LOWNEY ASSOCIATES
Environmental / Geotechnical / Engineering Services

STID 4428

93 SEP 17 PM 1:35

September 15, 1993
864-17A, MV091505

Mr. Charles W. Wren
UNITED STATES POSTAL SERVICE
c/o DANIEL, MANN, JOHNSON & MENDENHALL
222 Kearny Street, Suite 500
San Francisco, California 94108

RE: REMEDIAL MEASURES
EMERYVILLE POSTAL FACILITY
EMERYVILLE, CALIFORNIA

Dear Mr. Wren:

As you know, previous soil and ground water sampling (Lowney 1993) at the referenced site has detected a mixture of petroleum compounds including gasoline, diesel, kerosene, and oil. Fuel fingerprint analyses have indicated that the petroleum fuels present are very weathered and bear little resemblance to fresh product. The large degree of weathering or degradation is also evident in that benzene, toluene, ethylbenzene, and xylene (BTEX) have typically not been detected or are present at levels near the laboratory detection limits. These compounds are typically found at much higher levels in fresh fuels.

Soil at the site is not highly permeable consisting mainly of silts and clays above the ground water table. The shallow water-bearing zone consists mainly of silty and clayey sands with varying amounts of gravel. This water-bearing stratum is typically less than 5 feet thick. No clean, highly permeable sands or gravels were encountered at the site.

Considering that the petroleum hydrocarbons likely have been present at the site for more than 60 years, and the presence of relatively fine grained sediments at the site, the potential for additional significant migration is very low, in our opinion.

In our opinion, the relatively low levels of weathered petroleum hydrocarbons present at the site do not present a significant threat to human health or the environment. The site is located in an industrial/commercial area and is proposed for such use in the future. After site development, there would be no significant exposure pathways for on-site employees.

As an alternative to remedial measures, we recommend that a periodic sampling program be established to monitor the natural degradation of the petroleum compounds present at the site. In our opinion, allowing for the continued natural degradation of the existing compounds along with periodic monitoring would be the most cost-effective approach. It would be sufficient in protecting beneficial ground water uses as well as human and environmental health, in our opinion.

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However, as discussed at our meeting with the Alameda County Health Agency on September 13, 1993, we understand that the County is requiring that remedial measures be implemented at the site.

The specific objectives of the proposed remedial actions at the site are 1) to limit migration of petroleum fuel hydrocarbons in the shallow ground water and soil beyond its present extent, 2) restore the quality of the shallow ground water and near surface soils to a practical level, and 3) limit risks to human health and environment.

Prior to remedial system design, several remedial technologies were evaluated on the basis of effectiveness, implementability, and cost. A brief review of each technology is presented in Table 1, attached.

In our opinion, if the implementation of remedial actions is required by the Alameda County Health Agency, the most cost-effective remedial technology would consist of combined ground water and soil vapor extraction.

Ground water extraction alone would be effective in controlling further migration of the contaminants; however, due to the high degree of contaminant adsorption onto the relatively fine grained sediments present at the site, only a low to moderate degree of reduction in contaminant concentrations would be expected. The petroleum hydrocarbon concentrations present at the site are currently relatively low and a substantial further reduction would require a relatively long cleanup period.

The addition of soil vapor extraction would be useful in increasing the volatilization of compounds present and significantly shorten the required cleanup period. However, due to the heavier, weathered nature of the detected compounds, only a moderate degree volatilization would be expected. The main benefit to the addition of soil vapor extraction would be the enhancement of natural biodegradation typically caused by the significant increase in subsurface oxygen availability.

By operation of the soil vapor and ground water extraction system to control subsurface moisture and oxygen availability, biological activity can be greatly increased. Such systems, typically referred to as bioventing, typically do not require an increased capitol investment; however, operation costs are higher. In our opinion, due to the apparently large degree of biodegradation that has taken place at the site over the last 60 years, strict operational control of the proposed soil and ground water extraction system may not be needed to sufficiently enhance the natural biodegradation, but could be implemented, if warranted.

Heat or steam injection, in conjunction with soil vapor and ground water extraction, also has been shown to be very effective in increasing contaminant mobility and removal effectiveness; however, the costs of these technologies would be prohibitively high.

If you have any questions, please call.

Very truly yours,

LOWNEY ASSOCIATES

Stason Foster
Environmental Engineer

Ron L. Helm
Environmental Geologist

REGISTERED ENVIRONMENTAL ASSESSOR
RON L. HELM
No. 02215
Expires: 6-30-94
STATE OF CALIFORNIA

RLH:SIF:TJR

Copies: Addressee (4)
Alameda County, Department of Environmental Health, Division of Hazardous Materials (1)
Attn: Ms. Susan Hugo

Attachments: Table 1. Review of Potential Remedial Technologies
Plans
Specifications

TABLE 1. Review of Potential Remedial Technologies
Proposed Emeryville Postal Facility
Emeryville, California

TECHNOLOGY	DESCRIPTION	COMMENTS/EFFECTIVENESS	COST
No action	No remedial measures would be initiated.	Not acceptable to regulatory agencies.	None
Periodic Monitoring	Periodic ground water sampling to monitor natural degradation and migration.	Not acceptable to regulatory agencies.	Very Low
Ground water extraction and treatment	Extraction and treatment of impacted ground water. Discharge of treated water under permit to the sanitary sewer system.	Effective in reducing migration potential. Due to the heavy nature of contaminants and fine grained nature of sediments, low to moderate effectiveness in reducing concentrations.	Medium Capital Low/Med Operational
Ground water and soil vapor extraction and treatment	Extraction and treatment of impacted ground water and soil vapor. Discharge of treated water and vapor under permit to the sanitary sewer system and to the atmosphere, respectively.	Effective in reducing migration potential. Also effective at enhancing contaminant volatilization to better reduce contaminant concentrations in both soil and water.	Medium Capital Medium Operational
Bio Venting	Various operating perameters of the ground water and soil vapor extraction system are controlled to optimize natural contaminant biodegradation. Oxygen and carbon dioxide levels monitored to evaluate effectiveness. Optional nutrient addition.	Easily incorporated with ground water and soil vapor extraction system. Very helpful in reducing concentrations of less volatile contaminants.	Medium Capital Med/High Operational
Heat Injection	Heat pumps used to raise subsurface temperatures and increase contaminant mobility. To be used in conjunction with ground water and soil vapor extraction.	Easily incorporated with ground water and soil vapor extraction system. Very helpful in reducing concentrations of less volatile contaminants.	High Capital High Operational
Steam Injection	Steam boiler and injection wells used to raise subsurface temperatures and increase contaminant mobility. To be used in conjunction with ground water and soil vapor extraction.	Easily incorporated with ground water and soil vapor extraction system. Very helpful in reducing concentrations of less volatile contaminants.	Very High Capital Very High Operational

TECHNICAL SPECIFICATION FOR
SOIL VAPOR AND GROUND WATER EXTRACTION AND TREATMENT SYSTEM
PROPOSED EMERYVILLE POSTAL FACILITY
EMERYVILLE, CALIFORNIA

1.0 INTRODUCTION

1.1 Summary of Work

This specification introduces the requirements for providing complete turn key project services for the construction of a soil vapor and ground water extraction/treatment system at the proposed Emeryville Postal Facility. The contractor shall provide all labor, materials, tools, and equipment needed for the proposed treatment system. This system is to be constructed in accordance with the drawings, conditions, and specifications presented in this document.

The proposed system is to consist of nine wells used for the extraction of both soil vapor and ground water. The extracted vapor will be treated using a thermal oxidation unit during the initial stages of the site remediation. If contaminant levels are sufficiently reduced, the oxidation unit will be removed from the flow path and the vapors subsequently treated using activated carbon canisters for operational cost savings purposes. The extracted ground water will be treated using activated carbon canisters and subsequently discharged under permit to the sanitary sewer system.

A summary of work items for this project are presented below:

1. The contractor shall install five additional extraction wells to supplement the four existing extraction wells, at the locations shown on the attached drawings. Well pumps shall be installed at each of the nine extraction wells. The contractor shall also install all treatment pad equipment including, but not limited to, a thermal oxidizer, air compressor, refrigerated air dryer, surge tank, carbon canisters, filters, control panels, pumps, and peripherals.

2. The contractor shall install all utilities and piping; which include, but are not limited to, power wiring and conduit, control wiring and conduit,

air supply lines, and soil vapor and ground water conveyance lines with associated connections and headers. The piping and utility lines shall be installed in trenches at locations shown on the attached system layout drawings.

3. The contractor shall install all required flow control and monitoring systems including sensors, gauges, meters, and valves needed for system operation and as discussed in this specification.

2.0 GENERAL CONTRACTOR REQUIREMENTS

2.1 Materials and Workmanship

All equipment and materials to be used in the installation of the system shall be new and of the best of their kind, free of defects, and engineered for the intended application. All work shall be performed and completed in a thorough, workman-like manner.

Where equipment or material is referred to or designated in specifications by trade or manufacturer's name, it is so designated primarily to establish standards of quality, performance, finish, and appearance. It is not the intent to limit the choice of materials and equipment to the specific product designated. Substitutions with equipment approved as equal by the United States Postal Service (USPS) or their authorized representatives will be allowed, however, substitution requests will not be considered until after the award of the contract.

Should a substitution be allowed under this provision, and the item subsequently found to be defective or otherwise unsatisfactory for its intended use, the contractor shall, at his own expense, replace the item with that originally specified.

Whenever there is a reference to a standard published specification, the latest edition or revision, including all amendments, shall be used. The physical characteristics of all materials not particularly specified shall conform to American Society for Testing and Materials (ASTM) standards.

2.2 Permits and Licenses

The contractor shall procure all permits and licenses, pay all fees and taxes, give all notices, and coordinate all inspections which are required by local, state, and federal regulations/agencies during execution of the work.

As an exception, Bay Area Air Quality Management District (BAAQMD) and East Bay Municipal Utility District (EBMUD) permits to discharge treated soil vapor and ground water, respectively, are not included.

2.3 Final Test Operation and Warranty

After installation of all equipment, the system shall be operated under normal service conditions for a test period of seven days. Final acceptance of the work will only be made after the successful operation during the test period. If any deficiencies are found, these shall be corrected by the contractor. The contractor shall guarantee the work against defective materials and workmanship for a period of one year from the date of final acceptance of the work.

3.0 PRIMARY TREATMENT EQUIPMENT

The following is a discussion of the primary treatment system equipment which shall be furnished and installed by the contractor.

3.1 Extraction Well Installation

To supplement the four existing extraction wells, the contractor shall install five additional well to be used for the extraction of soil vapor and ground water. The proposed locations of these wells are shown on the attached drawings.

The wells shall be permitted and constructed in accordance with Zone 7 Water Agency and California Regional Water Quality Control Board guidelines and regulations. The wells shall be constructed by a driller with a valid State of California C57 license.

The wells shall be installed using a drill rig equipped with 12-inch hollow stem augers. Well casing shall be 4-inch diameter, threaded, flush-jointed, Schedule 40 PVC with sections containing perforated 0.02-inch slots installed in the lower portion of the wells. Slotted casing shall be installed from the bottom of the well to approximately 6 inches above the top of the water table. The wells shall be screened only

within the upper water-bearing zone, which based on previous borings at the site, extends from a depth of approximately 4 to 14 feet. The screened interval shall be determined by a California Registered Geologist at the time of drilling.

A filter pack composed of Lone Star number 3 sand shall be placed in the approximately 3- to 4-inch diameter annulus to approximately 6 inches above the slotted casing. A 1-foot seal composed of bentonite pellets topped by cement slurry to the ground surface shall be placed above the sandpack.

3.2 Baker Thermal Oxidizer

Soil vapor from the wells will be extracted and treated using a thermal oxidation unit during the initial stages of the site remediation. The thermal oxidizer shall be a trailer mounted Baker Furnace, Inc. SX-300. The blower shall be capable of providing 300 standard cubic feet per minute (scfm) at 10-inch mercury column vacuum, and retrofitted with a shiv-kit to provide normal operation flow of 200 scfm. The thermal oxidation unit shall include a 16-inch diameter knock-out pot. The water knock-out pot shall be upgraded to include an automatic pump with high and low level switches and high level alarm and plumbed to the water surge tank at the front of the water treatment train. All required modifications to the thermal oxidizer shall be made by the equipment manufacturer.

3.3 Vapor Phase Carbon System

If contaminant levels are sufficiently reduced during operation of the thermal oxidizer, the oxidation unit will be removed from the flow path and the vapors subsequently treated using activated carbon canisters to reduce operational costs. The blower and water knock-out system of the thermal oxidizer will still be used for the extraction of soil vapor. These carbon canisters shall be furnished and installed by the contractor; however, the actual connection of the vapor inlet hose from the blower shall be left unconnected since these canisters initially will not be used. Two canisters shall be installed in series. Connective piping shall be 4-inch diameter flexible hose with quick-connect fittings. The hose and fittings shall be Kenaflex suction hose Series 100 or equal and rated for operation at a minimum of 30 pounds per square inch gauge (psig). A sufficient amount of excess hose shall be provided so that

either of the two canisters can be used as the lead treatment canister. Vapor phase carbon units shall be Westates Carbon Model No. VSC-400-4, or approved equal. Normal operating flow for the vapor phase carbon units shall be at least 200 standard cubic feet per minute (scfm).

The vapor exhaust from the second in series carbon canister shall be discharged though an exhaust stack constructed by the contractor. This exhaust stack shall be constructed of 4-inch diameter schedule 80 PVC and outlet shall be a minimum of 15 feet above existing grade with a rain guard installed on the stack outlet. The stack should be stabilized with three guy wires mounted 120 degrees apart and attached at a height of approximately 8 feet. The guy wires shall be secured to the fence or other adequate support.

3.4 Well Pump Systems

For ground water extraction purposes, well pump systems shall be installed at each of the nine extraction well locations. The well pump systems shall include aboveground, 1-inch double diaphragm, air driven pumps with float level sensors capable of operating under a vacuum of 10 inches of mercury. The pump systems shall be able to extract up to 5 gallons per minute (gpm) of water and operate in as little as 8 inches water column in each well. The systems shall be capable of drawing water from a depth of at least 20 feet and pumping against 100 pounds per square inch (psi) of pressure. The systems shall include a 5-micron air filter with an automatic float drain. The systems shall also include an air regulator with pressure gauge to regulate the compressed air from 0 to 125 psi. Both the air filter and the regulator shall have metal bowls and be able to withstand 250 psi air pressure. All well pump systems shall be as supplied by Clean Environment Equipment, Inc., Model No. ADDP-1, or approved equal. All well caps shall provide a vacuum tight seal between the atmosphere and the vacuum conditions within the well environment. Such caps shall have fittings to which the water discharge hoses and sensor lines can be easily connected.

3.5 Surge Tank

Water extracted from the wells by the well pump systems shall be transferred to a surge tank. The surge tank shall be a 500-gallon capacity Rotational Molding, Model No. 525-VHD, or approved equal.

The tank shall include high/high level, high level, and low level pneumatic controls to the transfer pump for start and stop operation. The high/high level sensor shall activate a pneumatically actuated valve to deactivate all pumps transferring water into the surge tank in an alarm condition.

3.6 Water Transfer System

The water transfer system will transfer extracted ground water from the surge tank through the filtration and activated carbon systems and associated meters to discharge to the sanitary sewer system. The water transfer system shall have a normal operating flow rate range of 0 to 15 gpm. The transfer pump shall be an ARO, Model No. 666-15-343C, or approved equal. The system shall include a 5-micron air filter and an air regulator with pressure gauge to regulate the compressed air between 0 and 125 psi, as well as a 0.01-micron oil coalescing filter with visual indicator. The unit shall include a ground water discharge flow totalizer with an operable range of 0 to 15 gpm manufactured by Hersey, Model No. MVR-30, or approved equal. The system shall have a bag filter manufactured by Rosedale, Model No. 4-12-1 1/4P-2-200-SBNB, or approved equal. The system shall include a back pressure sensor and controls to shut off the transfer pump to insure that the carbon units do not receive more than 11 psig of pressure. The water transfer system shall be as supplied by Clean Environment Equipment, Inc. (carbon treatment system quick response box), or approved equal.

3.7 Water Phase Carbon System

The activated carbon water treatment canisters shall have a normal operating flow range of no less than 10 gpm. Two canisters shall be configured in series and piped using 3/4-inch flexible hose with threaded connections. A sufficient amount of excess hose shall be provided so that either of the two canisters can be used as the lead unit. Water phase carbon units shall be Westates Carbon Model No. ASC-200-.75, or approved equal.

3.8 Compressor

To supply air to the pneumatic pumps at the well heads and pumps and controls within the treatment pad area, a 5 horsepower, Powerex Oilless Rotary Scroll Air Compressor, Model No. SLP050831, or approved equal, shall be installed. The compressor unit shall be capable of delivering 15 actual cubic feet

per minute (acfm) at a maximum pressure of 120 psig and operate at a noise level of no greater than 59 dBA. The compressor system shall also include a 60-gallon vertical receiver with pressure gauge, relief valve, auto drain valve, and platform for mounting the refrigerated air dryer.

3.9 Refrigerated Air Dryer

To decrease the moisture content and dew point of the supply air and, thus, reduce condensation of water in air supply lines, a refrigerated air dryer will be used to condition the compressed supply air. This air dryer shall be a Zeks 18HSD heatsink cycling dryer or equal with a maximum working pressure of 150 psig.

3.10 System Location/ Treatment Pad

The treatment system equipment shall be installed on a concrete pad to be constructed by the contractor at the southwest corner of the property as shown on the attached drawings. This pad shall be a minimum of 6 inches thick with #4 rebar placed in both directions at 12-inch centers. Local building codes, if different, shall take precedence over these specifications. The treatment pad shall have plan dimensions of 22 by 28 feet. A continuous 6-inch wide spill containment curb/berm shall be constructed around the perimeter on the north and east sides of the treatment pad area. The top of curb elevation shall be constant and a minimum interior curb depth of 6 inches shall be maintained. The curb to be constructed along the south and west property boundaries, per the architectural drawings, shall also serve as a containment berm along the south and west perimeters of the treatment pad area. These curbs shall be poured continuously such that the contained area will be watertight. The pad shall be sloped a minimum of 0.5 percent toward a small (approximately 18-inch by 18-inch) sump located in the southwest corner of the treatment pad to provide efficient drainage of the contained area. A manually activated sump pump shall be installed to discharge rainwater runoff to the surge tank of the treatment system. The sump pump shall be a Teel 1/6 hp Model No. 2P087, or approved equivalent.

This pad and treatment system shall be enclosed on the north and east sides with a lockable 8-foot tall CalTrans grade (per section 80-4) chain-link security fence with wooden or plastic slats, or approved

equivalent. A 10-foot wide, two-door, center drop lock swing gate shall be installed along the eastern side of the pad area as shown on the attached drawings. The fence shall be installed on top of the spill containment berm. Proposition 65, no smoking, and all other signs required by law, shall be furnished and installed on the fencing. Each fence post shall be set in 2.5-foot deep by 1.5-foot diameter concrete. The maximum spacing between posts shall be 10 feet. The fence to be constructed along the south and west property boundaries, per the architectural drawings, shall enclose the north and east perimeters of the treatment pad area, abutting the 8-foot chain-link fence.

A freestanding removable weather shelter shall be constructed over the compressor and refrigerated air dryer. The weather shelter shall consist of a corrugated steel or similar roof installed approximately 6 inches above the equipment, sloped for rain drainage with overhangs on each side extending approximately 1.5 feet or alternatively abutting fencing.

4.0 PIPING REQUIREMENTS

4.1 General

The contractor shall install all piping and conduits needed for the conveyance of extracted soil vapor and ground water to the treatment system, as well as those needed for all electrical and pneumatic systems with all associated connections and headers. Where applicable, the piping and utility lines shall be installed in trenches at locations shown on the attached drawings. The drawings are to be taken for diagrammatic purposes only. The required sizes of piping are indicated; however, they are not intended to show every offset and fitting nor every structural difficulty that will be encountered during the work.

The contractor shall furnish and install all the necessary flanges, couplings, fittings, and connections needed to properly install the piping for its intended end use whether or not these items are indicated on the plans. Pipe and fittings shall be aligned and assembled so that there will be no piping distortion. Any significant changes to the proposed layout must be approved by the USPS or an authorized representative.

Immediately before installation, each pipe shall be carefully inspected by the contractor for defections and the interior of all piping shall be thoroughly cleaned of all obstructions and debris.

All piping, except air supply lines and electrical conduit, shall be schedule 80 PVC complying with ASTM D-1785, type 1 (normal impact), grade 1 (high chemical resistance). All PVC pipe fittings and peripherals shall also be schedule 80 and comply with ASTM D-2464, where applicable. All PVC piping, valves, and fittings shall be solvent welded, except as noted. Air supply lines shall be 1/2-inch copper Type L with soldered fittings. Quick-connect fittings shall be used at connections to well pump systems. All electrical conduit shall be of steel construction and meet all regulations and codes discussed in section 7.1. Required pipe diameters are presented on the attached drawings.

In the treatment pad area, all aboveground piping must be supported and braced to prevent sagging or overstressing of the pipe or connections and to prevent transfer of load or stress to any equipment. All piping which penetrates through concrete pavements or pads shall be fitted with a galvanized steel pipe sleeve. All aboveground PVC shall be painted in a neutral color.

4.2 Pipe Testing

All soil vapor and ground water conveyance piping and air supply lines shall be pressure tested prior to final connection to the system. The contractor shall notify the USPS 48 hours prior to performing the pressure tests. The PVC ground water lines shall be pressure tested with water at 150 psi for at least one hour. PVC soil vapor piping shall be pressure tested with air at 8 psi for one hour. Copper supply air lines shall be pressure tested with air at 185 psi for at least one hour. The contractor shall repeat the tests and perform any necessary adjustments or repairs until the test results indicate that the lines are free of leaks.

5.0 EXCAVATION BACKFILLING AND COMPACTION

5.1 Trenching/ Excavating

Approximate locations and typical details of required pipe and utility trenches are shown on the attached

drawings. All excavation work must be performed in compliance with OSHA guidelines.

Excavations shall be of sufficient size so that wellhead boxes, pipelines, or other structures have at least 4 inches clearance between the outer surface of the structure/pipe and the walls of the excavation. Clear spacing between piping (horizontal and vertical) must be a minimum of 2 inches. Minimum cover depth from the top of the pipe to grade shall be 24 inches.

5.2 Vapor Barrier

To eliminate "short circuiting" of soil vapor though permeable trench backfill material when a vacuum is applied to the vapor extraction wells, 10 millimeter visqueen shall be used to line all trenches and excavations, whether or not they are associated with the treatment system, which are to be located within 25 feet of any extraction well. This shall not apply if no granular material is used as backfill.

A typical trench detail showing the required liner is included on the attached drawings. As shown, a minimum overlap of 12 inches is required over the top of the granular backfill. A minimum overlap of 48 inches is required for longitudinal splices. Within reason, visqueen rolls with a maximum continuous length shall be used so as to minimize the required number of longitudinal splices. No longitudinal splices shall be located within 20 feet of an extraction well. All piping shall be buried a minimum of 30 inches below asphalt and a minimum of 24 inches below concrete surfaces.

At the wellhead locations, the visqueen liner must extend a minimum of 1 inch into the concrete seal surrounding the utility boxes which are to be installed per section 5.4.

The depth of all trenches and excavations located within 25 feet of an extraction well, whether or not they are associated with the treatment system, shall be minimized to the extent allowable for their intended use.

5.3 Bedding/Backfill and Compaction

Bedding material beneath and around piping shall be clean sand. The sand shall be lined with visqueen as specified above and then covered with clean native

soils to depths specified on the drawings. Overlying aggregate base and pavements shall be in accordance with the overall USPS facility construction specifications. Compaction of the backfill material shall also be performed in accordance with the overall USPS facility construction specifications.

5.4 Wellhead Boxes

The contractor shall supply and install traffic rated, water-tight, reinforced, pre-cast concrete utility boxes with galvanized steel, checker plate covers. The boxes shall contain pipe and conduit penetrations as required.

These boxes shall be sufficient in size to allow for easy installation, modification, and repair of all equipment and materials to be installed within the utility box. In addition, all sampling ports, gauges, and meters must be easily accessible.

The utility boxes shall be installed approximately 1/2 inch above adjacent grade with the concrete collar sloping to match adjacent grade. All boxes must be installed with at least a 6-inch concrete collar. The bottoms of the boxes must be level and sealed with concrete at least 2 inches in thickness.

The stove pipe security boxes and well casings which extend above grade on the existing wells shall be cut below grade to accommodate installation of utility boxes.

5.5 General Grading and Other On-Site Excavation Work

Although approximately 3 feet of non-impacted soil appear to be present at the surface across most of the site, the potential exists that impacted soil may be encountered during various grading and trenching activities. Thus, an appropriate site specific health and safety plan shall be prepared and followed during construction activities. Any soil that is discolored, has a petroleum odor, or elevated organic vapor meter readings shall be considered to be impacted unless analytical testing shows otherwise. Care should be taken not to unnecessarily disturb any impacted soil. Any potentially impacted soil that is excavated shall be stockpiled on-site and appropriately characterized. If encountered, impacted soil should be disposed off-site at an appropriate facility.

6.0 VALVES, METERS, AND GAUGES

6.1 General

The contractor shall furnish and install all valves, gauges, and meters as required in this specification and as required for the operation of the proposed equipment for its intended use. All such devices shall be connected by way of solvent welded, threaded connections, or appropriate unions. If additional flow control devices, not discussed in these specifications, are needed for the proper and intended use of the system equipment, the contractor shall provide and install the required devices. All valves, meters, gauges, and sampling ports shall be securely installed and easily accessible.

6.2 Ball Valves

Ball valves shall be Asahi/America Duo-Bloc True Union PVC ball valves with solvent welded connections rated to not less than 150 psi at operating temperatures, or approved equal.

6.3 Check Valves

Check valves shall be PVC, Technocheck seatless check valves with EPDM seals and threaded connections, rated to not less than 150 psi at operating temperatures, or approved equal.

6.4 Air Vacuum Gauges

All air vacuum gauges to be installed on vapor conveyance piping at each wellhead shall be manufactured by Rotron (Part No. 271950), or approved equivalent. Dial size shall be 2.25 inches with hard plastic window. Vacuum measurements shall range from 0 to 6 psi.

6.5 Air Pressure Switches

An air pressure switch shall be installed on the vapor piping just down stream of the vacuum blower and prior to entering the vapor phase carbon canisters. This air pressure switch shall be as manufactured by Rotron (Part No. 517122) or approved equivalent, and shall have a NEMA 7 housing.
The switch shall be installed and set to shut down the blower when the pressure reaches 4 psi.

6.6 Water Flow Totalizers

All mechanical water flow totalizers to be installed at each wellhead shall be Kent Model KMJ-34, or approved equivalent, and have a dial that reads in gallons. The normal operating flow ranges shall be from 0.1 to approximately 10 gpm.

6.7 Air Flow Meters

At each wellhead, a Dwyer DS-200 flow sensor, or approved equivalent, shall be installed along the vapor extraction line. These flow sensors shall be sized for operation in 2-inch diameter schedule 80 PVC pipe. Flow meters shall be installed a sufficient distance from bends and appurtenances as specified by the manufacturer.

6.8 Sample Port

All sample ports shall be 1/4-inch PVC labcock valves with male-hose end connections. These valves shall be rated for pressures up to 150 psi.

7.0 GENERAL UTILITY SYSTEM REQUIREMENTS

7.1 General

The contractor shall install all required utility hookups for the system including electricity and natural gas. All required installation and operational permits for the utility systems shall be obtained by the contractor.

7.2 Regulations, Codes, and Permits

All electrical work shall be performed in accordance with the requirements of the latest editions of the National Electrical Code (NEC), state, and local codes. In addition, all electrical work shall be performed according to the latest guidelines, regulations, and standards of the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Associations (NEMA), and the latest editions of the State Occupational Safety and Health Act (OSHA). Furthermore, where applicable, all electrical components shall be approved by the Underwriter's Laboratories, Inc. (UL) for their intended class of service. All required permits for the utility installation work shall be obtained by the contractor.

7.3 Installation

The contractor shall furnish and install all required electrical and natural gas systems required for operation of the proposed equipment and control systems. All electrical installations shall be free from improper grounds and short circuits. All circuits shall be tested using electrical circuit testers. The correctness of the wiring shall be verified by the actual operation of the equipment and controls. After completion, the contractor shall supply the USPS with a set of as built drawings showing conduit sizes, number, and sizes of wires run in each

conduit, the location of junction and pull boxes; and any other pertinent information regarding the electrical installation.

All wiring shall be in electrical conduits. All conduits must be continuous between outlets and shall have junction boxes where all connections are made. All conduits shall be water tight and properly sealed. All above ground conduits shall be installed a minimum of 18 inches above grade and securely fastened to Unistrut brackets that are bolted to concrete. Flexible conduit may be used in wellhead boxes and for electrical equipment in the treatment system area, providing that the length of the flexible conduit is not greater than 3 feet. All flexible conduit shall be the grounding, water-tight type.

The electrical system must be properly grounded using a grounding rod that shall be properly sized in accordance with NEC requirements. The rod shall not be less than 10 feet in length and 5/8 inch in diameter. The maximum ground resistance shall be 5 ohms. All connections of ground cable to the rod shall be thermoweld connections.

Conduit runs shall not interfere with the proper and safe operation of equipment or maintenance procedures which may include replacement of the various system components.

Separate utility service meters (electricity and natural gas) shall be installed at the site to monitor power usage by the system. All meters shall be installed to PG&E specifications. Contractor shall be responsible for ensuring that all necessary inspections by local agencies, building department, or other utilities are performed.