CITY OF EMERYVILLE

MARYANN LESHIN
Projects Coordinator

11/30/94

Susan:

Attached please find our consultant's report on Remedial Action at 4800 San Pablo Avenue.

We'll see you Wed., Dec. 7th at 10:00 am to discuss.

Thanks –

Maryann

HydroSolutions of California, Inc.
5917 Moss Creek Circle • Suite 2
Fair Oaks, California 95628 • (916) 967-1222 • FAX (916) 967-1223

October 10, 1994

Maryann Leshin
City of Emeryville Redevelopment Agency
2200 Powell Street, Suite 1200
Emeryville, California 94608

SUBJECT: REMEDIAL ACTION
4800 SAN PABLO AVENUE **(SUBJECT PROPERTY)**
EMERYVILLE, CALIFORNIA

RRSP: 94286-03-19

Dear Maryann:

Recent site investigations have identified conditions suggesting gasoline leakage into the subsurface beneath the subject property. The driving issue concerning groundwater contamination is the presence and concentration of benzene. One groundwater monitoring well, WB-14, contained 65 ppb (parts per billion) detectable benzene. The acceptable level for benzene enforced by the State is 1 ppb (California maximum contaminant level). Two additional wells, WB-8 and WB-9, contained 3.0 and 2.8 ppb detectable benzene, respectively. Although concentrations of petroleum hydrocarbons and benzene are low at the subject property with respect to other contaminated sites in California, the above identified levels typically are viewed by the Regional Water Quality Control Board (RWQCB) as requiring a limited remedial response.

Petroleum hydrocarbon contamination of sediment above the groundwater table have not been detected at significant levels. The highest TPH-G (petroleum hydrocarbons as gasoline) concentrations were detected at WB-9 (15 foot depth) and WB-8 (10 foot depth). Concentrations were 2.5 mg/kg (ppm) and 0.96 mg/kg.

Groundwater monitoring well, WB-14, penetrates a localized area of fine grained sand (perched aquifer condition) which has accumulated water. This water likely originates from leakage of a nearby storm sewer. Accumulation of water in this shallow area likely occurs from its relatively high degree of permeability as compared with surrounding sediment (i.e. silty clay).

In light of the above described conditions, HSCI will describe three remedial scenarios. The focus of remediation is two-fold; 1) remove the known TPH source material which potentially recharges the shallowmost aquifer with petroleum and 2) monitor the trend in groundwater quality with respect to TPH-G and benzene for a limited period of time. Three alternatives (scenarios) are described in the following paragraphs for the removal and treatment of the localized TPH source area. The second phase of remediation (groundwater monitoring) is described in the later section of this letter.

SCENARIO I. EXCAVATE, SPREAD AND DISPOSE

Based on the above discussed field data, the fine sandy material located along 48th Street (WB-14 and B-6) will be removed and treated on-site. Excavation of contaminated soils is a commonly used method for soil remediation. Excavation is accomplished using standard earth moving equipment.

Confirmation soil samples will be collected from the base and walls of the excavation to verify adequate removal of contaminated sediment. Contaminated sediment may be present in the fine sandy material only however the volume of sediment to be removed is not known. The greatest variable in cleanup costs is the volume of sediment requiring removal and transport to the landfill. Estimated cost of this alternative assumes an excavation of twenty feet by twenty feet by ten feet deep.

Excavated sediment will include a two step process:

1) Treat on-site by vapor extraction and bioremediation processes and
2) Partially treat on-site and disposed at an appropriate landfill.

If on-site treatment is not desirable, transporting to an appropriate landfill may be completed. Presence of BTXE in the excavated sediment will result in a higher disposal cost.

Backfilling may be completed immediately after excavation or after aerated material no longer contains TPH-G/BTXE. Immediate backfilling would require importing of grading material. Replacement of treated material as backfill material would require permission from the regulatory agencies and an interim excavation covering.

Due to low TPH-G concentrations likely to exist in excavated sediment, HSCI suggests spreading this material on a portion of the subject property. Erosion control may be needed if excavation and spreading are completed during the wet season. Sediment spreading will cause aeration and biodegradation resulting in the reduction of TPH-G and benzene concentrations. Enhancement of these effects can be made by expediting field activities during the hot months of summer. The Bay Area Air Quality Management District (BAAQMD) must be consulted to determine the need for obtaining a permit. It is the opinion of HSCI that levels of emissions will not likely require a permit from BAAQMD.

After a period of time (1-2 months during summer), soil samples will be collected from the treated sediment and analyzed for TPH-G and benzene, toluene, xylene, and ethylbenzene (BTXE). Assuming BTXE concentrations are nondetectable and TPH-G concentrations in sediment is low, the material may be transported to a landfill for disposal as a nonhazardous material. Specific cleanup levels of treated sediment depend on the landfill selected and their criteria.

Advantages for the above described remedial action include; 1) entire site will not be aggressively remediated, 2) excavation activities will require minimal time (2-3 days), 3) limited volume of sediment removed, 4) contaminated sediment will be spread and rendered nonhazardous, 5) minimum construction equipment needed, 6) higher temperatures of summer will enhance the treatment of spread sediment and 7) groundwater cleanup (monitoring) is minimal as compared to a pump and treat.

Disadvantages of this approach include; 1) petroleum hydrocarbons will not totally be removed from the subsurface, 2) a portion of contaminated groundwater may potentially migrate to off-site areas, 3) monitoring may continue for many years, 4) subject property will not be usable during time sediment is spread across subject property and 5) may need to dispose as a hazardous waste if material contains excessive BTXE after treatment.

Estimated costs are as follows:

Scenario I. Excavate, spread and dispose

Excavate	\$ 9,000 - \$11,000
Backfill	\$ 8,200 - \$10,000
Dispose (non-hazardous)......	\$ 16,500 - \$20,000
Total	\$ 33,700 - \$41,000

SCENARIO II. AIR SPARGING

Due to the localized shallow area of groundwater contamination, it is HSCI's opinion that Scenario I (excavation, treatment and disposal of contaminated aquifer sediment) impacts the short-term use of the property and is excessive both in cost and liability to accidents. An in-situ approach is more appropriate and, ultimately, less costly.

This remedial approach consists of the installation of 2-3 additional wells penetrating the sand matrix of the perched aquifer (16 foot depth). Air is bubbled into groundwater (sparging) causing oxygenation and stripping of volatiles from groundwater. A pump is also installed to circulate oxygenated water to other TPH impacted areas. Reinstallation of the sparging tool and pump at different well locations will further distribute the effects of stripping volatiles from groundwater.

Regulatory acceptance of this method is likely however this technology is not a standard practice used by the environmental industry. Application of air sparging is rapidly gaining acceptance as an effective method for remediating volatile chemical contamination within a permeable aquifer matrix.

The advantages of this method are as follows; 1) less disruptive than excavation and spreading, 2) minimal impact to land use activities during treatment, 3) enhance biodegradation thereby accelerating rate of cleanup, 4) oxygenated water will partially remediate contaminated groundwater located down-gradient (dependent of groundwater seepage rate, biological demand for oxygen and available nutrients), 5) will treat groundwater and overlying unsaturated sediment, 6) equipment needs are minimal, 7) less costly, 8) above groundwater treatment is not needed and 9) BAAQMD is not likely to require special conditions for compliance of air quality regulations.

The disadvantages for this method are as follows; 1) regulatory acceptance may require excessive effort, 2) degree of contamination not quantifiable without resampling treatment zone with a drilling rig and 3) equipment (compressor and piping) are vulnerable to vandalism.

Estimated cost for this scenario is $23,600 to $29,500.

SCENARIO III. ELECTROKINETIC TREATMENT

Electrolysis can be applied in both permeable and impermeable sediment. Application of electrolysis (electro-osmosis) to a contaminated zone of sediment can also oxidize the petroleum hydrocarbons and benzene-based organic chemicals. Electro-osmosis creates an imbalance of charged molecular bonds in clayey material which results in clay compaction and the release of the contaminant. Generally, electrodes are placed in the ground and an electric current induced. Simultaneous to this activity, vapor extraction is commonly used as a means of capturing volatiles which have been released from the sediment matrix.

This technology would require completing a feasibility study first for the purpose of determining the effectiveness of the technology. Secondly, once electrodes are installed into the ground, a vapor extraction well system is constructed and operated to capture volatiles released from the contaminated zone.

The advantages for this method are as follows; 1) in-situ thereby more intrusive than excavation option, 2) can dewater and release contaminants from a sand and clay matrix and 3) impact to land use activities is minimal.

The disadvantages for this method are as follows; 1) relatively new technology, 2) may be easier and less costly to excavate and aerate, 3) requires a feasibility study first (initially time intensive) and 4) may require BAAQMD permit for vapor extraction system.

Estimated cost for this remedial alternative is $23,000 to $34,500. This does not include costs for a feasibility study.

GROUNDWATER MONITORING

The second component of remedial action is groundwater monitoring. Assuming the source of contamination has been removed (e.g. sediment adjacent WB-14), presence of contaminated groundwater would likely remain the same or diminish in concentration. This assumes that the area of highest concentration has been identified. A reasonable level of effort has been completed based on the size of the property and number of monitoring wells. Field sampling procedures and laboratory variabilities cumulatively effect the accuracy of measurements. The mixed nature of sediment type further contributes to the distribution of leaked petroleum within the ground surface. Established locations for each monitoring well in the areas of highest TPH-G concentrations are ultimately the result of a combination of randomly selected locations and professional judgment (i.e. wells are located within the alleged positions of underground storage tanks and dispenser islands).

Quarterly sampling of WB-7, WB-8, WB-9 and WB-12 are suggested for a period of one year. Subsequent to collection of this information, data will be evaluated for trends. A decreasing trend suggests an improvement in the groundwater aquifer which supports the decision for reducing the frequency of sampling to semiannual or annual. Termination of the groundwater monitoring program can require many years.

It is the opinion of HSCI, however, to collect general water quality information and provide an explanation of natural biodegradation (intrinsic bioremediation) processes and rates of decay existing in groundwater beneath the subject property. This information would be included in correspondence made to the regulating agencies when requesting termination or decreased frequency of the monitoring program.

A brief description of intrinsic bioremediation is included below for the purpose of explaining the conceptual model of this process.

Intrinsic remediation is achieved when naturally occurring attenuation mechanisms, such as biodegradation (aerobic and anaerobic), bring about a reduction in the total mass of a contaminant dissolved in ground water. In some cases, intrinsic remediation will reduce dissolved-phase contaminant concentrations to below maximum contaminant levels (MCL) before the contaminant plume reaches potential populations (e.g. people, municipal or domestic wells).

Microbes existing in the subsurface require a food source, nutrients, moisture and electron receptors to grow and multiply. In the event of petroleum contamination, a food source is present (petroleum) and typically nutrients and electron acceptors are available in the groundwater flow. As the microbes consume the petroleum, nutrients and electron acceptors are depleted within the groundwater. This causes biodegradation of the petroleum to stop. Typically, oxygen, nitrates, iron, manganese, sulfate and carbon dioxide are depleted in this consecutive order. Groundwater continuously provides background levels of these nutrients and electron acceptors thereby revitalizing a portion of the microbes in time. This results in continued degradation of petroleum at a rate achievable at natural groundwater flow conditions (nutrient and electron acceptor delivery rate).

HSCI suggests field analysis of general water quality parameters also be collected and an estimate of the natural biodegradation completed. This information will be utilized with monitoring data when agencies are being requested, by the City of Emeryville Redevelopment Agency, to reduce or terminate the monitoring program.

Estimated costs for groundwater monitoring for a period of one year is $9,200 to $11,000. Estimated cost for evaluating intrinsic bioremediation is $1,700 to $2,000.

Total estimated cost of remediation is based on the cost of localized soil/groundwater cleanup at WB-14 plus the cost of groundwater monitoring for one year. It must be recognized that the duration of monitoring may potentially exceed one year. The intrinsic bioremediation argument presented to regulatory agencies may significantly strengthen decisions for completing groundwater monitoring in a shorter time frame.

After you have discussed remedial options with Kofi, let me know your thoughts.

Respectfully submitted,

Stephen J. Baker
Project Manager