ENGINEERING-SCIENCE, INC.

1901 MARINA VILLAGE PARKWAY
SUITE 200
ALAMEDA, CALIFORNIA 94501
TEL: (510) 769-0100
FAX: (510) 769-9244

15 June 1993
Ref: NC367

East Bay Regional Parks District
Parklands Design Department
P.O. Box 5381
Oakland, CA 94605

Attention: Mr. Warren Gee

Subject: Redwood Regional Park Underground Storage Tank Investigation

Dear Mr. Gee:

In accordance with your request, Engineering-Science, Inc. (ES) is pleased to submit to East Bay Regional Parks District (EBRPD) this summary of underground storage tank (UST) removal activities, and options for soil and groundwater characterization and remediation at the Redwood Regional Park site.

PREVIOUS INVESTIGATIONS

One 2,000-gallon diesel fuel and one 5,000-gallon unleaded gasoline UST were removed from the site on 29 April 1993. Soil samples collected beneath the USTs contained up to 2,200 mg/Kg total petroleum hydrocarbons as gasoline (TPH-g) and 434 mg/Kg total aromatic hydrocarbons (benzene, toluene, total xylenes and ethylbenzene, or BTXB). Total petroleum hydrocarbons as diesel (TPH-d) and lead were detected at maximum concentrations of 4 and 10 mg/Kg respectively.

Additional soil excavation activities were conducted on 10, 11 and 14 June 1993. Approximately 600 cubic yards of contaminated soil were excavated and stockpiled on site. The excavation covers an area of approximately 1,200 square feet and has a total depth of approximately 25 feet. Groundwater has entered the base of the excavation. We understand that EBRPD will request no further soil excavation, based on the potential for landslides and the presence of significant facility constraints (utilities and roads). We further understand that EBRPD will request ES to collect confirmation excavation soil samples on 15 June 1993 to document residual levels of soil contamination prior to backfilling of the excavation.

The Alameda County Health Care Services Agency - Hazardous Materials Division (ACHCSA-HMD) the local implementing agency (LIA) during UST removal and contaminated soil excavation activities. We anticipate that ACHCSA-HMD will also be

the LIA for any soil remediation and groundwater characterization or remediation activities at the site, with technical oversight provided by the San Francisco Bay Region of the California Regional Water Quality Board (RWQCB). We further understand that in-situ remediation of soil and groundwater may be required due to the proximity of contamination to surface water bodies and other sensitive receptors.

GROUNDWATER CHARACTERIZATION

Based on the elevated concentrations of TPH-g and BTXE detected and the presence of groundwater in the excavation, there is a high potential that groundwater in the vicinity of the UST excavation has been adversely impacted. In accordance with the RWQCB's policy for non-degradation of groundwater, it is likely that ACHCSA-HMD will require that a minimum of three groundwater monitoring wells be installed at the site, and monitored on a quarterly basis for a minimum of one year, to evaluate the potential impacts to groundwater associated with the leaking UST(s). Tasks associated with these quarterly monitoring events commonly include: collection of static water levels to determine direction of groundwater flow; collection of water samples for laboratory analysis; and preparation of quarterly groundwater monitoring reports.

SOIL CHARACTERIZATION

Should elevated levels of contaminated soil be left in situ, continued leaching of soil contamination to groundwater is likely. In order to prevent continued degradation of groundwater, ACHCSA-HMD may require that in situ soil remediation be conducted to reduce the magnitude of soil contamination. Selection of the proper in situ soil remediation technology will require a detailed evaluation of the spatial extent and magnitude of residual soil contamination and site geology. The most common method for evaluating these parameters is to conduct an exploratory borehole soil sampling and analysis investigation. These exploratory borehole may be advanced using either hand-held, pneumatic-driven samplers, or truck-mounted drilling rigs, depending on site characteristics. For sites with laterally extensive and relatively shallow soil contamination, soil gas surveys are a cost-effective means of evaluating the extent and magnitude of in situ soil contamination.

SOIL REMEDIATION OPTIONS

In Situ Techniques

The appropriate remedial option for in situ soil contamination is dependent on site-specific factors including: spatial extent, magnitude and type of contamination; site lithology; facility considerations; cost and environmental schedule constraints; and regulatory agency requirements. Following an evaluation of these parameters, the

appropriate soil remediation option can be selected. Based on preliminary data available, ES anticipates that the following in situ soil remediation technologies may be appropriate:

- Bioremediation
- Soil venting
- Bioventing
- Thermal treatment
- Stabilization/solidification

In addition, variations of these technologies may be implemented using steam injection, heating, and/or introduction of biological and chemical agents.

Stockpiled Soil

There are several options for remediating the approximately 600 cubic yards of stockpiled contaminated soil including off-site disposal, recycling or treatment or on-site remediation. On-site remediation may be the most cost-effective option assuming that sufficient space and time are available. On-site remediation might include passive or active aeration, with or without tilling or biological enhancement. These techniques will require a permit from the Bay Area Air Quality Management District (BAAQMD). Following treatment, soil samples will have to be collected to confirm the effectiveness of the technique. Depending on regulatory agency requirements, the treated soil may be used as backfill or may have to be disposed of off site at an appropriate disposal facility.

GROUNDWATER REMEDIATION OPTIONS

Based on the high potential for groundwater contamination at the site, and the proximity of sensitive receptors, ACHCSA-HMD may require remediation of groundwater. Groundwater may be extracted or treated in situ using numerous technologies including:

- Granular activated carbon
- Air stripping
- Biodegradation
- Air sparging
- Thermal treatment
- Extraction and off-site disposal/recycling/treatment

In summary, there are numerous proven technologies available for in situ remediation of soil and groundwater which may be applicable to the fuel contamination detected at the Redwood Regional Park site. Engineering-Science would be pleased to provide East

Bay Regional Parks Districts with the technical services necessary to evaluate and remediate known and potential contamination at the site. Please call if you have questions or require additional information.

Very truly yours,

ENGINEERING-SCIENCE, INC.

Bruce M. Rucker

Bruce M. Rucker
Project Manager

Neal E. Siler, Manager
Hazardous Waste
Management Department

BRM/NES/smb/41-26.R0