FACILITIES SERVICE OFFICE

UNITED STATES POSTAL SERVICE
850 CHERRY AVENUE
SAN BRUNO CA 94099-0300

May 10, 1993

Ms. Susan Hugo
Sr. Hazardous Material Specialist
Alameda County Department of Environmental Health
80 Swan Way, Room 200
Oakland, CA 94621

Re: Emeryville, CA - Preliminary Soil Quality Evaluation
Proposed Emeryville Postal Facility

Dear Ms. Hugo:

The purpose of this letter is to present the current environmental condition of the subject site and to announce the abatement measures to be undertaken by the United States Postal Service.

Attached is the April 16, 1993 Preliminary Soil Quality Evaluation prepared by our Environmental Consultant, Lowney Associates, which details the site conditions detected during the construction of the proposed Emeryville Postal Facility.

Based on the information contained in the attached report, it is our intention to implement the following abatement measures:

1. Contract with State certified contractors to remove two underground storage tanks and associated piping in full compliance with all Alameda County Tank Closure regulations;

2. Develop and execute a work plan to properly determine the lateral and horizontal extent of impacted soils and groundwater on the site, and

3. Proceed with advertising and award of a new construction contract for the Oakland, Ca. - Emeryville Branch which will include remedial measures for hydrocarbon contamination as recommended by our Environmental Consultant in the attached report. Based on the information that is now available to us, a soil vapor extraction system will be installed. It is now planned that design of the soil vapor extraction system will be completed on or about June 30, 1993. The design of the soil vapor extraction system will then be incorporated into the design for the complete facility. The anticipated date of construction award is September 15, 1993.

We will be contacting the former site owners for future oversite of any and all possible off-site studies and abatement measures.

We invite your comments; i.e., if you have any concerns regarding the above abatement measures, please contact Clair H. Kenaston, Project Manager at (415) 742-4601 as soon as possible so your concerns can be adequately addressed.

Sincerely,

Jerry A. Adkins
Manager
Facilities Service Office

ATTACHMENT

cc: Richard McMurtry, Division Chief for Groundwater Protection, RWQCB
Larry Hanna, Program Manager Environmental Engineering
Gary Bigelow, Environmental Counsel, USPS HQ, Law Department
Robert O'Connell, Atty., San Bruno Field Office
Clair Kenaston, Contracting Officer, SBFSO
Jim Zaruba, Real Estate Specialist, SBFSO
Ron Helm, Lowney Associates
Charles Wren, DMJM

LOWNEY ASSOCIATES
Environmental / Geotechnical / Engineering Services

April 16, 1993
864-17, MV041606

Mr. Charles Wren
UNITED STATES POSTAL SERVICE
SAN BRUNO FACILITIES SERVICE CENTER
850 Cherry Avenue
San Bruno, California 94099-0310

RE: PRELIMINARY SOIL QUALITY EVALUATION
6121 HOLLIS STREET
EMERYVILLE, CALIFORNIA

Dear Mr. Wren:

In accordance with your request, we have performed a preliminary soil quality evaluation at the proposed Emeryville Postal facility. The scope of work performed throughout this investigation was discussed with you and described in our subcontract agreement dated March 31, 1993.

The purpose of this investigation was to evaluate magnetic anomalies detected by others and the extent of shallow soil contamination. The magnetic anomalies appear to be associated with various sections of piping and debris. The majority of piping appears to be old utility lines. In addition to the underground storage tank uncovered during earlier construction activities, an additional underground storage tank was located beneath the sidewalk along the northern boundary of the property.

Four forms of petroleum fuel hydrocarbons (gasoline, kerosene, diesel, and oil) have been detected in the shallow on-site soils, mainly from 2 to 3 feet below grade to the top of the water table at 4 to 6 feet. Levels of petroleum fuel hydrocarbons generally average near 1,000 parts per million. However, concentrations up to 13,000 parts per million were detected.

We recommend further evaluation of the site's soil and ground water characteristics as well as the evaluation of remedial alternatives and objectives.

We refer you to the text of the report for details regarding our investigation. If you have any questions, please call.

Very truly yours,

LOWNEY ASSOCIATES

Stason I. Foster

Ron L. Helm C.E.G.
EG1808 Exp. 7/31/95

RLH:SIF

Copies: Addressee (6)

PRELIMINARY SOIL QUALITY EVALUATION

For

PROPOSED EMERYVILLE POSTAL FACILITY
Emeryville, California

To

UNITED STATES POSTAL SERVICE
SAN BRUNO FACILITIES SERVICE CENTER
850 Cherry Avenue
San Bruno, California 94099-0310

April 1993

PRELIMINARY SOIL QUALITY EVALUATION
PROPOSED EMERYVILLE FACILITY
6121 HOLLIS STREET
EMERYVILLE, CALIFORNIA

1.0 INTRODUCTION

1.1 Purpose

In this report, we present the results of our soil quality evaluation for the referenced site (Figures 1 and 2). The purpose of this work was to evaluate anomalies detected during a previous on-site geophysical survey (Dames & Moore, March 1993) and to further evaluate the extent of impacted soil.

1.2 Site Description/ Background

The project site currently consists of approximately 1.7 acres of undeveloped land bounded to the north by 62nd Street, to the south by Westinghouse Corporation property, to the west by Southern Pacific railroad tracks, and to the east by a parking lot for the 6121 Hollis Street building. The site is located in a primarily industrial area with many facilities dating back to the early 1920s. The site is proposed to be developed as a United States Postal Service facility by June 1994. Construction is expected to take 200 days. This facility is expected to cover 95 percent of the native soil. The cover cap will consist of the building foundations, asphaltic parking areas, and drives. Reportedly, only small strips of land primarily at the front entrance along 62nd Street will be left uncapped to allow planting of decorative landscaping.

Previous work to evaluate site conditions has included a review of site history, collection of numerous soil samples, installation of one ground water monitoring

well, collection of ground water grab samples, and the performance of a geophysical survey.

As discussed in detail in the previous reports for the site, the property has been used for a variety of purposes by several tenants. Former tenants include the Thomas Rigging (a draying and rigging company), ITT Grinnell (a plumbing supply business), and the U.C. Livermore Laboratory. A former on-site warehouse was also reportedly used for storage and repair of automobiles (Dames & Moore, March 1993).

A 1930 Sanborn map also showed the site to have been used as an oil distribution facility, occupied by both Shell and Guardian Oil Companies. Fourteen storage tank, presumably above ground, were reportedly used to store petroleum fuels at the site. Four of the tanks, located on the southeastern portion of the site were used to store gasoline. The ten remaining tanks were located on a concrete pad near the southwestern corner of the property; these tanks reportedly stored oil. Oil pumps and a filling shed were also reportedly shown on the Sanborn map. This distribution facility was demolished sometime prior to 1949 (Dames & Moore, March 1993).

Polychlorinated biphenyl (PCB) contamination has been detected in soil and ground water immediately south of the site on property owned by Westinghouse. This site has been enclosed by a slurry wall and capped. Several soil samples collected near the southern site boundary were analyzed for PCBs by the California Department of Health Services in February 1981. Reportedly, elevated PCB levels were detected. The former owner of the site, ITT Grinnell Corporation,

contracted CH2M Hill in June 1981 to evaluate soil quality in the shallow soil. Reportedly, PCBs were detected along the property's southwestern boundary adjacent to a railroad spur.

To further evaluate the potential impact to soil quality from the Westinghouse facility, 41 shallow soil samples were reportedly collected and analyzed for PCBs (Harding Lawson Associates, September 1990). Reportedly, only one sample contained PCBs (52 parts per million [ppm]). A second analysis performed on this sample detected PCBs at 17 ppm.

To assess the concentrations of PCBs and total petroleum hydrocarbons (TPH) in subsurface soil and ground water, soil sampling and analysis was also conducted at the site by Harding Lawson Associates (April 1992). Of the 22 samples analyzed, PCBs were detected only in one sample (21 ppm) collected near the eastern boundary of the property (Boring B-9) at a depth of 6.5 feet. TPH as diesel was detected in three borings, with a maximum concentration of 700 ppm near the western property boundary (Boring MW-1). TPH as kerosene was also detected in three borings at concentrations ranging from 2 to 86 ppm. To evaluate ground water quality, one ground water monitoring well was installed and sampled; two ground water grab samples were also collected at the site. Analytical results of ground water samples collected were analyzed for PCBs, TPH, and benzene, toluene, ethylbenzene, and xylenes (BTEX). The PCB Aroclor 1260 was detected up to 390 parts per billion (ppb). This level exceeds the federal drinking water standard of 0.5 ppb. TPH as diesel was detected up to 22,000

ppb, and TPH as kerosene up to 870,000 ppb (Harding Lawson and Associates, April 1992).

Reportedly, during preliminary on-site construction activities in January and February 1993, several underground pipes and a 600-gallon underground storage tank were encountered at the site. A geophysical survey was subsequently performed to evaluate if additional buried features were present (Dames & Moore, March 1993). This survey detected other anomalies.

To further evaluate soil quality, five trenches were excavated at the site in February 1993 (Dames & Moore, March 1993). Fourteen soil samples were collected from 13 locations within the trenches. Diesel fuel, kerosene, petroleum oil and the PCB Aroclor 1260 were detected during this investigation at levels up to 6 ppm, 56 ppm, 81 ppm, and 0.053 ppm, respectively.

1.3 Westinghouse

Westinghouse Electrical Corporation facility, which began operations in 1924, is located immediately southeast of the site. The property located directly south of the site is also owned by Westinghouse. This facility was previously used as a maintenance and repair facility for electrical transformers which contained PCBs and has a history of PCB contamination problems. Westinghouse was formerly listed on the State Superfund List and is currently on the CRWQCB North Bay Toxic list as well as on the Division of Toxic Substance Control Backlog Site Cleanup List. PCBs have been detected at the Westinghouse facility at levels up to 430,000 ppm as well in soil on the property located directly south of the project site at up to 130,000 ppm. Ground water below the facility was also found to be

impacted by PCBs. Between 1985 and 1986, Westinghouse initiated remedial measures which included the excavation and off-site disposal of highly impacted soil and on-site encapsulation of soil containing lower PCB levels. As discussed above, a bentonite and polymer slurry wall was installed around the site to a depth of 30 to 35 feet to limit the off-site migration of PCBs. The impacted soil was subsequently covered with a clay and asphaltic concrete cap (Dames & Moore, March 1993).

1.4 Scope of Work

The scope of work performed during this investigation included the following:

- Excavation of several exploratory trenches using a backhoe to evaluate geophysical anomalies and the extent of impacted soil.

- Collection of 15 soil samples from various on-site locations.

- Laboratory analysis of 10 soil samples for TPH as gasoline and BTEX (EPA Test Method 8015/8020), total petroleum oil (Standard Test Method 5520EF), and volatile organic compounds (VOCs) (EPA Test Methods 8010 and 8240); analysis of 11 samples for TPH as diesel (EPA Test Method 8015); and analysis of six samples for PCBs (EPA Test Method 8080), and metals including cadmium, chromium, lead, zinc, and nickel.

- Preparation of this report.

2.0 SITE INVESTIGATION

2.1 Backhoe Exploration

On April 1, 1993, a backhoe was used to excavate several exploratory trenches at locations A through L (Figure 2). The purpose of these trenches was to evaluate several anomalies detected during the previous geophysical survey as well as to uncover sections of the buried piping so that an evaluation of pipe size and use could be made. Several soil samples were collected and analyzed by a state certified laboratory to evaluate the nature and extent of impacted soil. Analytical results are present on Figure 3. In addition, an organic vapor meter (OVM) was used in the field to screen excavated soil for volatile hydrocarbons. Color Photographs of several of the trenches are presented on Figures 4A and 4B.

2.1.1 Trench A

Trench A was excavated at the southeast corner of the property to further evaluate a north-south trending pipeline that was previously encountered in this area (Dames & Moore, March 1993). The end of a 4-inch diameter pipe was encountered at a depth of approximately 1 foot. This pipe extends off-site to the north. The southern pipe end was capped; however, an approximately 1-inch diameter screw plug was open at the top of the pipe. No fluids were observed in the pipe. Black silty clay was encountered at the ground surface to the top of the ground water table at a depth of approximately 3.5 feet. The silty clay visually appeared to be saturated with petroleum oil. Two soil samples (SS-8) collected at a depth of 1.5 and 3.0 feet revealed TPH as gasoline, TPH as diesel and petroleum oil at levels up to 320 ppm, 2,500 ppm and 13,000 ppm. An oil sheen was also observed floating on the ground water (Figure 4B).

The source of oil encountered and the purpose of the pipe were unclear. However, Because the pipe runs off-site, it is likely a former utility line.

2.1.2 Trench B

To evaluate soil quality along a former railroad spur, Trench B was excavated along the western site boundary. Approximately 1 foot of dark brown gravelly fill was encountered below the former track spur. Soil sample SS-7 was collected at a depth of 0.5 feet; TPH as diesel, petroleum oil, and PCB 1260 were detected at 37, 670, and 0.62 ppm, respectively. This gravel was underlain by brown silty clay to a depth of 3.5 feet. Between 3.5 to 4.5 feet, an increase in sand and gravel content as well as a strong petroleum odor were noted. A grayish green soil discoloration and OVM reading of over 1,000 ppm were noted. A diesel-like product was observed on the ground water which was encountered at a depth of 4.5 feet.

2.1.3 Trenches C, D, and E

Trenches C, D, and E were excavated along an east west trending pipeline that was uncovered during previous on-site work (Dames & Moore, March 1993). This pipe was buried at a depth between 2.0 and 3.5 feet; it was 6 inches in diameter at the west end and 4 inches diameter pipe at its east end. The west end of the pipe was open and filled with soil. The eastern end was submerged in the existing water filled excavation.

Discolored grayish green soil (sandy/gravelly clay) was generally encountered between depths of 2.5 to 5-feet. OVM readings ranged to over 1,000 ppm with the highest levels recorded in Trenches C and E. Soil Sample SS-4 was collected at a depth of 4.5-feet in Trench E. TPH as diesel, TPH as gasoline and petroleum oil was detected at 880, 320 and 1,200 ppm,

respectively. Between the depths of 5 and 7 feet, a decrease sand and gravel content as well as discoloration was observed. A second soil sample was collected at 7 feet. TPH as diesel and TPH as gasoline was detected at 34 and 2.6 ppm, respectively. Near the surface of the ground water, an increase in the grayish green discoloration was observed.

The magnetic anomaly previously detected at Trench D corresponded with a known pipe; however, its magnitude suggested that additional buried objects may be present at this location. During trenching, however, only the pipeline was observed.

2.1.4 *Trenches F, G, and H*

Trenches F and G were excavated along a 2-inch diameter pipe that was capped at its western end. This pipe was buried at a depth of approximately 2.5 feet and extended off-site to the east. Similar to the other trenches, discolored grayish-green silty and sandy clay was encountered extending downward from a depth of approximately 3 feet. An increase in sand and gravel was observed with depth. Ground water was encountered at a depth of approximately 6 feet. A diesel-like product was observed on the ground water. OVM readings ranged to over 1,000 ppm. Four soil samples were collected from Trenches F and G. TPH as diesel, TPH as gasoline and petroleum oil were detected at levels up to 2,900, 2,200 and 980 ppm, respectively.

At the location of Trench G, two additional pipe lines were connected to the main pipe. One pipe ran south approximately 20 feet and the other ran east parallel to the main pipe. The pipe connection was broken during excavation, allowing access. The pipes were empty and appeared to be old water lines due to the

presence of calcium scaling. OVM readings taken from inside the pipes were not elevated.

Trench H was excavated to a depth of 2.5-feet at the end of the southern branch line. Impacted soil was not encountered at this depth.

2.1.5 Trenches I, J, K, and L

Trenches I, J, and K were excavated at previously detected magnetic anomaly locations (Dames & Moore, March 1993). A broken 3-foot long section of 2-inch diameter steel pipe was discovered in Trench I. In Trench J, a 1.5-inch diameter steel electrical conduit was found. This conduit was broken at the anomaly location; it extended both north and south from the break. Another broken section of 2-inch diameter piping approximately 2 feet in length was found in Trench K.

Soil encountered in these trenches did not appear to be impacted. Trench J was excavated to a depth of approximately 2.5 feet while the others were excavated to a depths of approximately 5 feet. The soil encountered was not discolored and no elevated OVM readings were recorded.

The pipe extending west from Trench L was a 1-inch diameter conduit; it was not connected to the 4-inch line that runs north and south.

2.1.6 Suspect UST

A suspected underground storage tank (UST) fill pipe located along the sidewalk on the northern boundary of the site was also observed during the geophysical survey. This pipe was opened and its depth was measured to be approximately 6 feet. This pipe did not

appear to be a tank fill pipe. The tank capacity was estimated to be approximately 600 gallons with a diameter of 3 feet. A few inches of liquid that appeared to be a petroleum oil were present at the tank bottom.

2.2 Analytical Results

Based on OVM readings and field observations, 15 soil samples were collected from several trenches; 10 samples were selectively analyzed for petroleum fuel hydrocarbons, VOCs, PCBs, and metals. The analytical results are summarized in Table 1. According to the analytical laboratory, the petroleum fuel scans detected a mixture of petroleum compounds including kerosene. The analytical laboratory characterized these TPH mixtures by comparing the gas chromatogram obtained for the sample with a library of chromatograms typically associated with fresh product. The site characterization results characterized the TPH in the site soil as a weathered mixed of petroleum products. These weathered mixtures bear little resemblance to fresh product. A discussion of sampling protocol and copies of the laboratory reports are attached in Appendix A.

TABLE 1. Laboratory Results of Soil Samples from Exploratory Trenches
6121 Hollis Street
Emeryville, California
(concentrations in ppm)

Sample	Depth (ft)	Gasoline	Diesel	Oil	Benzene	Toluene	Ethyl-benzene	Xylenes	VOCs†	PCBs
SS-1**	3.0	1,600 (C4-C12)	850 (C9-C15)	970	0.89	1.8	3.0	3.7	ND*	ND
SS-1	7.0	2,700 (C4-C12)	1,200 (<C20)	NA	12	<.005	13	24	ND	NA
SS-2	3.0	<1.0	<1.0	<50	<.005	<.005	<.005	<.005	ND	NA
SS-2	6.0	140	450	310	<.005	<.005	<.005	0.24	ND	NA
SS-3**	2.5	2,200 (C4-C12)	2,900 (C9-C15)	980	1.8	<.005	<.005	12	ND	ND

continued

TABLE 1. Laboratory Results Soil Samples from Exploratory Trenches
6121 Hollis Street
Emeryville, California
(concentrations in ppm)
(continued)

Sample	Depth (ft)	Gasoline	Diesel	Oil	Benzene	Toluene	Ethyl-benzene	Xylenes	VOCs†	PCBs
SS-3	6.0	<1.0	<1.0	<50	<.005	<.005	<.005	<.005	ND	NA
SS-4**	4.5	320	880 (C9-C20)	1,200	0.22	0.27	0.49	2.3	ND	ND
SS-4	7.0	2.6 (C4-C12)	34 (C9-C21)	NA	<.005	0.014	0.022	0.022	ND*	NA
SS-5	4.5	<1.0	1.9 (C5-C15)	<50	<.005	<.005	<.005	<.005	NA	NA
SS-7**	0.5	NA	37 (C16)	670	NA	NA	NA	NA	ND	0.62
SS-8**	1.5	NA	NA	7,700	NA	NA	NA	NA	NA	0.042
SS-8**	3.0	320 (C4-C12)	2,500 (C10-C17+>C17)	13,000	0.21	<.005	<.005	0.20	ND*	NA

NA Not analyzed
ND Not Detected Above Laboratory Detection Limits
† EPA Test Method 8010 (Except as Noted)
* EPA Test Method 8240
** Also analyzed for Metals (Cd, Cr, Pb, Zn, and Ni)

Several samples, as noted in Table 1, were also analyzed for metals including cadmium, chromium, lead, zinc, and nickel. Metal levels appeared to be at background levels with the exception of soil sample SS-7, which was collected beneath the railroad spur near the property's western boundary. Elevated levels of lead and zinc were detected at 520 and 500 ppm, respectively. However, these levels are below the Total Threshold Limit Concentration or the maximum total concentrations of chemicals allowed in a non-hazardous waste.

3.0 CONCLUSIONS

The site is proposed to be developed as a United States Postal Service facility by June 1994. We understand that construction will require approximately 200 days. To achieve final grades, we also understand that 2,000 cubic yards of soil will likely be off-hauled. The facility is expected to cover approximately 95 percent of the native soil The cover cap will consist of the building foundation, asphaltic parking areas, and drives. Reportedly, only small strips of land primarily at the entrance along 62nd Street will be left uncapped to allow planting of decorative landscaping.

The purpose of this investigation was to evaluate magnetic anomalies detected by others as well as to further evaluate soil quality.

3.1 Anomalies and Piping

The magnetic anomalies detected by Dames & Moore (March 1993) at the site appear to be associated with various sections of piping and debris. The majority of the piping encountered appears to be old utility lines which serviced the former on-site buildings. However, a possible fuel transfer line 4 to 6 inches in diameter was encountered extending approximately 100 feet east from Trench C.

In addition to the underground storage tank uncovered during previous construction activities, a second tank is present beneath the sidewalk along the northern portion of the property. Based on field measurements, the estimated capacity of this tank is 600 gallons.

3.2 Soil Quality

In general, non-impacted silty and sandy clay was encountered at the ground surface extending to a depth

of 2 to 3 feet in most test trenches. On the southern half of the site, approximately 3,000 to 6,000 cubic yards of discolored (greyish-green) silty/sandy clays were generally encountered from 2 to 3 feet downward to ground water. Ground water was encountered at depths ranging from 4 to 6 feet.

Four forms of TPH have been detected in the on-site soils generally at depths ranging from 2 to 3 feet below the ground surface to the top of the ground water table at a depth of 4 to 6 feet. These petroleum hydrocarbons have been characterized as TPH as diesel, TPH as gasoline, kerosene, and oil. TPH as diesel was detected in nine of eleven samples; TPH as gasoline was detected in seven of ten samples and petroleum oil was detected in seven of ten samples. The analytical laboratory indicated the presence of TPH as kerosene in a majority of the samples tested; however, analytical testing was not performed to quantify its concentration. According to Dames & Moore (March 1993), the kerosene may be associated with the abandoned UST located in the south-central portion of the site. TPH as gasoline and diesel concentrations generally ranged from 750 to 1,000 ppm with concentration up to 2,900 ppm. Our investigation was inconclusive to source of the gasoline and diesel; however, in our opinion, they are likely associated with the former on-site above ground fuel storage tanks. Petroleum oil generally ranged from 500 to 1,000 ppm with concentrations up to 13,000 ppm near the southeast corner of the site. This soil appeared to be impacted by a "heavy" petroleum oil, different from the diesel-like product encountered in the other trenches. The impacted soil extended to ground water. The source of the elevated oil concentrations is also unclear; it is likely associated

with either the abandoned pipeline detected in Trench A or the former aboveground fuel storage tanks.

At most locations, the petroleum impacted soil encountered appeared to be within a relatively permeable stratum located directly above the ground water table. This stratum is likely within the zone of ground water fluctuation or capillary fringe. Free product on the ground water table appears to have been transported across the site, subsequently impacting soil throughout the zone of ground water fluctuation. What appeared to be a diesel fuel was also observed on the ground water table in several of the trenches on the southern portion of the site and in Monitoring Well MW-1. The thickness of this product ranged from a sheen to approximately 1/8 inch.

3.3 PCBs/Metals

PCB 1260 and elevated levels of lead and zinc were also detected in one soil sample collected beneath the railroad spur near the western property boundary. This sample was collected at a depth of 0.5 feet from the gravelly fill material. This gravel layer is approximately 1 foot thick. The lead, zinc, and PCB 1260 concentrations detected in this material were below their respective TTLC values of 1,000, 5,000, and 50 ppm, respectively.

4.0 RECOMMENDATIONS

In our opinion, the levels of petroleum fuel hydrocarbons detected on-site warrant the implementation of remedial measures to reduce contaminant concentrations and the potential for further migration. Our recommendations are summarized below:

- We recommend contacting former on-site tenants and owners to evaluate responsible parties and to obtain financial assistance with further on-site remedial actions.

- We recommend contacting Westinghouse regarding the 2,000 cubic yards of soil potentially impacted with low levels of PCBs that will be off-hauled from the site during construction. We understand that the PCB contamination likely came from the Westinghouse facility.

- We recommend consulting with an environmental attorney concerning reporting obligations to state and local agencies.

- Prior to the start of construction activities, we recommend that the two underground storage tanks at the site be removed and appropriately disposed. The suspected product pipe extending east from Trench C should also be removed. This work should be performed in accordance with all regulatory guidelines. The remaining piping is suspected to be only old utility lines. However, it may also be desirable to remove these lines so that they do not interfere with construction activities.

- We recommend further evaluation of the site's soil and ground water characteristics. Three to five monitoring/extraction wells should be installed across the site to further evaluate ground water quality, aquifer parameters and soil quality underlying the shallow water-bearing zone. At least one monitoring well should be installed near the site's up-gradient property boundary. Data from

this well would help evaluate if off-site/up-gradient petroleum fuel sources are impacting the site. Consideration should also be given to evaluating the extent of ground water contamination down-gradient of the site.

- We recommend evaluating remedial alternatives and objectives. The remedial objectives should specify the contaminants and media of interest, exposure pathways, and preliminary remedial goals that permit a range of treatment and/or containment alternatives to be developed. Based on the preliminary data presented above, the remedial alternatives that should be considered include no action, soil excavation and ground water pump and treat, and soil vapor extraction enhanced with steam injection and ground water pump and treat. Pilot/treatability studies should also be conducted to evaluate the success of the preferred remedial alternative.

- In our opinion, the evaluation of remedial objectives and alternatives as well as the design of the preferred remedial technology can be completed by August 1993. We recommend that the design recommendations be incorporated into the upcoming bid document for the construction of the postal facility. We understand that the Postal Service desires to begin construction activities on-site so that the new facility, with a construction schedule of 200 days, can be completed by June 1994. Since 2 to 3 feet of non-impacted soil appears to be present across much of the site, in our opinion, depending upon the approved remedial alternative, construction activities could proceed as

planned if the approved remedial alternative is incorporated into the general construction plans. Installation of various remedial system components could also be performed concurrently with and/or before construction activities. If pilot testing shows that a combined ground water and steam injection/vapor extraction system will be cost effective for site remediation, extraction/injection wells and trenching could be installed during site construction. The system could subsequently operate from within a fenced on-site enclosure with minimal disturbance to normal facility activities.

Since soil appears to have been impacted by free product present on the ground water table, it does not appear that excavation of the soil would be a cost-effective means of remediation. Soil excavation alone would not cleanup impacted ground water. The degraded petroleum oil detected in the southeastern corner of the site appears to be different from the petroleum compounds encountered at the other trench locations. In our opinion, the petroleum oil detected at this location may be difficult to degrade using remedial techniques previously discussed. Thus, assuming that the volume is relatively small, excavation and off-site disposal of this material may be the most cost-efficient remedial method. We estimate that excavation, transportation, and disposal of this material would cost approximately $75 to $150 per cubic yard.

Based on the preliminary data obtained from the site, on a preliminary basis, it appears that a remedial system consisting of ground water and soil vapor extraction/treatment enhanced with steam injection would be applicable to site conditions. In our opinion,

remediation costs for this type of system would be much less expensive than off-hauling impacted soil and importing clean soil.

A soil vapor extraction system uses a vacuum pump to draw soil vapor from extraction wells constructed with slotted casing in the impacted stratum. The increased subsurface air flow volatilized the lighter hydrocarbons which are removed in gaseous form. The soil vapor is then treated prior to discharge to the atmosphere. Ground water extraction and treatment, which results in a "flushing" of contaminants from soil within the water-bearing stratum, is commonly combined with soil vapor extraction.

Soil vapor extraction is usually very effective in removing volatile (gasoline range) hydrocarbons from subsurface soils. However, heavier diesel and oil range hydrocarbons are also present in soil at the site. To enhance the volatilization of these heavier compounds, we recommend that steam injection be evaluated for applicability to the site.

Steam Injection/Vapor Extraction (SI/VE) systems use wells to inject steam into the impacted area both above and below the ground water table. Ground water and soil vapor extraction wells are also installed within the impacted area. The impacted soil and and ground water are heated by the steam, creating a steam zone. As the steam zone grows towards the extraction wells, it pushes the hydrocarbons ahead of it. In the steam zone, the residual hydrocarbons are volatilized at the elevated temperatures (up to 450°F) and captured by the extraction wells. The extracted vapors are then condensed, and the recovered condensate and ground

water are passed through an oil/water separator. The recovered fuel can be recycled elsewhere. A portion of the treated ground water can then be reinjected to the subsurface as steam.

This technology was historically developed for use in the petroleum industry to force underground oil reserves toward extraction wells. However, it has more recently been found to be an effective technique for remediation of petroleum fuel impacted soil and ground water.

5.0 LIMITATIONS

Soil deposits and rock formations may vary in type, strength, and many other important properties across any geologic area. The study that we have made assumes that the data obtained in the field and laboratory are reasonably representative of field conditions and that the subsurface conditions are reasonably susceptible to interpolation and extrapolation between sampling locations.

The accuracy and reliability of geo- or hydrochemical studies are a reflection of the number and type of samples taken and the extent of the analysis conducted, and is thus inherently limited and dependent upon the resources expended. Our sampling and analytical plan was designed using accepted environmental engineering principles and our judgement for the performance of a reconnaissance soil quality investigation, and was based on the degree of investigation desired by you. It is possible to obtain a greater degree of certainty, if desired, by implementing a more rigorous soil sampling program or by installation

of monitoring wells to establish a baseline of ground water quality.

This report was prepared for the use of the United States Postal Service in evaluating conditions at the referenced site at the time of this study. We make no warranty, expressed or implied, except that our services have been performed in accordance with environmental engineering principles generally accepted at this time and location. The chemical and other data presented in this report can change over time and are applicable only to the time this study was performed.

* * * * * * * *

REFERENCES

Harding Lawson Associates (HLA), "Site Investigation Report, Proposed Facility, 6121 Hollis Street Emeryville, California," April 22, 1992.

Dames & Moore, "Health and Safety Plan for the U.S. Postal Service, 6121 Hollis Street Emeryville, California," March 4, 1993.

Dames & Moore, "Geophysical Survey Results, U.S. Postal Service Emeryville Facility, 6121 Hollis Street Emeryville, California," March 5, 1993.

Dames & Moore, "Soil Sampling and Chemical Testing Results, U.S. Postal Service Emeryville Facility, 6121 Hollis Street Emeryville, California," (Draft) March 16, 1993.

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Photograph #1
Trench A

Photograph #2
Trench B

864-17, 4/14 SF*EB

SITE PHOTOGRAPHS

EMERYVILLE POSTAL FACILITY
Emeryville, California

LOVNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE 4A
864-17, April 1993

Photograph #3
Trench C

Photograph #4
Trench F

864-17, 4/14 SF*eb

SITE PHOTOGRAPHS

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FIGURE 4B
864-17, April 1993