drawing C1), approximately 0.5 mile south/southwest of U.S. Interstate 880. San Francisco Bay is approximately 1.5 miles southwest of the site and the Alameda Harbor Tidal Canal is approximately 0.25 mile north/northeast of the site. The surrounding topography is relatively flat with the surface elevation of the site approximately 17 feet above mean sea level (MSL). Land use in the area is residential and commercial. Structures at the site include a building with a convenience store, two multi-pump fuel dispenser islands covered by a canopy, and three underground storage tanks (USTs).

The site was formerly occupied by a Regal Service Station owned by Wickland Oil Company, Sacramento, California. Exxon acquired the property from Wickland Oil Company in 1988.

2.2 Summary of Previous HLA Investigations

HLA has conducted three phases of site characterization and presented the results to Exxon in reports dated June 24, 1988; March 21, 1989; and May 1, 1990, respectively. HLA has also been conducting monthly water-level measurements and quarterly groundwater sampling at the site since June 1989. The following presents a summary of these investigations.

- HLA has installed seven groundwater monitoring wells onsite.
- The uppermost water-bearing zone consists of 1 to 5 feet of fill overlying interbedded sand, silty and clayey sand, and silt of the Merritt Sand and Posey Formations to an approximate depth of 38 feet. Confining clay of the San Antonio Formation is present at depths deeper than 37 feet.
- Potentiometric surface elevations measured in July 1991 ranged from approximately 10 to 11.5 feet MSL (approximately 6 to 7 feet below ground surface).
- No free-phase petroleum product has been detected at the site.

- Petroleum constituents have been detected in soil samples collected from all borings drilled at the site. Detected concentrations of total petroleum hydrocarbons (TPH) as gasoline range from 0.6 to 2,600 milligrams per kilogram (mg/kg).

- The highest concentrations of TPH as gasoline were detected in soil samples collected near the tank field and in the downgradient southeast corner of the site.

- Concentrations of benzene in groundwater samples collected from all monitoring wells exceed the California Department of Health Services (DHS) action level of 0.7 micrograms per liter (μg/l).

- The highest concentrations of benzene in the groundwater are adjacent to and downgradient of the tank field and dispenser islands.

3.0 SYSTEM DESCRIPTION

3.1 Extraction Wells

Five 4-inch diameter groundwater extraction wells, EW-1 through EW-5, will be installed to a depth of approximately 40 feet each before the commencement of work for this contract. Each wellhead will consist of a well casing with a cement/bentonite seal, enclosed inside a watertight traffic box.

Pneumatic pumps (QED "Solo" Pumps) and vault boxes will be installed at each extraction well as shown on the drawings. Each pump will be suspended from the well cap and will be placed approximately 3 feet above the bottom of the well. After extraction system startup, the depth of the pumps may be adjusted to obtain the optimum extraction volumes from the wells. The existing manhole covers will be replaced with 17" X 30" X 24" traffic-rated precast-concrete vault-boxes. The wellheads will be modified to accommodate the air supply and water discharge lines, sampling ports, and associated fittings.

3.2 Conveyance Piping and Trenches

Pipe trenches linking the extraction wells, sewer and storm drain discharge points, and the treatment system will be constructed as shown on Drawings C1 through C4. The pipe trenches will be excavated through the existing asphalt and concrete pavement. Lines between the extraction wells and the treatment system will be installed in the trenches to transport compressed air and extracted groundwater. Primary piping between the extraction wells and the treatment system will be encased in 4-inch-diameter Schedule 80 PVC pipe for secondary containment. Extracted groundwater will be transported within the containment through a combination of 3/4-inch and 1-inch inside diameter (ID) reinforced nitrile tubing. Compressed air will be directed from a compressor in the treatment system to the extraction pumps through a combination of 3/4-inch and 1/2-inch ID reinforced nylon tubing.

Separate tie-ins to the sanitary sewer and to the storm drain will be installed as shown on Drawing C1 to allow effluent from the treatment system to be discharged to either point. Treatment

system effluent will gravity-flow from the treatment system to the sewer lateral through a 2-inch-diameter SDR-35 pipe, sloped at a 1% grade. Once an NPDES discharge permit is obtained, treatment system effluent will gravity-flow to the storm drain on Park Street through a 2-inch Schedule 80 PVC discharge line.

Trenches will be backfilled with clean imported soil and compacted. The asphalt and concrete pavement will be repaired as shown on Drawing C4 to its original condition or better.

3.3 Treatment System Compound

A bermed concrete pad will be constructed as shown on the drawings to contain a skid-mounted groundwater treatment unit (provided by Exxon) and a set of polishing carbon canisters. The treatment system area will be enclosed within a 7-foot high fence with gates placed to provide access to the carbon storage area and the control panel on the skid-mounted treatment unit. The area will replace two parking spaces next to the building on the site. The treatment pad area must be leveled and existing asphalt removed before construction of the concrete pad.

The Contractor shall provide and install conduit and cable to tie the skid-mounted treatment system into the electrical service inside the station as shown on Drawing C1.

4.0 GENERAL CONDITIONS

4.1 Definitions

The following definitions apply to this document in its entirety.

- "Project Site" means the site of Exxon Company, USA, Service Station #7-0104, 1725 Park Street, Alameda, California.
- "Owner" means Exxon and its designated agent or representative.
- "Construction Manager" means party and its designated agent or representative, selected by Exxon, to manage construction activities.
- "Engineer" means Harding Lawson Associates and its designated agent or representative.
- "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 which enters into an agreement with the Contractor to perform part of the work.
- "Property Tenant" means the person or persons currently operating the site on behalf of Exxon.
- "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.

4.2 Independent Contractor

The Contractor shall act as an independent contractor and not as an agent or employee of the Construction Manager. The Contractor will be solely responsible for the control and direct performance of details of the work performed by the Contractor, his employees, agents, subcontractors, and consultants. If a subcontractor is used, the Contractor shall coordinate the work of all subcontractors and assure a finished job consistent with workmanlike standards.

4.3 Contractor Responsibility

- The Contractor acknowledges that he has taken reasonable steps to ascertain the nature and location of work and conditions which can affect the work or its cost.

- The Contractor agrees to furnish at his expense all labor, materials, equipment, tools, services, and insurance as necessary or required to perform the Work described in this Agreement. This may include health protection devices and clothing as established in a Health and Safety Plan prepared by the Construction Manager.

- The Contractor shall maintain, at all times on the project site, a competent resident superintendent, who shall not be replaced without written notice to the Construction Manager except under extraordinary circumstances. The superintendent will be the Contractor's representative at the project site and shall have authority to act on behalf of the Contractor. All communications given to the superintendent shall be as binding as if given to the Contractor.

- Prior to commencing work, the Contractor shall pay all charges and fees necessary to provide electrical service and to obtain the required permits and approvals from the local agency that has jurisdiction over construction; including permits for electrical, mechanical, and civil construction. The Contractor shall also coordinate the work schedule and inspections with the power company and responsible local agency.

- The Contractor shall confine construction equipment, the storage of materials and equipment, and the operations or workmen to areas permitted by the Property Tenant and the Construction Manager and by law, ordinances, permits, or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment.

- The Contractor shall keep the premises free from accumulations of waste materials, rubbish, and other debris resulting from the Work. At the completion of the Work, the Contractor shall remove all waste materials, rubbish, and debris from and about the premises as well as all tools, appliances, construction equipment, machinery, and surplus materials, and shall leave the project site clean. The Contractor shall restore to their original condition those portions of the site not designated for alteration by the Contract Documents.

- All material shall be new and shall meet or exceed the specifications provided herein.

- Materials that are not specifically labeled or defined shall be provided by the Contractor. These include but are not limited to piping and valving, wiring, concrete, conduits, electrical items, pipe supports, and chain-link fencing.

- The Contractor shall permit, facilitate, and provide proper and safe conditions for inspection and testing by the Owner or Construction Manager or their representatives during the course of the work. Agents or authorized representatives of the Owner, Construction Manager, Property Tenant, testing agencies, and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspection, and testing.

4.4 Performance Guarantee

All works constructed by the Contractor shall be guaranteed to operate to the Owner's satisfaction for a period of 1 year from the date of Final Acceptance of the Work as specified herein. The Contractor shall repair any defect of equipment, material, or workmanship at his own expense.

The Contractor is responsible for all damage to the Owner's real or personal property, and damage to such property shall be repaired at the Contractor's expense.

The Contractor shall commence repairs within 5 working days of notification from the Owner or Construction Manager. If the Contractor fails to remedy any failure or defect after receipt of notice, the Owner or Construction Manager shall have the right to remedy the failure or defect at the Contractor's expense.

4.5 Health and Safety

The Contractor shall be responsible for its activities and those of its employees or agents with respect to job site safety. Neither the professional activities nor the presence of the Owner or the Construction Manager or their employees, subcontractors, and consultants shall be understood to control the operations of any other parties with respect to job site safety.

The Contractor shall take proper safety and health precautions to protect the Work, the workers, the public, and the property of others. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire Work, except for any completed unit of work which may have been accepted separately under the Agreement.

The Contractor shall demonstrate compliance with the following requirements to the Construction Manager's satisfaction before construction begins:

- The Contractor shall have an on-site person safety-trained in compliance with OSHA Hazardous Waste Operations Standards (29 CFR 1910.120(E)).
- All employees who work on the project shall have completed an EPA-certified 40-hour safety training course and all required annual 8-hour refreshers including respirator training, and shall actively participate in a medical monitoring program.
- A Health and Safety Plan for the project shall be prepared by the Contractor and approved by the Construction Manager prior to commencement of work.
- If the Contractor does not comply with its Health and Safety Plan, it will be cause for the Construction Manager to suspend the Contractor's work and to require Contractor's personnel to evacuate the area. All costs associated with delays caused by suspension of work due to noncompliance with the approved Health and Safety Plan shall be borne by the Contractor.

4.6 Protection of Persons and Property

The Contractor shall barricade open excavations occurring as part of this work. All excavations in public access shall be covered with trench plates when the Contractor is not actively working in excavation. The Contractor shall ramp trench plates at edges with cold mix to avoid tripping hazard to service station patrons; the Contractor shall remove ramping material when removing plate.

The Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement undermining, washout and other hazards created by earthwork operations.

The Contractor shall not remove material beyond the indicated subgrade elevations or dimensions without specific direction of the Construction Manager. Unauthorized excavations shall be backfilled and compacted at no expense to the Owner.

4.7 Insurance

Contractor shall, at its sole cost and expense and before commencement of the work, obtain and maintain insurance coverage during the progress of the work as set forth below.

- Worker's Compensation-Statutory and Employer's Liability, including occupational disease with limits of not less than $500,000 per occurrence/aggregate.
- Comprehensive General Liability with limits of not less than $1,000,000 applicable to bodily injury, sickness, or death in any one occurrence and not less than $1,000,000 for loss of or damage to property in any one occurrence. This coverage shall include the following:
    - Comprehensive form
    - Premises/operations
    - Underground explosion and collapse hazard
    - Products/completed operations
    - Contractual liability
    - Independent contractors
    - Broad form property damage
    - Personal injury
- Automobile Liability, covering use of all owned, non-owned, or hired vehicles used by Contractor with limits of not less than $1,000,000 applicable to bodily injury, sickness, or death of any one person per occurrence and $1,000,000 for loss of or damage to property in

any one occurrence. Such coverage shall be considered primary, noncontributory, and contain a severability of interest provision.

- Contractor shall provide a Certificate of Insurance. The Certificate shall name the Owner, Property Tenant, Construction Manager, and Engineer as additional insured.

4.8 Inspection

The Contractor acknowledges that he is fully familiar with all the terms, conditions, and obligation of the plans, exhibits, specifications, and documents described in the Agreement; the location of the job site, the conditions under which the work is to be performed; and that he enters into this contract based upon his investigation of all such matters.

All work shall be subject to inspection and tested at reasonable times before acceptance to ensure compliance with the terms of the contract. Inspections and tests are for the sole benefit of the Owner and do not relieve the Contractor of responsibility for damage or loss of material before acceptance.

4.9 Permits/Licenses/Utilities

The Contractor agrees to provide, at his expense, all the necessary permits, certificates, inspections and licenses made necessary by the Work and required by virtue of all applicable laws, regulations, ordinances, and other rules of the State, City or other jurisdiction where the work is done. The Contractor warrants that he is a licensed contractor in the State of California.

The Contractor shall obtain and pay for all construction permits and licenses. The Owner or Construction Manager shall assist the Contractor, when necessary, in obtaining such permits and licenses; however, it is the Contractor's responsibility to obtain such permits and licenses. The Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of the opening of the Bids. The Contractor shall pay all charges of utility service companies for connections to the Work. The Owner shall pay all charges of such companies for capital costs related thereto.

4.10 Notification

- The Contractor shall provide a written schedule of work which shall be mutually approved by the Construction Manager and the Property Tenant prior to commencement of work.
- The Contractor shall notify the Construction Manager and each appropriate local agency at least three business days in advance of project milestones.
- The Contractor shall provide three-day written notice of any planned utility outage which shall be mutually approved by the Construction Manager and Property Tenant.

4.11 Notices

All notices and other communications required to be given under this Agreement and in the absence of a specific direction otherwise, shall be deemed effectively made or given if written and delivered to the appropriate party at the address listed below, or at such other address or addresses as Owner or Construction Manager may from time to time designate in writing.

With respect to Owner:

Exxon Company, USA
P.O. Box 4032
Concord, California 94520
Attention: Mr. Bill Wang

Construction Manager to be determined by Exxon

With respect to Contractor:

_____
_____
_____
_____

4.12 Interruption of Utilities

The Contractor shall provide a 3-work-day written notification to Construction Manager and Property Tenant of a mutually agreed upon time and duration for temporary disconnection of any utility service at the site. The Contractor shall cooperate with the Property Tenant and Construction Manager to schedule disruptions to the existing power service during non-operating or non-peak hours of the store and pump islands.

4.13 Existing Utilities

The Contractor shall locate existing underground utilities in areas of work and provide adequate means of support and protection during earthwork operations. Excavation of material surrounding an underground utility will be excavated by hand.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the Contractor shall consult the utility companies immediately for directions. The Contractor shall cooperate with the Property Tenant and utility companies in keeping respective services and facilities in operation. The Contractor shall repair damaged utilities to their original condition and to the satisfaction of the utility owner(s) and the Construction Manager.

4.14 Traffic Control

The Contractor's operations shall cause no unnecessary inconvenience. The access rights of the public shall be considered at all times. Unless otherwise authorized, traffic shall be permitted to pass through the Work, or an approved detour shall be provided.

Safe and adequate pedestrian and vehicular access shall be provided and maintained to fire hydrants, commercial and industrial establishments, parking lots, service stations, and establishments of similar nature. Access to these facilities shall be continuous and unobstructed unless otherwise approved by the Construction Manager.

Safe and adequate pedestrian zones and public transportation stops, as well as pedestrian crossings at the Work shall be maintained unless otherwise approved by the Construction Manager.

Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time. If backfill has been completed to such extent that safe access may be provided, and the street is opened to local traffic, the Contractor shall immediately clear the street and driveways and provide and maintain access.

The Contractor shall cooperate with the various parties involved in the delivery of mail and the collection and removal of trash and garbage to maintain existing schedules for these services.

The Contractor shall be responsible for barricades and traffic signs and shall obtain necessary approvals prior to blocking any roadways.

4.15 Project Closeout

4.15.1 Substantial Completion

Before requesting inspection by the Owner for certification of Substantial Completion, the Contractor shall complete the following. List exceptions in the request.

- In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
- If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
- Advise Owner of pending insurance change-over requirements.
- Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- Deliver tools, spare parts, extra stock, and similar items.
- Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools and similar elements.

4.15.2 Final Acceptance

Before requesting final inspection by the Owner for certification of final acceptance and final payment, the Contractor shall complete the following. List exceptions in the request.

- Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
- Submit an updated final statement, accounting for final additional changes to the Contract Sum.
- Submit final meter readings for temporary utilities and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.

4.15.3 Record Drawings

The Contractor shall maintain a clean, undamaged set of blue or black line white-prints of the Drawings in this Agreement and any vendor-supplied prints. The Contractor shall mark the sets to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where vendor prints are used, record a cross-reference at the corresponding location on the Agreement drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

- Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
- Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
- Note related Change Order numbers where applicable.
- Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

4.16 Final Payment

Final payment shall be due when the services described in this Agreement are fully completed and satisfactorily performed. Before issuance of final payment and if required by the Construction Manager, the Contractor shall submit evidence satisfactory to the Construction Manager that all payrolls, bills from materials and equipment, and all known indebtedness connected with the Contractor's services have been satisfied and paid.

The making and acceptance of final payment shall constitute: (1) A waiver of all claims by the Owner against the Contractor, except claims arising from unsettled liens, from defective work appearing after final inspection, or from failure to comply with the Agreement or the terms of any special guarantees specified therein; however, it shall not constitute a waiver by the Owner of any rights with respect to the Contractor's continuing obligations under the Agreement and (2) a waiver of all claims by the Contractor against the Owner other than those previously made in writing and still unsettled. A waiver must be executed on the Owner's Release of Lien form.

4.17 Modification and Assignment

No agreement or understanding in any way modifying this Agreement shall be binding upon Owner unless made in writing and approved by Owner. Additional costs will be paid for only on the prior written consent of Owner. This Agreement may not be assigned or further subcontracted by Contractor without the prior written consent of Owner.

Without invalidating the Agreement, the Owner or Construction Manager may, at any time or from time to time, order additions, deletions, or revisions in the work; these will be authorized by Change Orders. Upon receipt of a Change Order, the Contractor shall proceed with the work involved. All such Work shall be executed under the applicable conditions of the Agreement. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made.

4.18 Laws

The terms and conditions of this Agreement, and the rights and obligations of the Owner and the Contractor thereunder, shall be subject to and interpreted in accordance with the laws of the State of California.

The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to the Work. If the Contractor observes that the Specifications or Drawings are at variance therewith, the Contractor shall give the Owner or Construction Manager prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate modification. If the Contractor performs any Work knowing or having reason to know that it is contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner or Construction Manager, the Contractor shall bear all costs arising therefrom; however, it shall not be the Contractor's primary responsibility to make certain the Specifications and Drawings are in accordance with such laws, ordinances, rules, and regulations.

4.19 Use of Construction Manager's Equipment

If the Contractor uses the Construction Manager's equipment or facilities, the Contractor shall reimburse the Construction Manager at a predetermined rate and shall hold Construction Manager harmless from any claims, actions, demands, damages, liabilities, or expenses, including attorney's fees, resulting from the use of such equipment or facilities.

4.20 Taxes

The Contractor shall comply with federal, state, and local tax laws, Social Security acts, unemployment compensation acts, and worker's compensation acts insofar as applicable to the performance of this contract.

4.21 Liability and Indemnification

The Contractor agrees to defend, indemnify, and hold harmless the Owner, Property Tenant, Engineer, and Construction Manager from any and all liens, losses, claims, and damages and causes of action of every nature or character in connection with payments for which the Contractor shall be liable for, including labor, materials, equipment, royalties, and patent rights furnished by the Contractor, subcontractors and consultants used in the performance of this Agreement.

The Contractor agrees to defend, indemnify, and hold harmless the Owner, Property Tenant, Engineer, and Construction Manager from and against any and all claims, demands, causes of action, loss, damage, liability, and expense including attorney's fees and court costs, for damage to property and injuries to and death of any person arising out of, or in connection with the operations of the Contractor, its subcontractors and consultants, and their respective agents and employees except where the injury(ies) or damage(s) related to such claims, demands, or causes of action are caused by the sole negligence of the Owner, Property Tenant, Engineer, or Construction Manager.

Any loss or damage to Contractor's machinery, equipment, or tools, at job site for work performed under this contract shall be at Contractor's sole expense and risk.

4.22 Attorney's Fees

In the event of any dispute arising under this Agreement, the prevailing party shall be entitled to recover reasonable attorney's fees.

4.23 Mechanics' Lien

Contractor agrees to indemnify and hold harmless the Owner and the Construction Manager against all laborer's, materialmen's, and mechanics' liens arising from its work, and shall keep the job site free from all such claims, liens, and encumbrances.

4.24 Confidentiality

All information obtained by Contractor in the Performance of Services hereunder will be strictly confidential and will not be used for the benefit of Contractor, or any affiliate, subsidiary, or parent organization of Contractor, or disclosed to any third party, either during Contractor's employment or after its termination, except as may be necessary in order to perform services pursuant to this Contract.

4.25 Termination

Notwithstanding any other provision herein to the contrary, Owner or Contractor may terminate this Agreement at any time upon 7 days prior to written notice to the other. The Contractor shall stop all work on the date of notification or as otherwise stated in any such notice to terminate or suspend the services. The Owner shall reimburse the Contractor for those expenses necessarily incurred by Contractor because of the termination for which the Contractor has not been otherwise compensated.

Should the Contractor fail to perform any of its obligations hereunder, within the time and in the manner provided or otherwise violate any of the terms of this Agreement, the Owner may terminate this Agreement by giving written notice of such termination, stating the reasons for such termination in such event. The Contractor shall be compensated as above, provided, however, there

shall be deducted from such amount the amount of damage if any, sustained by Owner by virtue of the Contractor's breach of or default under this Agreement.

4.26 Force Majeure

Contractor shall not be liable for failure to perform services provided for in this Agreement when such performance is hindered or prevented by strikes, lockouts, war or acts of war, riots or civil commotions, fire, interference by any governmental authority, or other cause beyond the reasonable control of Contractor.

5.0 SCOPE OF WORK

The Contractor shall provide all labor, materials and equipment required to install all components of the groundwater extraction, treatment, and discharge system except for the installation of groundwater extraction wells. The Contractor shall provide all components of the system necessary to make a complete, integrated, and operational groundwater extraction and treatment system except for the following components: five pneumatically-operated groundwater extraction pumps, a primary skid-mounted groundwater treatment unit with integral controls and piping, a secondary skid-mounted groundwater treatment unit for "polishing", and six 200-pound canisters of activated carbon. The Contractor shall install the groundwater extraction pumps, the skid-mounted treatment units, and the carbon canisters as indicated on the drawings.

The Contractor shall also provide all necessary technical support during start-up and initial operation.

The following summarizes the work to be performed by the Contractor:

- Supply and install vault-boxes as shown on the drawings.
- Install QED "Solo" Pumps or equivalent (supplied to the Contractor) as shown on the drawings. The Construction Manager will specify the depth of installation.
- Modify wellheads as shown on the drawings.
- Conduct trench work including excavation, backfilling, and compaction as specified and as shown on the drawings.
- Supply and install all underground/aboveground piping, valves, and fittings as specified and as shown on the drawings, including:
    - 4-inch-diameter Schedule 80 PVC double containment. Line shall be tested with compressed air at 10 psi for two hours.
    - 3/4-inch and 1-inch-inside-diameter (ID) reinforced nylon tubing for extracted groundwater. Line shall be tested with compressed air at 100 psi for 2 hours.
    - 3/4-inch and 1/2-inch ID reinforced nylon tubing for compressed air. Line shall be tested with compressed air at 100 psi for 2 hours.
    - Sewer discharge through 2-inch-diameter SDR-35 sloped at a 1% grade.
    - Storm drain discharge through 2-inch-diameter Schedule 80 PVC.

  - Electrical service through 2-inch galvanized steel conduit (aboveground). Conduit seal all ends.

- Supply and install treatment system foundation and fence as specified and as shown on Drawings C1 and C3.
- Install and anchor the skid-mounted components of the treatment system (supplied to the Contractor) as shown on Drawing C3.
- Install activated carbon canisters (supplied to the Contractor) as shown on Drawing C3.
- Dispose and/or treat excess hazardous excavation materials and debris from the work site in accordance with all federal, state and local regulations.
- Resurface and landscape, including replacement of irrigation piping, sprinklers, and landscaping, to bring the work site to original condition.
- Supply necessary labor, equipment (including safety equipment), and materials for installation of all system equipment, instruments, controls, and necessary components and accessories for the total product and groundwater extraction system.
- Obtain all necessary construction/trade permits.
- Pay all charges and fees necessary for power hookup; coordinate inspection by utility representative; purchase all materials necessary for hookup.
- The Contractor shall demonstrate the satisfactory operation of the installed equipment before turnover to the Owner. A representative of the skid-mounted treatment system vendor will assist in the startup of the vendor-supplied portion of the system; satisfactory operation of all other portions of the system shall be the responsibility of the Contractor.

6.0 PIPING MATERIAL SPECIFICATIONS

Specifications for piping materials to be supplied by the Contractor for construction of the groundwater extraction system at the project site are presented below.

6.1 Secondary Containment

The secondary containment from extraction wells EW-1 through EW-5 to the treatment system shall be 4-inch-diameter Schedule 80 PVC, ASTM D1785. PVC fittings shall be 4-inch-diameter Schedule 80 PVC, ASTM D2464 threaded or ASTM D2467 socket. Water and air tubing (specified below) shall be protected by the same PVC secondary containment pipe.

6.2 Groundwater Influent Line

The groundwater influent line from the extraction wells to the treatment system shall be 3/4-inch and 1-inch ID Black Primo Flex Class A Modified Nitrile tubing and shall be rated at 200 psig. The line shall be compatible with and resistant to petroleum products.

6.3 Air Supply Line

The pneumatic pump air supply line shall be 1/2-inch and 3/4-inch ID Black Primo Flex Class A Modified Nitrile tubing and shall be rated at 200 psig.

6.4 Sanitary Sewer Discharge Line

The effluent line from the treatment system to the storm drain inlet on Park Street shall be 2-inch-diameter Schedule 80 PVC, ASTM D1785. PVC fittings shall be 2-inch-diameter, Schedule 80 PVC, ASTM D2464 threaded or ASTM D2467 socket.

6.5 Storm Drain Discharge Line

The effluent line from the treatment system to the on-site sanitary sewer lateral shall be 2-inch-diameter SDR-35.

7.0 EARTHWORK

7.1 General

7.1.1 Summary

This section includes specifications for excavating and backfilling of soil for installation of well vaults, groundwater collection piping, treatment system concrete pad, and treated water discharge piping.

7.1.2 Definitions

- "Excavation" consists of removal of material encountered to install system components as indicated on the contract drawings.
- "Subgrade" is the undisturbed earth or the compacted soil layer immediately below granular subbase or topsoil materials.
- "Structure" is any building, foundation, slab, tank, utility, or curb, or other man-made stationary feature occurring above or below ground surface.

7.1.3 Submittals

The Contractor shall submit the following test reports directly to the Construction Manager from the testing services, with copy to Contractor:

- Field reports; in-place soil density tests.
- One optimum moisture-maximum density curve for each type of soil encountered.

7.1.4 Quality Assurance

The Contractor shall perform excavation work in compliance with the following codes and standards:

- California Code of Regulations (CCR) Title 8, California Occupational Safety and Health Standards (Cal OSHA).

The Owner will employ and pay for a qualified geotechnical testing and inspection laboratory to perform soil testing and inspection services during earthwork operations.

7.1.5 Project Conditions

Refer to Section 4, "General Conditions" for requirements regarding existing utilities and interruption of utilities.

The use of explosives is not permitted.

7.2 Products

- Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.
- Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand. Subbase material shall comply with specification for Class I aggregate subbase as defined by CALTRANS Standard Specification Section 25-1.02.
- Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter. Backfill and fill materials shall comply with specification for Class IV select material as defined by CALTRANS Standard Specification Section 19-3.06, and shall be compacted to 90%.

7.3 Execution

7.3.1 Excavation

Earth Excavation includes the excavation of pavements and other obstructions visible on the surface together with earth and other materials encountered.

7.3.2 Stability of Excavations

The Contractor shall comply with local codes, ordinances, and requirements of agencies having jurisdiction. Contractor shall obtain Cal-OSHA permit, if required, prior to commencement of construction work.

7.3.3 Storage of Excavated Materials

The Contractor shall stockpile excavated materials acceptable for backfill and fill where directed by the Construction Manager. Place, grade, and shape stockpiles for proper drainage.

Locate and retain soil materials away from edge of excavations. Do not store within drip lines of trees.

The Contractor shall properly dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

7.3.4 Backfill and Fill

The Contractor shall place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Section 8.2.

- Under natural soil areas, use satisfactory excavated or borrow material.
- Under walks and pavements, use backfill and fill material.

Backfill excavations as promptly as work permits, but not until completion of the following:

- Removal of shoring and bracing (if used), and backfilling of voids with satisfactory materials.
- Removal of trash and debris from excavation.
- Authorization of the Construction Manager to begin backfilling.

7.3.5 Placement and Compaction

The Contractor shall place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Owner if soil density tests indicate inadequate compaction.

Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 1557:

- Under structures and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density. Compact all else at 90 percent maximum density.
- Under unpaved areas, compact top 6 inches of subgrade at 80 percent maximum density. Compact all else at 90 percent maximum density.
- Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density. Compact all else at 90 percent maximum density.
- Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations. Flooding or jetting shall not be permitted. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

7.3.6 Grading

The Contractor shall shape the surface of areas under new pavement to line, grade, and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation to match elevations of the surrounding pavement.

After grading, the Contractor shall compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

7.3.7 Pavement Subbase Course

Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

Refer to Section 9 of this document for asphalt paving specifications.

The Contractor shall place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

When a compacted subbase course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

7.3.8 Field Quality Control

The Contractor shall allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

7.3.9 Disposal of Excess and Waste Materials

The Contractor shall remove waste materials, including unacceptable excavated material, trash, and debris, and properly dispose of it off Owner's property.

8.0 ASPHALT PAVING

8.1 General

The extent of asphalt concrete paving work is shown on the drawings.

Prepared aggregate subbase is specified in Section 8 of this document.

8.1.1 Submittals

The Contractor shall provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

8.1.2 Site Conditions

Weather Limitations: The Contractor shall apply prime and tack coats when ambient temperature is above 50 deg.F (10 deg.C), and when temperature has not been below 35 deg.F (1 deg.C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

The Contractor shall construct asphalt surface course when atmospheric temperature is above 40 deg.F (4 deg.C), and when base is dry. Base course may be placed when air temperature is above 30 deg.F (-1 deg.C) and rising.

Grade Control: The Contractor shall establish and maintain required lines and elevations.

8.2 Products

General: The Contractor shall use locally available materials and gradations which exhibit a satisfactory record of previous installations.

- Base Course Aggregate: Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.
- Asphalt Cement: AASHTO M 226 (ASTM D 3381) for viscosity-graded material and AASHTO M 20 (ASTM D 946) for penetration-graded material.
- Prime Coat: Cut-back asphalt type; AASHTO M 82 (ASTM D 2027) MC-30, MC-70 or MC-250.
- Tack Coat: Emulsified asphalt; AASHTO M 140 (ASTM D 977) or M 208 (D 2397); SS-1, SS-1h, CSS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

8.3 Execution

8.3.1 Surface Preparation

The Contractor shall:

- Saw Cut Edges: Cut pavement to a neat edge using a powered saw equipped with a shatterproof abrasive or diamond-rimmed blade.
- Remove loose material from compacted subbase surface immediately before applying prime coat.
- Prime Coat: Apply at rate of 0.20 to 0.50 gal. per sq. yd., over compacted subgrade. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.
- Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.
- Allow to dry until at proper condition to receive paving.
- Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

8.3.2 Placing Mix

The Contractor shall:

- Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 deg.F (107 deg.C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.
- Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

8.3.3 Rolling

The Contractor shall:

- Begin rolling when mixture will bear roller weight without excessive displacement.
- Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

- Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

- Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

- Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

- After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

- Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

8.3.4 Field Quality Control

The Contractor shall:

- Test in-place asphalt concrete courses for compliance with requirements for thickness.

- Repair or remove and replace unacceptable paving as directed by the Construction Manager.

In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

- Base Course: 1/2", plus or minus.

- Surface Course: 1/4", plus or minus.

9.0 CONCRETE WORK

9.1 General

9.1.1 Description of Work

The extent of concrete work is shown on the drawings and specified in the scope of work.

9.1.2 Quality Assurance

The Contractor shall comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

- ACI 318 "Building Code Requirements for Reinforced Concrete".
- Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

9.1.3 Submittals

The Contractor shall submit the following:

- Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, curing compounds and others as requested by Owner.
- Samples: Submit samples of materials as requested by Owner, including names, sources and descriptions.
- Material Certificates: Provide materials certificates in lieu of materials laboratory test reports. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

9.2 Products

The Contractor shall use materials as follows:

9.2.1 Form Materials

- Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

9.2.2 Reinforcing Materials

- Reinforcing Bars: As indicated on the drawings.

9.2.3 Concrete Materials

- Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to Owner.
- Use one brand of cement throughout project, unless otherwise acceptable to Owner.
- Fly Ash: ASTM C 618, Type C or Type F. Limit use of fly ash to not exceed 25% of cement content by weight.
- Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
    - For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
    - Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Owner.
- Water: Drinkable.
- Calcium chloride or admixtures containing more than 0.1% chloride ions are not permitted.

9.2.4 Related Materials

- Liquid Membrane Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Owner. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq ft./gal.
- Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.
- Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

9.2.5 Proportioning and Design of Mixes

The Contractor shall prepare design mixes by either laboratory trial batch or field experience methods. If trial batch method used, use an independent testing facility acceptable to Construction Manager for preparing and reporting proposed mix designs.

The Contractor shall submit written reports to the Construction Manager of proposed mix of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Owner.

The Contractor shall design mixes to provide normal weight concrete with the following properties:

- 3000 psi 28-day compressive strength; W/C ratio, 0.58 maximum (non-air-entrained), 0.46 maximum (air-entrained).
- Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Owner.
- Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
    - Reinforced foundation systems: Not less than 1" and not more than 3".
    - Other concrete: Not more than 4".

9.2.6 Concrete Mixes

The Contractor shall:

- Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.
- Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
- During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
    - When air temperature is between 85 deg. F (30 deg. C) and 90 deg. F (32 deg. C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg. F (32 deg. C), reduce mixing and delivery time to 60 minutes.

9.3 Execution

The Contractor shall perform the following tasks as specified:

9.3.1 Forms

- Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- Fabricate forms for easy removal without hammering or prying against concrete surfaces.
- Chamfer exposed corners and edges using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

9.3.2 Placing Reinforcement

- Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

9.3.3 Installation of Embedded Items

- General: Set and build into work embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

9.3.4 Concrete Placement

- Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Moisten wood forms immediately before placing concrete where form coatings are not used.
- General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

- Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

- Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

- Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing is completed.

- Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

- Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

- Maintain reinforcing in proper position during concrete placement operations.

- Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

- When air temperature has fallen to or is expected to fall below 40 deg. F (4 deg. C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg. F (10 deg. C), and not more than 80 deg. F (27 deg. C) at point of placement.

- Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

- Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

- Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

- Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg. F (32 deg. C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

- Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

- Fog spray forms, reinforcing steel and subgrade just before concrete is placed.

- Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

9.3.5 Slab Finishes

- Float Finish: Apply float finish to slab surfaces to receive trowel finish and other finishes as hereinafter specified.

- After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane so that depressions between high spots do not exceed 5/16" under a 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drain. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

- Trowel Finish: Apply trowel finish to slab surfaces to be exposed-to-view.

9.3.6 Concrete Curing and Protection

- General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

- Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

- Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI procedures. Avoid rapid drying at end of final curing period.

- Curing Methods: Perform curing of concrete by curing and sealing compound as specified herein.

- Provide curing and sealing compound to exterior slabs as follows:

    - Apply curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

9.3.7 Removal of Forms

Formwork not supporting weight of concrete may be removed after cumulatively curing at not less than 50 deg. F (10 deg. C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

Formwork supporting weight of concrete may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days.

9.3.8 Concrete Surface Repairs

- Repair of Defective Areas: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Construction Manager.
- Repair methods not specified above may be used, subject to acceptance of the Construction Manager.

10.0 ELECTRICAL WORK

10.1 General

This Section includes wires, cables, conduit, boxes, fittings, and connections for power systems rated 600 volts and under.

10.1.1 Description of Work

Electrical Work consists of the connection of the skid-mounted groundwater treatment unit power panel to the existing electrical service inside the building at the site.

10.1.2 Quality Assurance

10.1.2.1 Wires, Cables and Connectors

Regulatory Requirements: The Contractor shall comply with provisions of the following codes:

- NFPA "National Electrical Code."
- UL Compliance: Provide components which are listed and labeled by UL under the following standards.
  - UL Std. 83 Thermoplastic-Insulated Wires and Cables.
- NEMA/ICEA Compliance: Provide components which comply with the following standards:
  - WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

10.1.2.2 Electrical Boxes and Fittings

- NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
- UL Compliance: Comply with applicable requirements of UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.
- NEMA Compliance: Comply with applicable requirements of NEMA Stds/Pub No.'s OS1, OS2 and Pub 250 pertaining to outlet and device boxes, covers and box supports.

10.2 Products

The Contractor shall provide products according to the following requirements:

10.2.1 Wire and Cable

- General: Provide wire and cable suitable for the temperature, conditions and location where installed.
- Conductors: Provide solid conductors for power circuits no. 10 AWG and smaller. Provide stranded conductors for sizes no. 8 AWG and larger.
- Conductor Material: copper for all wires and cables.
- Insulation: Provide THHN/THWN insulation for all conductors.

10.2.2 Connectors for Conductors

The Contractor shall provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and class for applications of services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

10.2.3 Electrical Conduit, Boxes, and Fittings

The Contractor shall provide galvanized rigid conduit and code-gage sheet steel junction and pull boxes, with screw covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and stainless steel nuts, bolts, screws and washers.

10.3 Execution

The Contractor shall perform the following tasks as specified:

10.3.1 Installation of Wires and Cables

- General: Install electrical cables, wires, and connectors in compliance with NEC.
- Coordinate cable installation with other Work.
- Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.
- Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.

- Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.

- Keep conductor splices to minimum.

- Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.

- Use splice and tap connectors which are compatible with conductor material.

- Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than no 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.

- Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.

10.3.2 Installation of Electrical Boxes and Fittings

- Install electrical boxes and fittings as required, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

- Coordinate installation of electrical boxes and fittings with wires, cables, and connectors.

- Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.

- Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

- Provide electrical connections for installed boxes.

- Subsequent to installation of boxes, protect boxes from construction debris and damage.

- Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.

10.3.3 Field Quality Control

Prior to energizing, the Contractor shall check installed wires and cables with a megohm meter to determine insulation resistance levels to assure requirements are fulfilled.

Prior to energizing, the Contractor shall test wires and cables for electrical continuity and for short-circuits.

Subsequent to wire and cable hook-ups, the Contractor shall energize circuits and demonstrate proper functioning.

11.0 EQUIPMENT SPECIFICATIONS

Vendor information on equipment to be provided to the Contractor, including the extraction well pumps, the primary groundwater treatment unit, and the carbon canisters, is included in the Appendix.

LARGE MAP REMOVED

APPENDIX

Equipment Vendor Information

PULSEPUMP

Solo™ Controllerless Remediation Pump

Revolutionary pump eliminates controllers, for the simplest system ever to specify, install, and operate.

OPTIMUM PERFORMANCE—WITH NO CONTROLLERS!

Solo™ is going is going to change the way you think about ground water cleanup. One of the earliest users, a major east coast remediation contractor, says it is "the simplest pump available at this time".

Solo (patent pending) is an intelligent high-rate pneumatic displacement pump for total fluids applications. It runs itself, with an internal float system and a magnetic "brain" cartridge. The brain—about the size of a roll of Life Savers®—senses liquid level in the pump without liquid contact, turning the air supply on when the pump is full, and turning it off as soon as the pump empties.

EASY SET-UP, AUTO-OPTIMIZING

With its built-in brain, Solo doesn't require air cycle or on-off level control at the wellhead, greatly simplifying system design. All you need above the well cap is a compact, inexpensive air filter/pressure control.

Solo is easier to install than other pumps. You don't have to connect controllers or set timing cycles. And system specification is less complex—just run air to each well, drop in Solo and walk away.

Continued operation is truly hands-off. Solo constantly reacts to changes in well recovery rate, so it's always pumping at the highest rate possible. It also shuts down automatically if water in the well drops below the pumping level.

EFFICIENT, TROUBLE-FREE OPERATION

Because cycling is controlled at the pump, Solo is either refilling or discharging 100% of the time. There's no waiting between active phases of the cycle for the entire length of air supply tubing to re-pressurize.

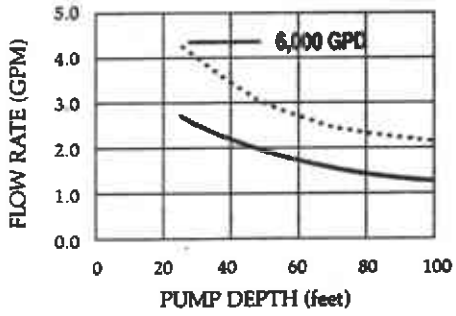
This operating efficiency enables Solo to deliver high pumping rates while reducing air supply requirements.

The pumping mechanism in Solo uses the same high-clearance design that has made Pulse Pump the standard for field performance without clogging or breakdowns. The controller mechanism uses a magnetic link to isolate it from pumped fluids, and is streamlined into a removable cartridge to simplify service. All parts, including the brain cartridge, are rated for at least 5,000,000 cycles and are field-replaceable if necessary.

COST-EFFECTIVE CLEANUP

By eliminating controllers and delivering consistently superior performance, Solo will significantly lower the cost of many cleanup projects. And its simple installation and "hands-off" operation will allow you to handle more jobs in less time.

FLOW PERFORMANCE CURVES:



DEPTH (feet): ·····10 ft. Submergence/100 psi
——— 2 ft. Submergence/100 psi

On Pump Flow Curves: Flow curves are for a pump at the stated conditions, and will vary under other conditions. Flow rate will also be affected by discharge and air tube sizes and run length. QED's technical service department will check your discharge and air system design and select pump and control equipment to meet your requirements.

CHEMICAL COMPATIBILITY CHART:

	GASOLINE	FUEL OILS	CHLORINATED SOLVENT	NON-CHLORIDE ACIDS	HYDROCHLORIC ACID	BASES
S.S./TEFLON/ NYLON	•	•				•

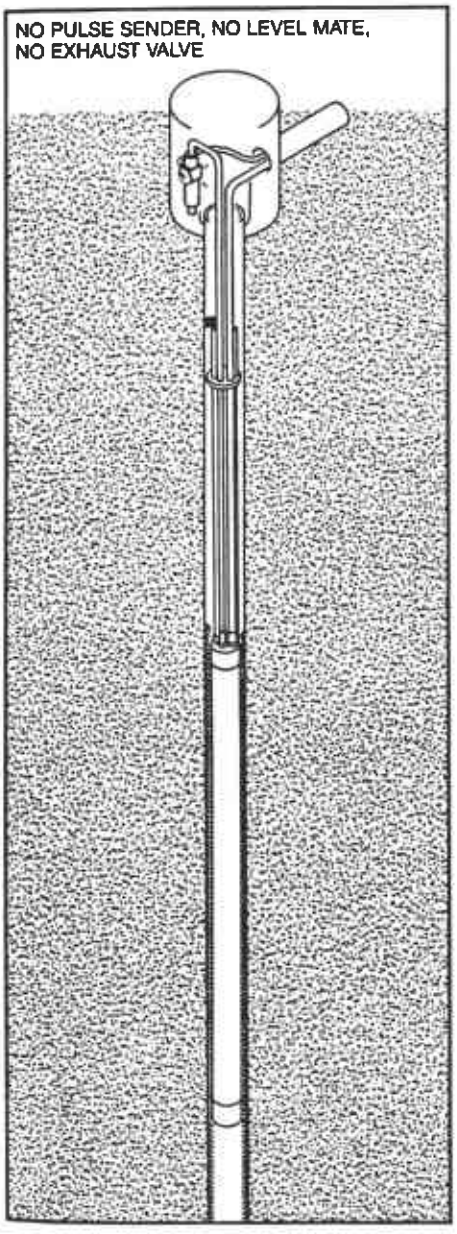
SPECIFICATIONS:

MODEL NO.	PUMP MATERIAL	MIN. WELL I.D. (inches)	PUMP O.D. (inches)	LENGTH (inches)	PUMP VOL. (ml)	WT. (lbs)	FITTING SIZE (inches) & MATERIAL
SP4000	S.S./Teflon/ Nylon	4	3.00	48	2000	14	.25 - .75 (four sizes) S.S. Barb & Clamp

TUBING/HOSE PACKAGES:

MODEL NO.	LENGTH (feet)	TYPE	PUMP* DISCHARGE	PUMP* AIR SUPPLY	PUMP* EXHAUST	BRAIN* EXHAUST
SP25H	25	Hose	.63 Flexible	.25 Flexible	.50 Nylon	.25 Nylon
SP25T	25	Tubing	.75 Nylon	.38 Nylon	.50 Nylon	.25 Nylon
SP50H	50	Hose	.63 Flexible	.25 Flexible	.50 Nylon	.25 Nylon
SP50T	50	Tubing	.75 Nylon	.38 Nylon	.50 Nylon	.25 Nylon
SP100H	100	Hose	.63 Flexible	.25 Flexible	.50 Nylon	.25 Nylon
SP100T	100	Tubing	.75 Nylon	.38 Nylon	.50 Nylon	.25 Nylon

Note: All-nylon tubing is more economical. Flexible hose allows easier coiling for depth adjustment and portability.
* Dimensions in inches



SOLO PUMP PACKAGES:

MODEL NO.	WELL DIAM (inches)	CAP ACCEPTS
SP4000A	4	Hose
SP4000B	4	Tubing
SP4000C	6	Hose
SP4000D	6	Tubing
SP4000E	8	Hose
SP4000F	8	Tubing

Each package contains: Solo pump, well cap and fittings, filter/regulator with autodrain.

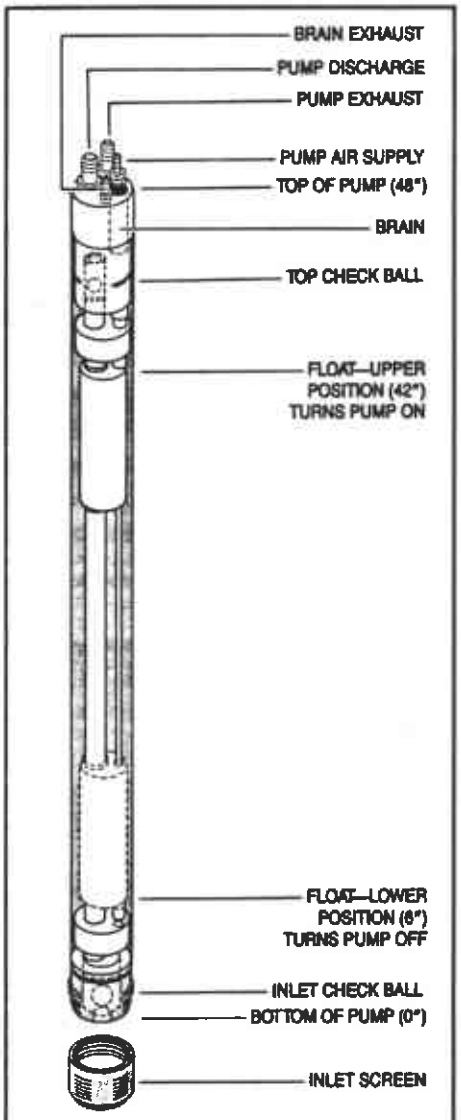
OPERATING REQUIREMENTS:

Minimum Depth of Liquid: 48" above pump bottom

Recommended Air Pressure Not To Exceed: 100 psi

Recommended Air Flow Depending On Pump Conditions: 2-4 SCFM

Besides the pump, each basic Solo package include a well cap with attached filter/regulator and a flexible hose (shown) or tubing set.



HOW IT WORKS

Controllerless Remediation Pump

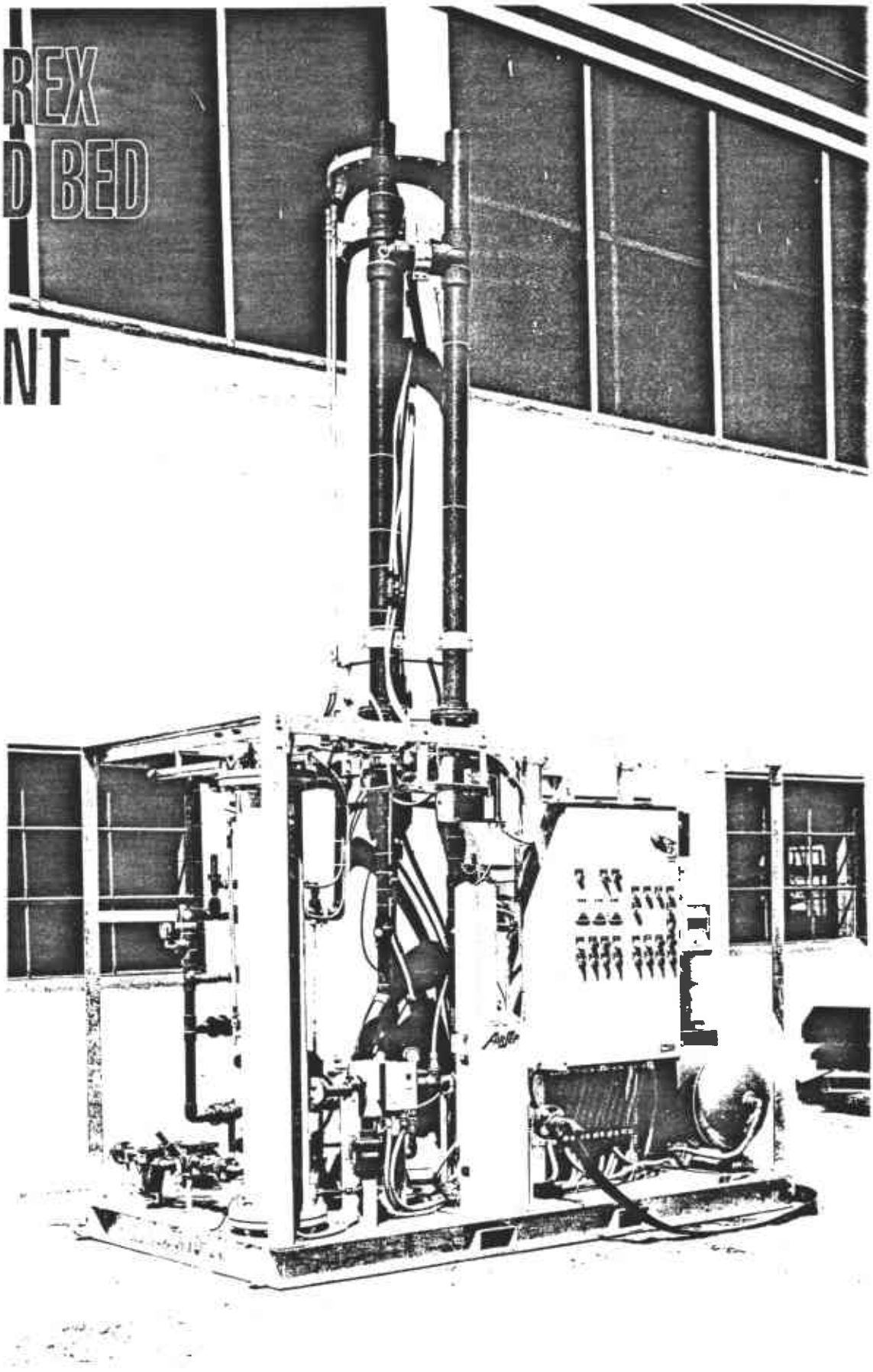
In the intake cycle, the inlet check ball allows liquid to enter the pump, while the top check ball keeps it from coming back into the pump from the discharge tubing. Rising liquid carries the float to the upper position, where it moves the actuator rod up, signalling the brain to allow air to enter the pump, beginning the discharge cycle.

The air pressure seats the inlet check ball and forces the liquid in the pump into the fill tube and up the discharge line, unseating the top check ball with the upward force of the discharging liquid.

As the liquid level falls in the pump, the float drops down, eventually pulling the actuator rod down, signalling the brain to shut off the air supply. Then the entire cycle repeats.

The Solo requires a minimum depth of 4.0 feet of liquid, and shuts itself off when the well liquid level is pumped down. The pumping action automatically begins again when the well has recharged.

THE ENVIREX GAC-FLUID BED BTEX TREATMENT SYSTEM



High rate process treats contaminated groundwater

- low ppb BTEX effluents
- no off gas
- surge buffering
- small, portable

From Envirex Ltd. Your single source for water and wastewater solutions.

1901 South Prairie Ave.,
Waukesha, WI 53186.
414/547-0141

GAC-FLUID BED

FLUID BED REACTOR - Small skid (shown) treats up to 30 GPM at 10 ppm BTEX and is 20 inches dia. by 16 ft. tall. Package units are available up to 14 ft. dia., and up to 1850 GPM.

EFFLUENT/RECYCLE STRUCTURE - This convenient overflow system automatically controls recycle.

NEMA 4X CONTROL PANEL - Houses controls, switches, motor starters, etc., in a weathertight, chemical duty panel. Skid is pre-wired.

PRESSURE SWING ADSORPTION OXYGEN GENERATOR (PSA) - Generates a 90-95% pure oxygen gas to pre-dissolve with water before entering the Fluid Bed reactor. Use of pure oxygen enhances treatment and eliminates off-gas and potential stripping.

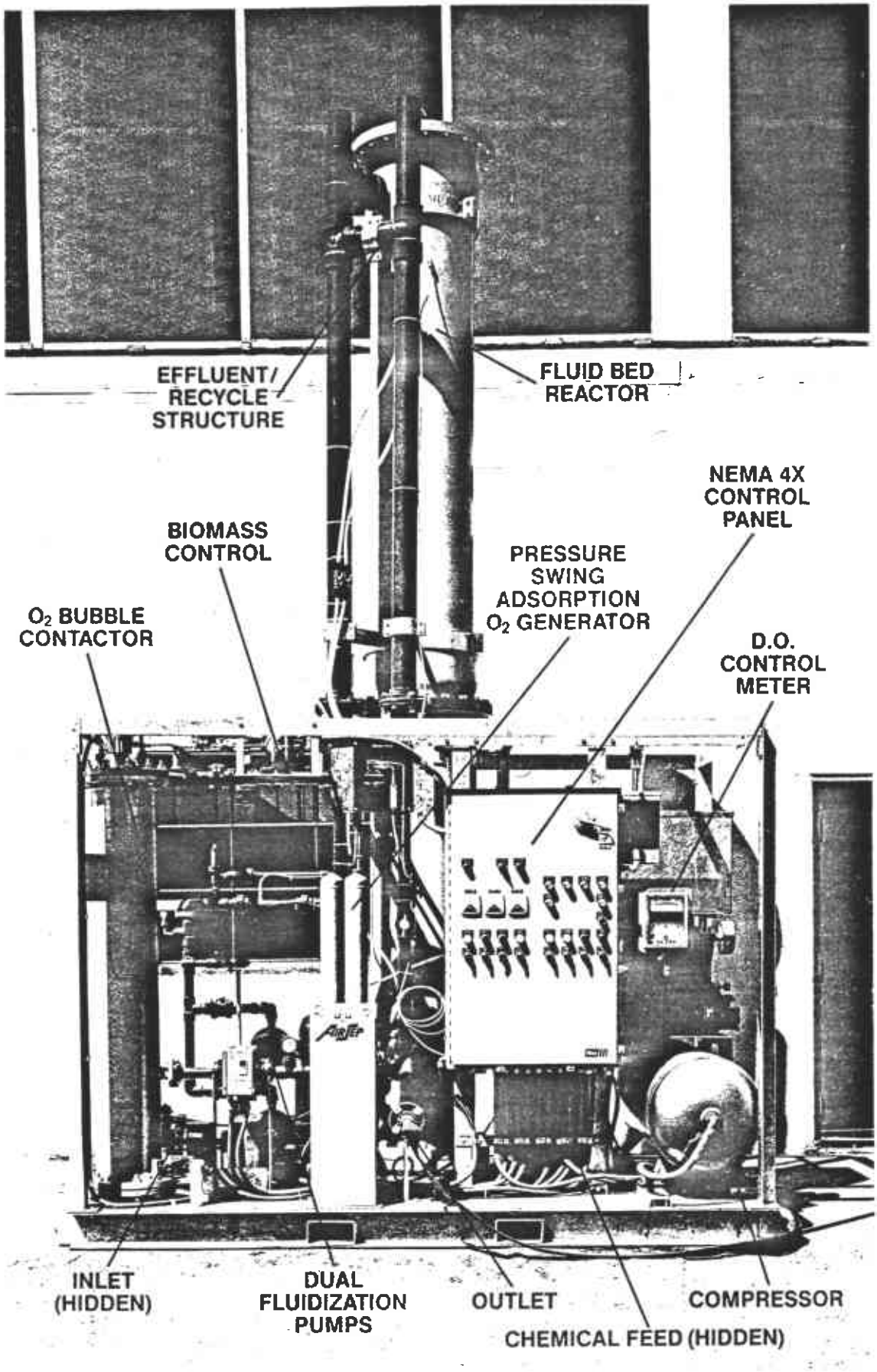
COMPRESSOR - Provides pressurized air for feeding the PSA oxygen generator.

D.O. CONTROL METER - Monitors system effluent dissolved oxygen to prevent under/over oxygenation of the treated water.

0_2 BUBBLE CONTACTOR - Provides for pre-dissolution of oxygen into the fluidization flow and prevents bubbles from escaping the system.

DUAL FLUIDIZATION PUMPS - Provide a steady fluidization flow to the reactor, eliminating sensitivity to fluctuations in inlet flow. The second pump is provided as a pre-piped spare.

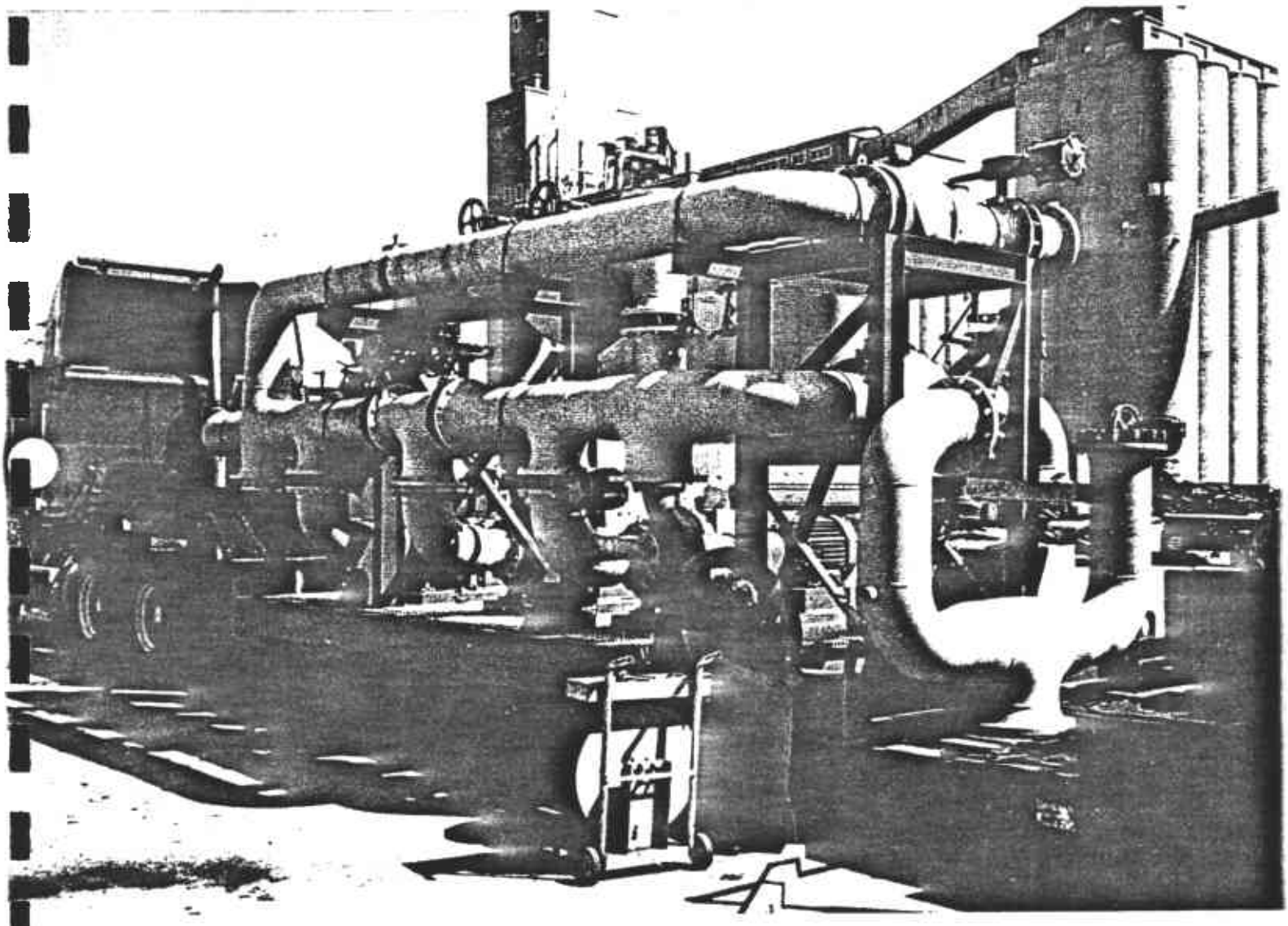
CHEMICAL FEED - A nutrient feed system, including storage tank and metering feed pump, is provided since most groundwater will be nutrient deficient.



THE ENVIREX GAC-FLUID BED
BTEX TREATMENT SYSTEM

ENV LTD 200
5M 4/91

GAC Fluid Bed
Efficient, economical bioremediation of BTEX groundwater



Envirex

fluidized bed process

- Biological reduction and adsorption in a single reactor
- Effective treatment of low ppm wastes
- Low ppb BTEX effluents in extremely short detention times
- Small, portable and inexpensive
- Environmentally sound, true destruction of organics

An inexpensive, high rate bioremediation system

Small, low cost and flexible, the Envirex GAC (Granular Activated Carbon) Fluid Bed provides an easy, environmentally sound method of remediating groundwater and process waters contaminated with BTEX (benzene, toluene, ethylbenzene and xylene) compounds.

This system combines the best of two remediation techniques—an aerobic biological process and an activated carbon column—in one reactor. It actually destroys the BTEX compounds rather than merely transferring them into another phase.

The GAC Fluid Bed meets the lowest parts per billion standards quickly, economically and reliably, in the smallest space possible. Packaged systems, available up to 4,000 gpm, are easy to move, set up and operate.

Biologically viable and stable at low BTEX concentrations

The extremely low organic concentrations found in most BTEX sites pose special treatment problems for biological systems.

Biomass attrition often exceeds the rate of new biomass production. Suspended growth systems, including those using powdered carbon, simply cannot maintain viable biomass populations at such low concentrations.

The GAC Fluid Bed's use of activated carbon as a truly immobilized cell carrier is critical to the biosystem's long term stability. Organics are physically held by the carbon in close proximity to microorganisms growing in and on it, allowing sufficient time for those microorganisms to degrade the material. The activated carbon also serves as a driving force in moving organics from the liquid phase onto the carbon and into contact with the microorganisms.

In the event contaminant levels drop so low that good biological growth cannot be maintained (levels in the very low ppb range), the GAC Fluid Bed will continue to function much like a conventional carbon column.

No carbon hauling, minimal carbon replacement

The carbon carrier in the GAC Fluid Bed is biologically regenerated within the bed. There's no need to thermally regenerate carbon or dispose of spent carbon, which may be considered a hazardous waste when contaminated with benzene.

Unlike powdered carbon systems, the GAC Fluid Bed doesn't waste carbon with the sludge, so carbon replacement costs are kept to a minimum. Any carbon loss is due solely to natural attrition and the adsorption of refractory materials. This may eventually exhaust the carbon, but in much lower quantities than in conventional systems since biodegradable organics are destroyed biologically.

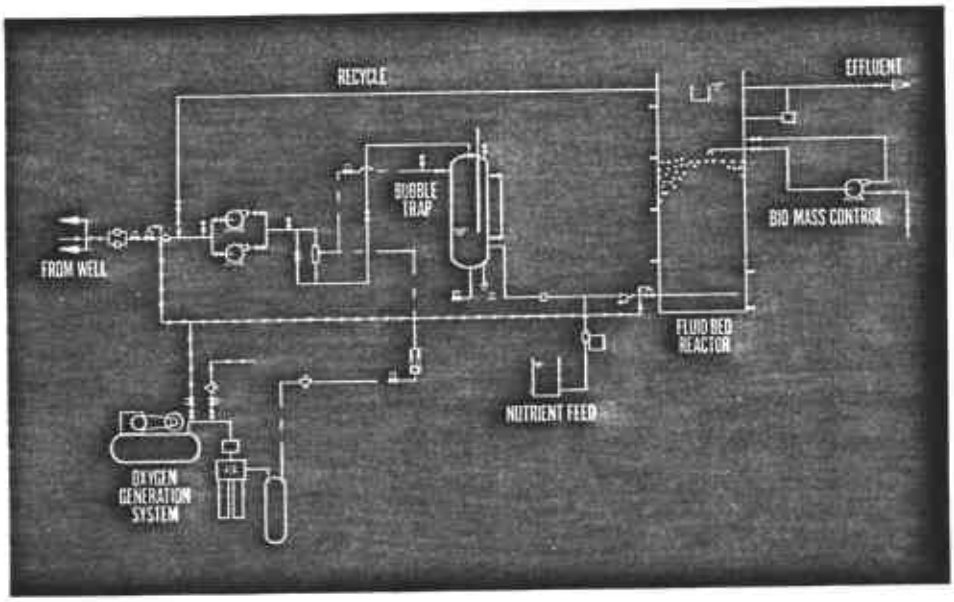
Elimination of off gas production

By economically utilizing pure oxygen predissolved in water about to enter the reactor, the GAC Fluid Bed system eliminates the stripping of BTEX by aeration.

removal rates, the GAC Fluid Bed merely adsorbs the organics onto the carbon, a much faster reaction. Single pass detention times of 8 minutes are common (compared to 8-24 hours in conventional biological systems). Under certain soil conditions, the oxygen-rich BTEX acclimated effluent can be reinjected into the ground to speed in situ activity and further reduce cleanup times and costs.

Adsorptive removal of refractory material

Adsorption on the carbon removes non-biodegradable or slow-to-degrade organics, including many materials that would pass through other biosystems untouched. Oxidized iron precipitates in and on the biomass, providing iron control without the pretreatment and maintenance required in physical chemical systems.



The GAC Fluid Bed Treatment Process

High surface areas for higher removal rates

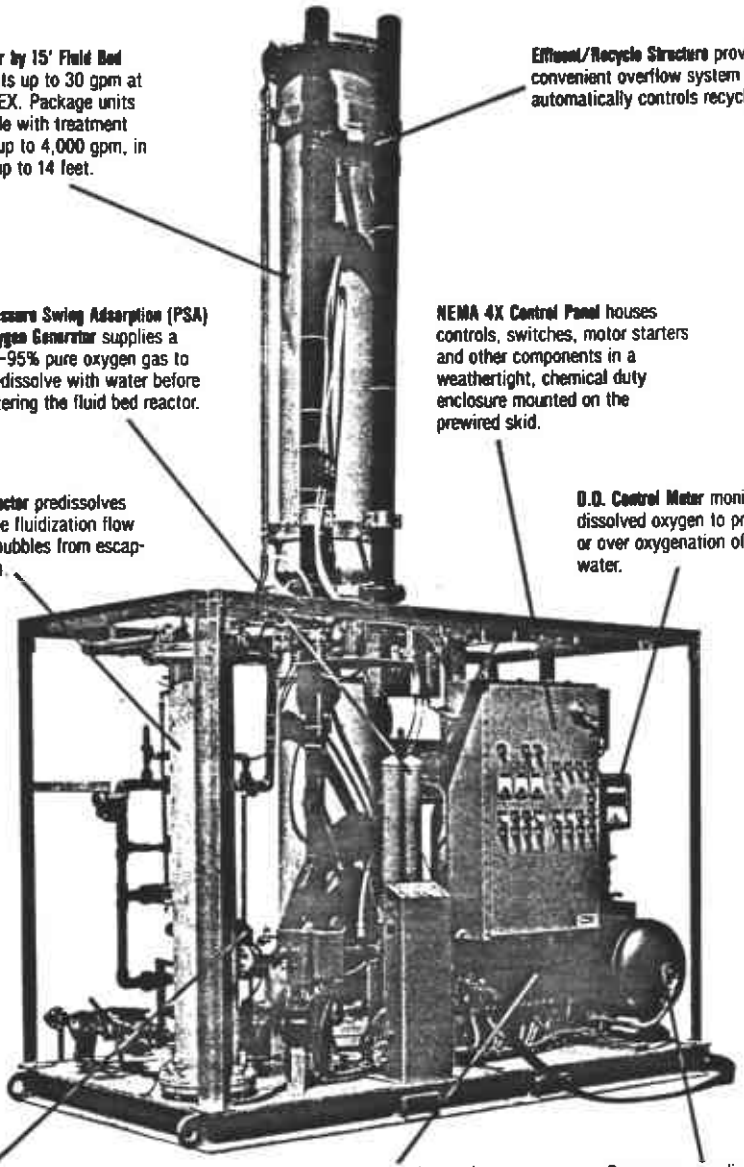
The design of the GAC Fluid Bed provides extremely high surface areas for biological growth—an order-of-magnitude advantage over other processes making this a very effective, high rate treatment system.

Shorter detention and reaction times

While other biological systems rely on hydraulic detention time and mass transfer of organics to ensure good

Compact and fully portable

Significantly smaller than other process equipment, the GAC Fluid Bed is a truly portable system. Skid mounted and self contained, it can be moved easily to another site at the completion of a remediation. Other processes require permanent, field erected systems at flow rates that still fit into the GAC Fluid Bed package systems.



20"-diameter by 15' Fluid Bed Reactor treats up to 30 gpm at 10 ppm BTEX. Package units are available with treatment capacities up to 4,000 gpm, in diameters up to 14 feet.

Effluent/Recycle Structure provides a convenient overflow system that automatically controls recycle.

Pressure Swing Adsorption (PSA) Oxygen Generator supplies a 90-95% pure oxygen gas to predissolve with water before entering the fluid bed reactor.

NEMA 4X Control Panel houses controls, switches, motor starters and other components in a weathertight, chemical duty enclosure mounted on the prewired skid.

O_2 Bubble Contactor predissolves oxygen into the fluidization flow and prevents bubbles from escaping the system.

D.O. Control Meter monitors system dissolved oxygen to prevent under or over oxygenation of the treated water.

Dual Fluidization Pumps ensure a steady fluidization flow to the reactor, eliminating sensitivity to fluctuations in inlet flow. The second pump provides the reliability of a prepiped spare.

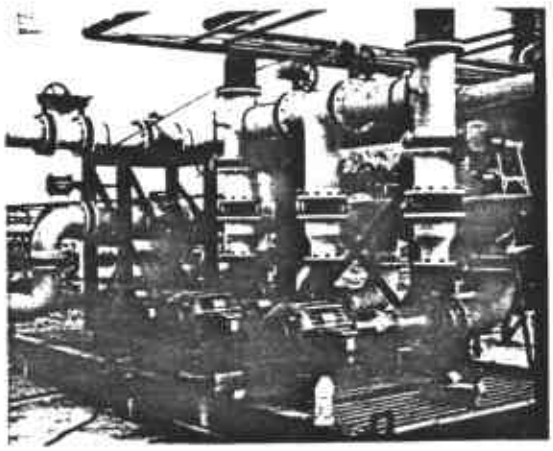
Chemical Feed System for nutrient deficient groundwater includes storage tank and metering feed pump.

Compressor supplies pressurized air for feeding the PSA oxygen generator.

A 30 GPM "service station" GAC Fluid Bed package plant.

TYPICAL COSTS PER 1,000 GALLONS TREATED (10 PPM BTEX FEED)

Two 14 foot diameter GAC Fluid Beds treating 4,000 GPM of BTEX contaminated groundwater.



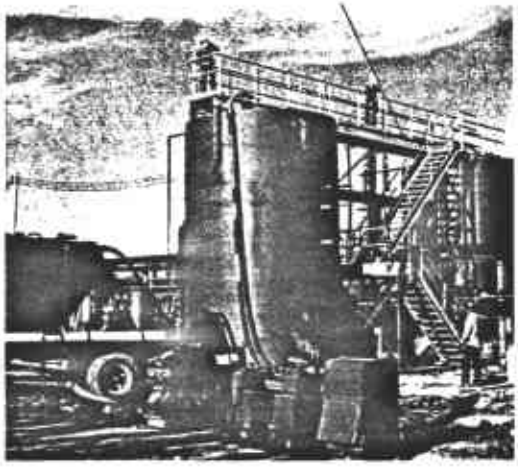
Part of the 4,000 GPM package system is this fluidization pump skid, with a piped in spare pump.

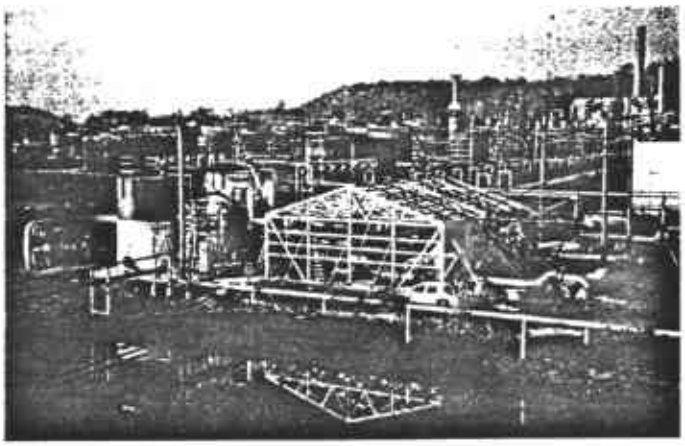
Benefits of GAC Fluid Bed Over Standard Bioremediation Processes

- *Fast reactions*
- *Highly stable*
- *High removal rates at low ppm*
- *Low ppb effluents*
- *No stripping*
- *No carbon disposal*
- *Low carbon replacement*
- *Refractory material removal*
- *Flexible operation*
- *In situ remediation*
- *Self contained and portable*

Type of Treatment	Influent			Capital Costs	Operating Costs Yearly @ $0.10/KWHR			Yearly Operating Costs	$ per 1000 Gallons (5 Year Straight Line Depreciation of Capital)
	Flow	BTEX PPM	BTEX #/Day		Power	Carbon	O_2		
Carbon Only	100 GPM	10	12	125,000	2,352	126,290	—	128,642	2.92
Air Stripping With Vapor Phase Recovery				70,000	3,919	67,475	—	71,394	1.62
GAC Fluid Bed				145,000	3,919	200	679	4,798	.64
Carbon Only	100 GPM	25	30	125,000	2,352	274,000	—	276,352	5.73
Air Stripping With Vapor Phase Recovery				95,000	5,487	168,000	—	173,487	3.66
GAC Fluid Bed				245,000	7,839	600	1,703	10,147	1.13
Carbon Only	2,000 GPM	10	240	600,000	23,516	2,271,000	—	2,295,416	2.21
Air Stripping With Vapor Phase Recovery				535,000	27,433	1,406,000	—	1,433,433	1.41
GAC Fluid Bed				585,000	31,355	5,000	14,244	50,599	.15

Loading carbon during start up of a GAC Fluid Bed Reactor.

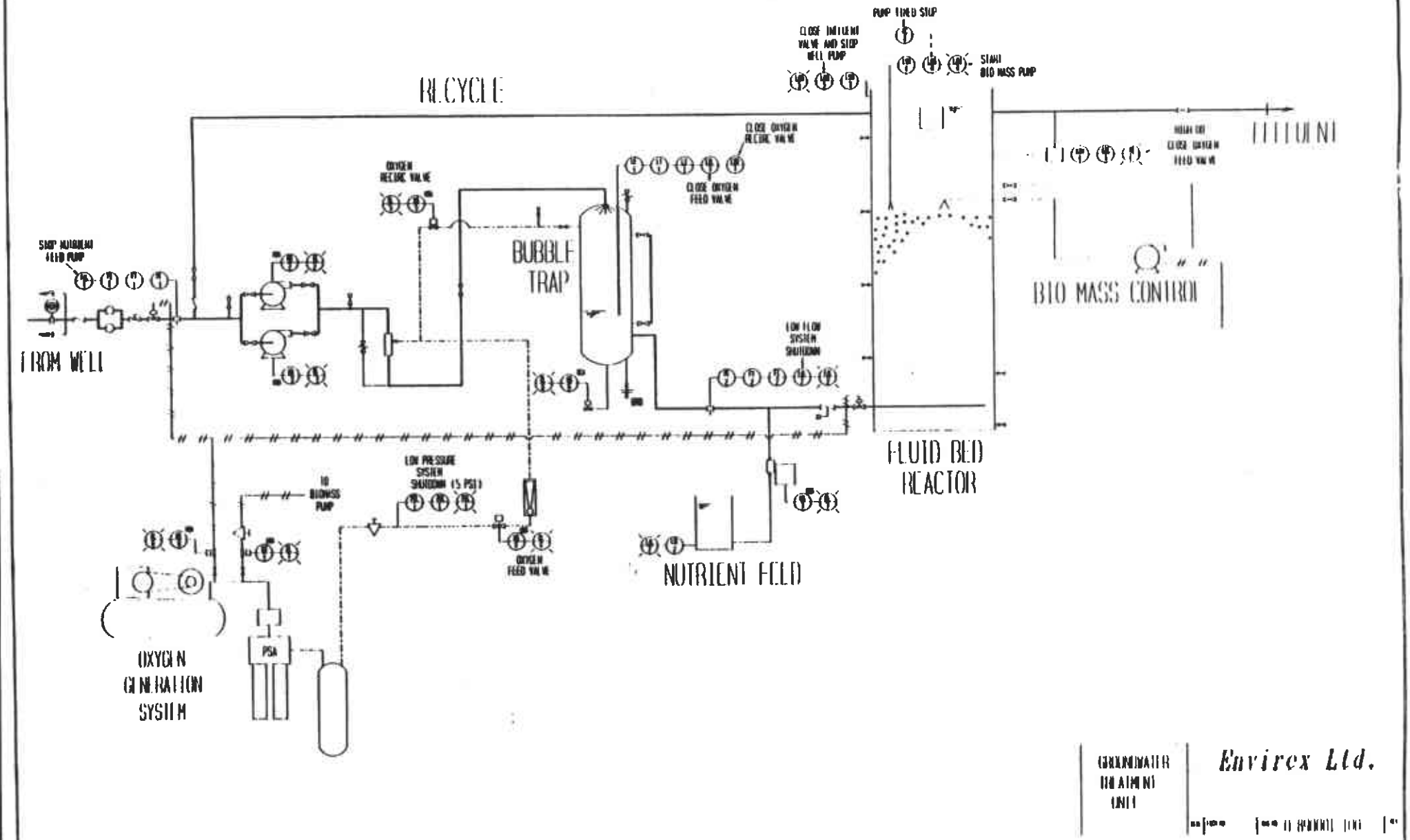


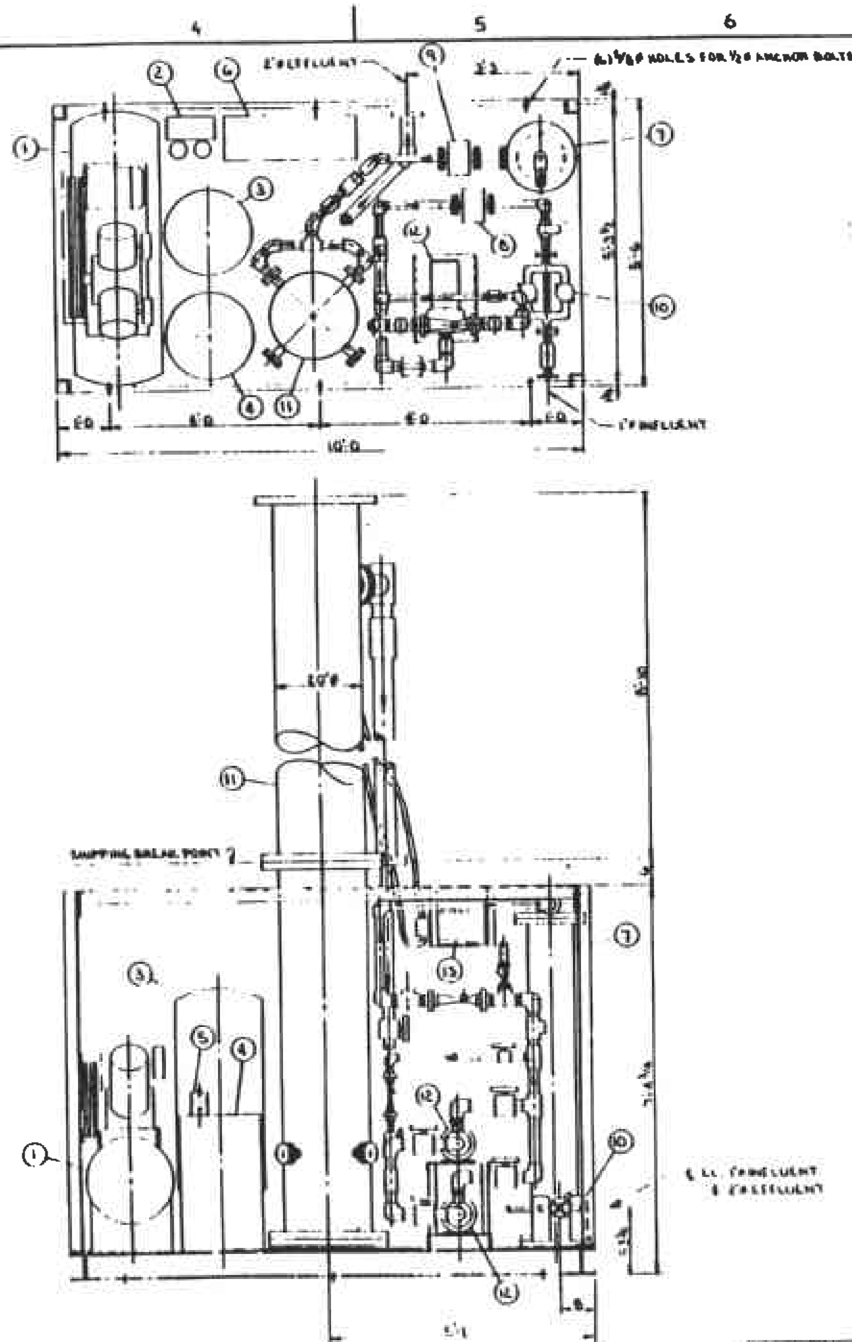


Shop fabricated reactors combined with prepiped pump and control skids permit rapid installation and start up.

Envirex Ltd.

Fluid Bed Group
P.O. Box 1624
Waukesha, WI 53187-1624
Phone: 414/547-0141
Fax: 414/547-4120


RECYCLE
FROM WELL
BUBBLE TRAP
FLUID BED REACTOR
BIO MASS CONTROL
NUTRIENT FEED
OXYGEN GENERATION SYSTEM
PSA
Envirex Ltd.



LIST OF COMPONENTS

DRAWING NO. HE90001-101

ITEM	QTY		DESCRIPTION
1	1		SAYLOR-BEALL AIR COMPRESSOR, MODEL RC-715-80, 5HP, 230/460V, 3PH, 60HZ TEFC MOTOR WITH AIR DRYER, FACTORY MOUNTED ON 20"Ø, 80 GAL HORIZONTAL AIR RECEIVER.
2	1		AIRSEP MODEL AS-10 PSA OXYGEN GENERATOR.
3	1		20"Ø, 60 GAL VERTICAL SURGE TANK.
4	1		18"Ø, 30 GAL NUTRIENT FEED TANK, POLYETHYLENE.
5	1		NUTRIENT FEED PUMP, PROMINENT, 115V, 60HZ.
6	1		42"H x 30"W x 10"DP NEMA 4X ELECTRICAL POWER PANEL, 460V, 3PH, 60HZ POWER SUPPLY.
7	1		10"Ø BUBBLE SEPARATION TANK WITH LIQUID LEVEL GAUGE GLASS AND RELIEF VALVE.
8	1		L+N MODEL FTI MAG VARIOMAG MAGNETIC FLOWMETER, 1" SIZE, FULL SCALE = 30GPM, 115V, 60HZ.
9	1		L+N MODEL FTI MAG VARIOMAG MAGNETIC FLOWMETER, 1 1/2" SIZE, FULL SCALE = 30GPM, 115V, 60HZ.
10	1		PVC DUPLEX BASKET STRAINER, 1" SIZE.
11	1		20"Ø REACTOR VESSEL, PVC, WITH PVC FLOW DISTRIBUTION SYSTEM, EFFLUENT COLLECTION SYSTEM AND ACTIVATED CARBON MEDIA.
12	2		RECYCLE PUMP, GOULDS MODEL NPE, 1 1/4" x 1 1/2"-6, 1HP, 230V, 1PH, 60HZ TEFC.
13	1		BIO MASS PUMP 1/3HP, 115V, 60HZ

CUSTOMER NOTE:
1) ALL MAIN PIPE, VALVES & FITTINGS WILL BE UV PROTECTED PVC.
2) ALL FLANGE BOLT HOLE PATTERNS WILL MEET ANSI [illegible]
3) STRUCTURAL STEEL SKID FRAME WORK, PIPE SUPPORTS, PUMP MOUNTING BASES & BUBBLE SEPARATION TANK WILL BE HOT DIP GALVANIZED.

SCALE 3/8" = 1'-0"

Envirex

TITLE: GENERAL ARRANGEMENT - FLUID BED GROUNDWATER TREATMENT UNIT

DISTRIBUTION

CONSTRUCTION PACKAGE
GROUNDWATER EXTRACTION AND TREATMENT SYSTEM
EXXON STATION #7-0104
1725 PARK STREET
ALAMEDA, CALIFORNIA

Copy No. 5

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1 copy:	Exxon Company, U.S.A. P.O. Box 4032 2300 Clayton Road Concord, California 94520 Attention: Ms. Jo Beth Folger	6
7 copies:	Job File	7 - 13
1 copy:	QC/Bound Report File	14
1 copy:	Chronological File	15

MAS/CEM/MLS/cm

QUALITY CONTROL REVIEWER:

David P. Hochmuth, P.E.
Associate Engineer