WESTERN
GEO-ENGINEERS
CALIF. CONTRACTOR #513857
REGISTERED GEOLOGISTS

1386 EAST BEAMER STREET
WOODLAND CA 95776-6003
(530) 668-5300
FAX (530) 662-0273
wege@mother.com

July 15, 1999

Mr. Tom Peacock
Alameda County
Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6782

Dear Mr. Peacock:

The following [redacted] discusses the need and procedures for injecting [redacted] groundwater recovered from the soon to be installed receptor trench along Brighton Avenue into recovery wells (R-1, R-2 and R-3) associated with former Desert Petroleum Station #793.

1.0 SITE LOCATION AND DESCRIPTION

Former Desert Petroleum #793 is a non-active service station, located on the northwest corner of the intersection of Park Boulevard and Hampel Street at 4035 Park Blvd., Oakland, California (Figure 1), parcel # 024-0533-007. The site is located in projected section 32; T1S; R3W; MDB&M at an approximate elevation of 210 feet above mean sea level (Figure 2).

2.0 LOCAL GEOLOGY

2.1 Geomorphology

The site is located on the western slope of the Berkeley Hills. The Berkeley Hills are a northwest-southeast trending range within the Coastal Range Province of California. Erosion of the Coastal Ranges has filled the valleys within and bordering the Coastal Range with sequences of gravels, silts, sands, and clays.

2.2 Stratigraphy

The native soil from surface to 13 feet below ground surface (BGS) consists of dark brown silty clay. The dark brown clay is underlain by light brown stiff clay that includes subrounded to

rounded metavolcanic gravel. This clay extends to approximately 23 feet BGS at the northwest corner of the site. A fine to medium sand, clayey sand, and silty sand underlies the gravel and clay.

3.0 WORKPLAN

During the construction of the receptor trench, it is anticipated that dewatering of the excavation will be a necessity, see Figures 3 and 4. This recovered groundwater will be placed into a 21,000-gallon capacity Baker Tank that will be located on the service station property. Water will be transported from the receptor trench to the Baker Tank via a 1000-gallon capacity polyethylene tank positioned in the bed of a one ton truck. Transfer of water from the 1000-gallon tank to the 21,000-gallon tank will be performed using a gasoline rated centrifugal pump and one inch diameter gasoline rated hose. Once it becomes apparent that the weekly purged volume does not mandate the storage capacity of the 21,000-gallon Baker Tank, this tank will be cleaned and removed from the site. The 1000-gallon capacity polyethylene tank will be placed in the treatment compound to hold the purged groundwater until it is treated and injected. And a 200-gallon capacity polyethylene tank will be used to transport the purged water from the receptor trench to the 1000-gallon polyethylene tank.

3.1 Cost Benefit Breakdown to Handle Purged Groundwater

- Estimated Evergreen vacuum truck rate during dewatering and weekly purging of receptor well for one year **$82,500,** for removal, trucking and disposal.
- Estimated WEGE pump truck during dewatering and weekly purging of receptor well for one year **$24,800,** with gravity feed treatment/reinjection system.
- If reinjection method is not used, and if the City of Oakland would allow discharge to sewer. The additional yearly costs for sewer discharge versus injection is approximately **$7,100.**

3.2 SCHEDULE

July 12, 1999	Received Pre-Approval letter from UST fund.
July 15, 1999	Hand deliver two week notice to residences along Brighton Avenue: Start construction of receptor trench along Brighton Avenue.
July 28 – 30, 1999	Staging-in equipment and preparing site for installation of receptor trench.
August 2, 1999	Start excavating of receptor trench.
August 20, 1999	Completion of receptor trench.
August 24, 1999	Perform Quarterly groundwater sampling with natural attenuation monitoring and nutrient analysis of wells, including newly installed wells and receptor trench.
August 31, 1999	Start weekly groundwater removal from receptor trench and nutrient addition at recovery well R-3. Commence with injection of treated groundwater produced from receptor trench and monitor wells into R-3.

3.3 TREATMENT OF RECOVERED GROUNDWATER

Treatability Study

All purged groundwater (recovered from dewatering for receptor trench, monitor well development, monitor well purging/sampling and weekly purging of receptor trench) will be stored in a 21,000-gallon capacity Baker Tank that will be delivered to the site clean. Once approval is granted from Alameda County Health, approximately 500 gallons of water will be pumped from the Baker Tank through two in series 50-gallon capacity activated water carbons (Wheelabrator Aqua Scrub) at a rate not to exceed 5 gallons per minute (gpm) into a 1000 gallon capacity polyethylene tank, see Figure 5. Water samples will be obtained from sample ports located prior to the water scrubs, between the water scrubs and at the exhaust of the water scrubs. These samples will be analyzed for TPHg, BTEX and MTBE. Upon receipt of State of California Certified Laboratory report of results a request will be made to initiate injection of the treated groundwater into R-1 at a rate not to exceed 5 gpm. The injection of this treated groundwater will continue until the Baker Tank is empty and removed from the site. Once the water stored in the Baker Tank has been completely injected into R-1 then weekly injection of water recovered from the weekly purging of the receptor trench and/or monitor wells will be performed at a rate of 5 gpm not to exceed 1000 gallons per day/week, see Figure 6.

The weekly purging and injection of 1000 gallons of treated groundwater will continue for approximately two months to evaluate the benefit of weekly purging of 1000 gallons versus continues pumping from the receptor trench and continuous discharge/injection into R-1

Nutrient Augmentation

After completion of the receptor trench, weekly purging will commence, extracting approximately 1000 gallons of gasoline contaminated groundwater per visit. Prior to treating and injecting this purged water into R-1 groundwater, samples will be obtained from R-1, the receptor trench, newly installed wells at 4006 Brighton Avenue and 4026 Brighton Avenue and RS-7. These samples will be analyzed for TPHg, BTEX, MTBE, Dissolved Oxygen, Sulfate, Nitrate, Ferrous Iron, ORP, Nitrogen as Ammonia and Ortho Phosphates.

Western Geo-Engineers anticipates augmenting the treated groundwater with sodium hexametaphoshpate and ammonium sulfate. In an earlier workplan dated November 5, 1997 (revised December 9, 1997), trisodium phosphate (TSP) was suggested. Further research of this additive indicated that TSP would need to be in combination with Mono-Sodium Phosphate (MSP) to maintain a pH between 6.5 and 7.5 and that the TSP-MSP solution would not invade the formation as much as was hoped.

Phosphate

Research of the current literature indicates that the direct addition of orthophosphate may cause the precipitation of insoluble phosphate salts, thus plugging the infiltration wells and the surrounding aquifer.

In sodium hexametaphosphate (SHMP), the phosphate is in the form of polyphosphate, which forms complex ions with the calcium and iron ions and does not precipitate out of solution. Additionally SHMP has a neutral pH of 7 and may be used in the treatment of potable water.

Ammonium Sulfate

Ammonium sulfate as an ammonia source may be mixed into the SHMP water mixture. In addition to ammonia, this will also supply some sulfate, an important electron acceptor, to the system.

No additives will be used until results of the above mentioned groundwater sampling has been completed and evaluated.

4.0 COLLECTION AND ANALYSIS OF GROUNDWATER SAMPLES

The third quarter sampling should occurred on or about August 24, 1999. Water samples will be collected from monitor wells MW1, RS-2, RS-5, and RS-6 located on-site and RS-7 located in the center of Brighton Avenue to the northeast of the site (Figure 3). Water samples will also be collected from the three onsite water recovery/injection wells (R1, R2 and R3), from the receptor trench wells (3 wells, one at each end and one at the center), from the backyard wells to be installed at 4006 and 4026 Brighton Avenue and from the down gradient well installed in the city easment west of Brighton Avenue across from 4032 Brighton Avenue. Appendix A contains QA/QC, details, methods, procedures, abbreviations, and acronyms used in sampling and analysis.

4.1 Depth to Water Measurements

Depth to water will be measured at all monitor wells, the three onsite water recovery/injection wells, the three receptor trench wells, the two backyard wells and the downgradient well. The depth to water measurements are derived using a product/water interface probe. Measurements are referenced to surveyed elevation at the top of casing at each well.

4.2 Purging of Monitor Wells

David Pittman Well Purge (DPWP), using a truck mounted vacuum lift pump and one-inch diameter PVC tubing will purge the monitor wells of three volumes of water. This is the same truck and operator as has been regularly used under the name of Lawrence Tank Testing. The

specific volume of water removed from each well will be recorded on the well sampling data sheets.

4.3 Collection and Certified Analysis of Groundwater Samples

After purging, the wells will be allowed to recover to at least 80% of their original well volumes. A groundwater sample is then collected from each well with a disposable polyethylene bailer and decanted, with no headspace, into two 40 ml VOA vials containing 0.5 ml HCL acid as a preservative. North State Environmental Laboratories has been contracted to analyze all water samples for concentrations of TPH-G, BTEX, and MTBE using EPA methods 5030/8015M/8020. Method 8020 presence of MTBE will be verified with EPA Method 8260. The February 23, 1999 sample results showed all wells below laboratory lower detection limits for MTBE using standard methods and the September 1998 samples from all wells were also analyzed for the Fuel Oxygenants using EPA Method 8260. All wells tested below laboratory lower detection limits.

Fuel Oxygenants	Laboratory Lower Detection Limits
Ethanol	500 ug/L
Methyl-t-Butyl Ether (MTBE)	1 ug/L
Di Isopropyl Ether (DIPE)	5 ug/L
Tertiary Butyl Alcohol (TBA)	5 ug/L
Ethyl t Butyl Ether (ETBE)	5 ug/L
t-Amyl Methyl Ether (TAME)	1 ug/L

Selected wells will also be analyzed by NSE for Nitrogen as Ammonia, Ortho Phosphates, methane, carbon dioxide and hydrocarbon degraders (R-1, RS-7, receptor trench middle well and the backyard wells).

WEGE will field measure the following on all wells using the HACH DR/2000 Spectrophotometer: Dissolved Oxygen, Sulfate, Nitrate and Ferrous Iron.

Also field measurements of pH, conductivity, temperature and oxygen reduction potential (ORP) will be obtained,

4.4 Disposition of Waste Water

The wastewater generated from the purging of the monitor wells, dewatering for installation of the receptor trench and weekly purging of the receptor trench will be placed into the 21,000 capacity Baker Tank. This water will then be pumped through 2 50-gallon activated carbon water scrub units in series prior to being injected into R-1 to act as the carrier for the nutrients to remediate the sewer lateral. A treatability study will be performed prior to injection. Also concurrence from Alameda County Health will be obtained prior to injection.

Once it is established that the 21,000 gallon capacity tank is no longer needed, a smaller (1000 gallon capacity) polyethylene tank will be placed in the treatment compound located at 4035 Park

Blvd. to contain the weekly purged groundwater prior to treatment and injection/nutrient augmentation.

5.0 LIMITATIONS

This report is based upon the following:

A. The observations of field personnel.
B. The results of laboratory analyses performed by a state certified laboratory.
C. Referenced documents.
D. Our understanding of the regulations of the State of California, Alameda County and the City of Oakland.
E. Changes in groundwater conditions can occur due to variations in rainfall, temperature, local and regional water use, and local construction practices.
F. In addition, variations in the soil and groundwater conditions could exist beyond the points explored in this investigation.

State Certified Laboratory analytical results are included in this report. This laboratory follows EPA and State of California approved procedures; however, WEGE is not responsible for errors in these laboratory results. Western Geo-Engineers is a corporation under California Registered Geologist #3037 and/or Contractors License #513857. The services performed by Western Geo-Engineers have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the State of California and the Oakland area. Our work and/or supervision of remediation and/or abatement operations, active or preliminary, at this site is in no way meant to imply that we are owners or operators of this site. Known or suspected contamination of soil and/or groundwater must be reported to the appropriate agencies in a timely manner. No other warranty, expressed or implied, is made.

Sincerely,

George Converse
Geologist

Jack E. Napper
Ca. Reg. Geologist #3037

cc: Mr. John Rutherford, Desert Petroleum (805) 644-6784
Mr. Leroy Griffin, Oakland Fire Dept.

-WEGE-

DESERT STATION #793
4035 Park Blvd.
Oakland, California

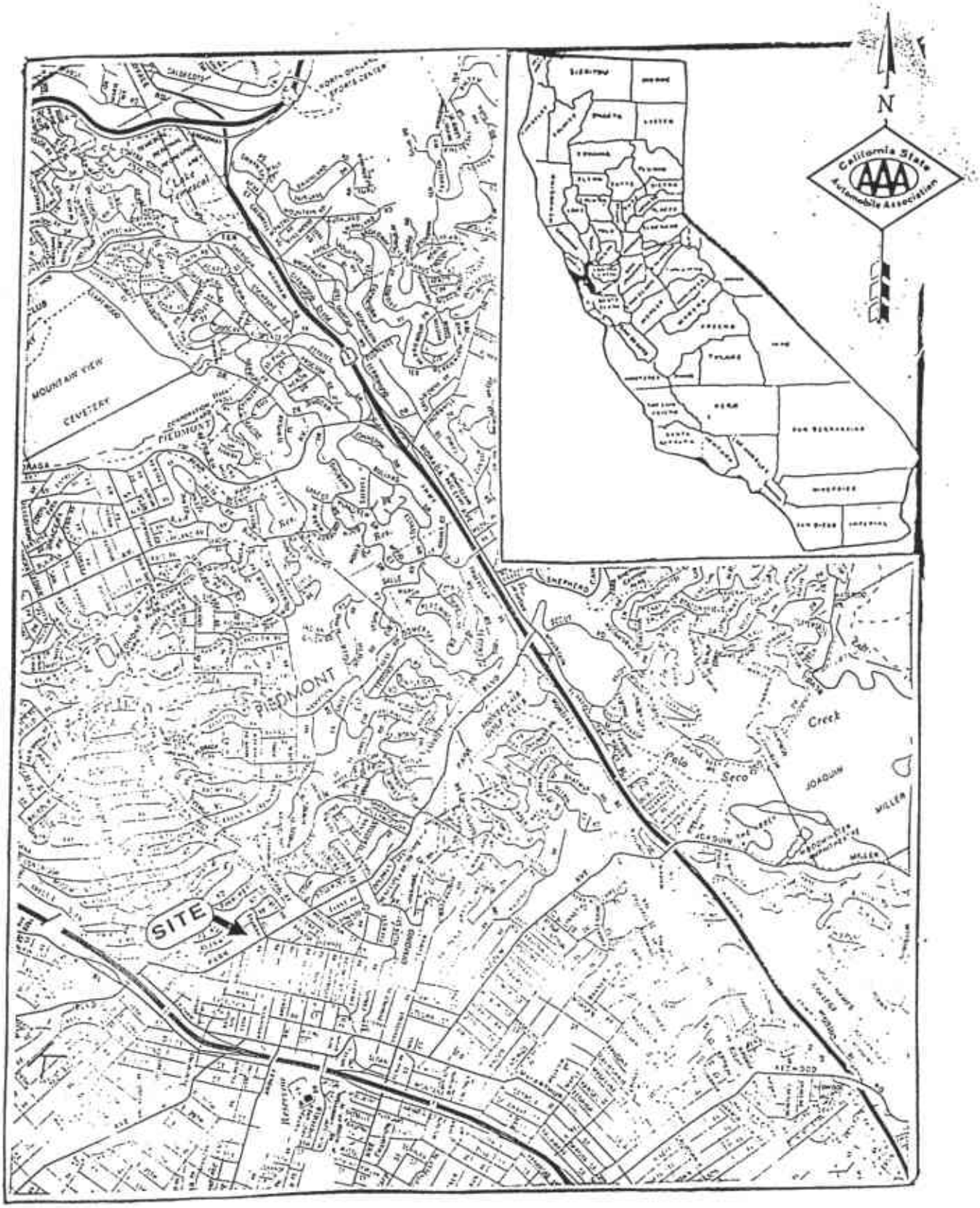

FIGURE 1

Location (AAA Map)

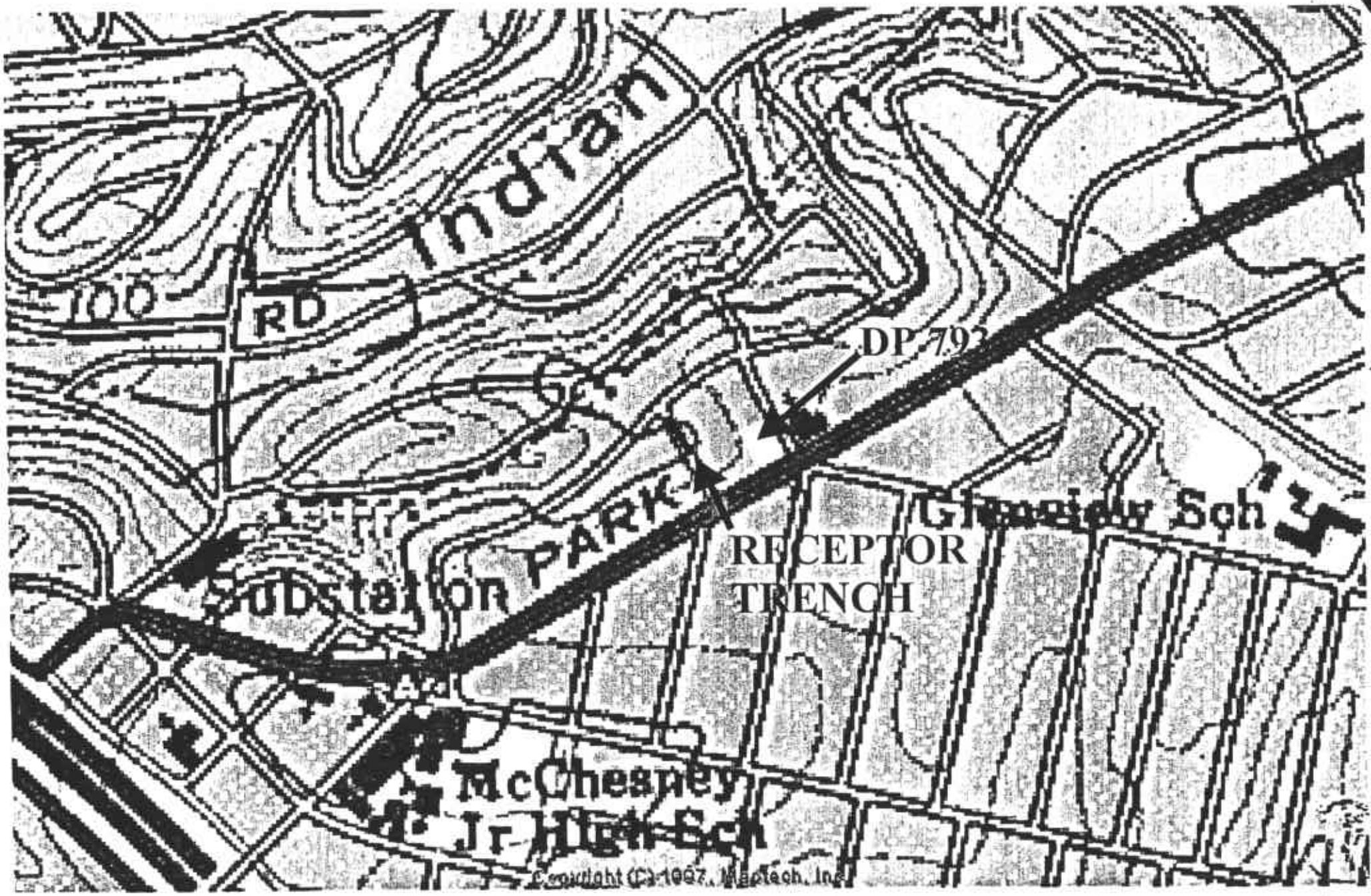

FIGURE 2
PORTION OF OAKLAND EAST 7.5 MINUTE USGS TOPOGRAPHIC MAP

NORTH

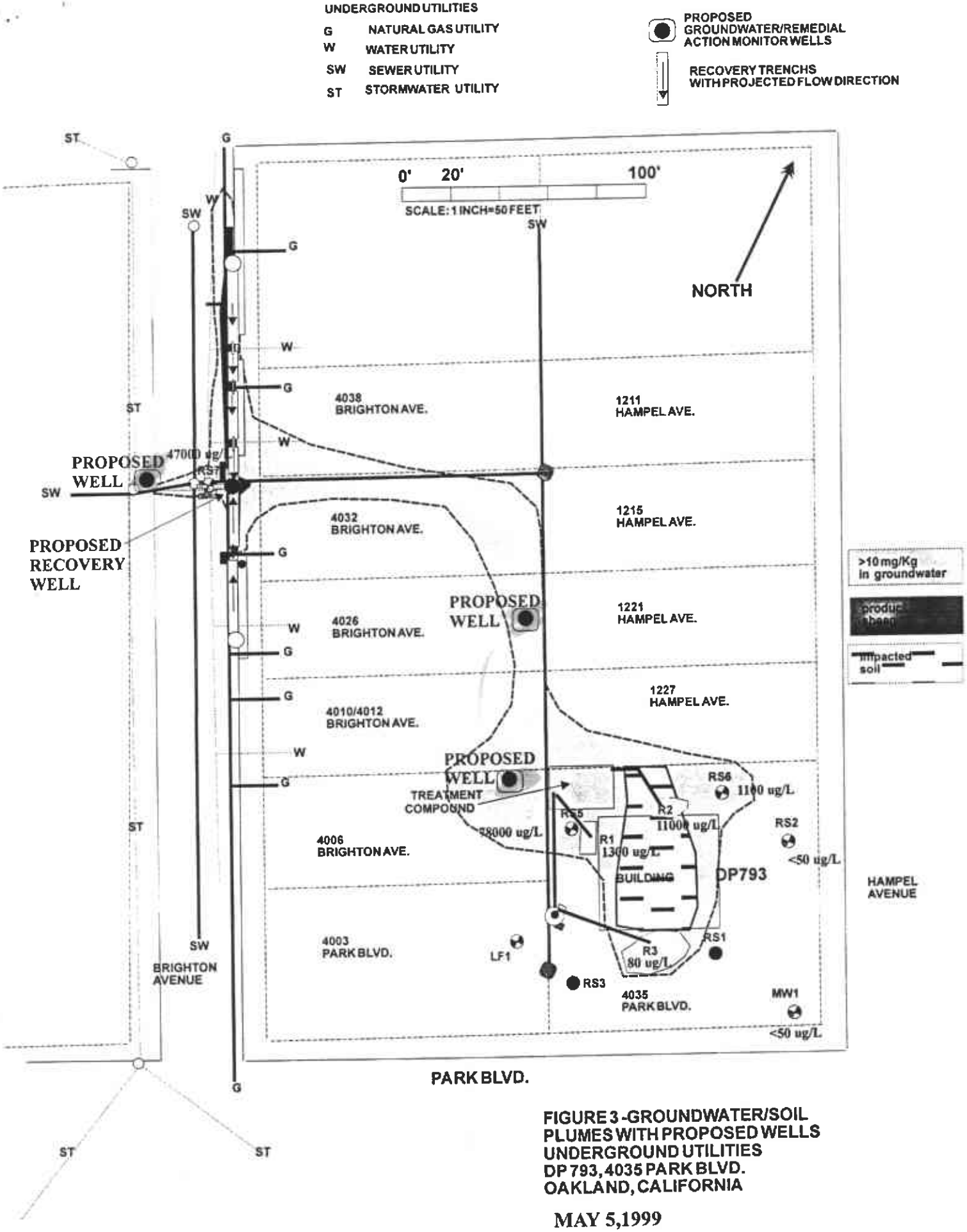

FIGURE 3 -GROUNDWATER/SOIL PLUMES WITH PROPOSED WELLS UNDERGROUND UTILITIES DP 793, 4035 PARK BLVD. OAKLAND, CALIFORNIA

MAY 5,1999

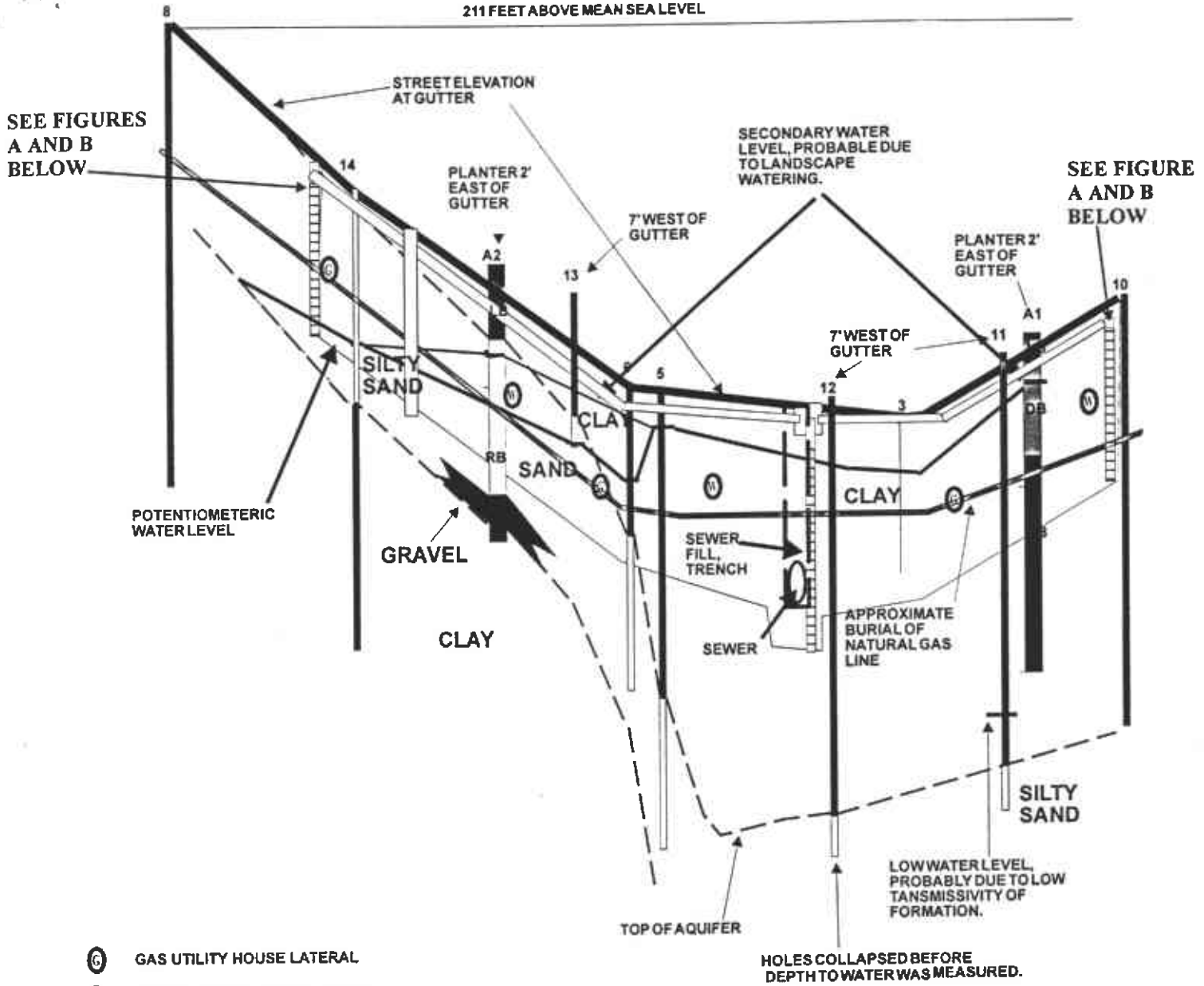

FIGURE 4
CROSS SECTION
CONCEPTIONAL RECEPTOR TRENCH
FOR FREE PRODUCT AND GROUNDWATER RECOVERY
DP793, 4035 PARK BLVD.
OAKLAND, CALIFORNIA

PURGED GROUNDWATER TREATABILITY STUDY FOR REINJECTION

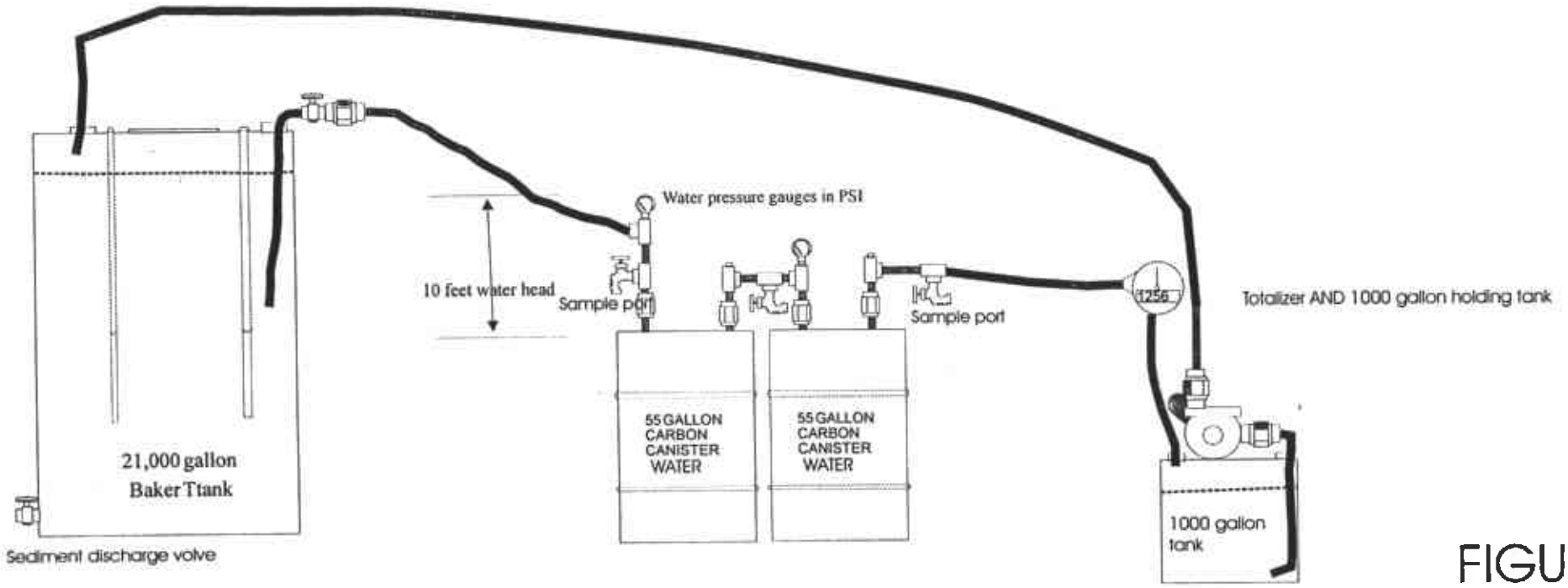

FIGURE 5

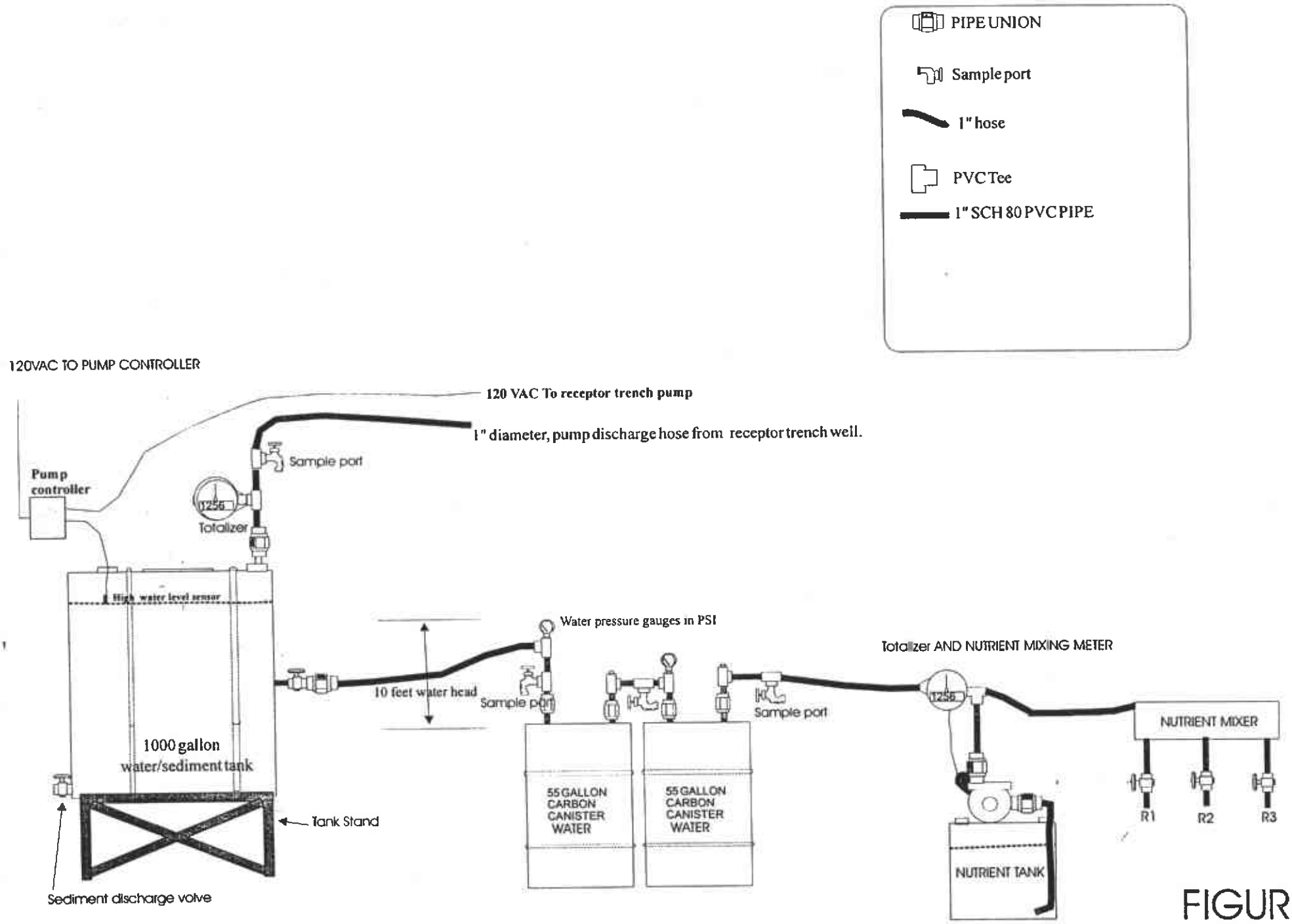
PIPE UNION
Sample port
1" hose
PVC Tee
1" SCH 80 PVC PIPE
120VAC TO PUMP CONTROLLER
120 VAC To receptor trench pump
1" diameter, pump discharge hose from receptor trench well.
Pump controller
Sample port
1256
Totalizer
High water level sensor
Water pressure gauges in PSI
10 feet water head
Sample port
Sample port
Totalizer AND NUTRIENT MIXING METER
1000 gallon water/sediment tank
Tank Stand
55 GALLON CARBON CANISTER WATER
55 GALLON CARBON CANISTER WATER
NUTRIENT MIXER
R1
R2
R3
NUTRIENT TANK
Sediment discharge valve

FIGURE 4