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Alameda County
Environmental Health

GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES

Project No.
7584.1.001.01

June 1, 2007
Revised July 9, 2007

Mr. Robert Strong
500 Bollinger Canyon Way, Suite A4
San Ramon, CA 94583

Subject: 224 Rickenbacker Circle
Livermore, California

WORK PLAN FOR ADDITIONAL SITE CHARACTERIZATION

Dear Mr. Strong:

ENGEO Incorporated (ENGEO) is pleased to present this work plan for additional site characterization at 224 Rickenbacker Circle in Livermore, California (Figure 1). This work plan was developed in response to the Alameda County Health Services Agency letter dated June 26, 2007. The purpose of the proposed activities is to further delineate the soil vapor impacts and further define the extent of tetrachloroethylene (PCE) impacted soil and groundwater beneath the Property.

SITE CONCEPTUAL MODEL

Alameda County Environmental Health (ACEH) has requested a Site Conceptual Model (SCM) for 224 Rickenbacker Circle. The purpose of the SCM is to summarize important site issues and provide a guide for future assessment and remediation. The various components of the SCM are presented below.

Brief Site History

The site was formerly operated as a dry cleaning facility that previously utilized a PCE-based machine. According to the property owner, approximately 10 years ago, the PCE-based machine was replaced by an Exxon DF2000 clean solvent machine and subsequently a silicon based machine. All equipment was removed from the building in October 2005. In 2005, impacted soil was first discovered during property transaction due diligence activities. Site characterization and delineation of soil, soil gas, and groundwater impacts have been ongoing since 2005 as described below. The site has remained unoccupied since 2005 and the owner has proposed continued use of the site for commercial purposes.

Current Site Description

The site is currently occupied by a vacant structure and paved parking areas. A landscaped area is located north of the building, along Rickenbacker Circle. The property is located within a commercial area. The Livermore Water Reclamation Plant is located approximately 750 feet to the

west and the Livermore Municipal Airport is located approximately ½ mile west of the property. Residential development is located approximately 750 feet to the south and 1,500 feet to the east.

Based on subsurface conditions encountered during previous field work, the site is underlain by silty clay with interbedded layers of clayey silt/sand, and gravelly sand. First groundwater has been encountered across the site at depths ranging from 22 to 26 feet below the ground surface. Based on review of the Preliminary Stratigraphic Evaluation prepared by Norfleet Consultants for Zone 7 Water Agency, multiple aquifers likely exist beneath the property.

Site Characterization

As part of due diligence activities, JMK Environmental Solutions, Inc. advanced three soil borings to a depth of approximately 35 feet below the ground surface and recovered soil samples from each boring in October 2005. Analytical results of the soil samples indicated the presence of PCE to the maximum depth explored in the two borings nearest the former dry cleaning machine location. Based on review of the laboratory results for the soil samples, several samples exhibited concentrations of PCE in excess of the San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels (ESLs) for vapor intrusion. Groundwater was not encountered during the investigation, and therefore, no groundwater samples were collected.

A copy of the report prepared by JMK Environmental Solutions, Inc. was submitted to the ACEH along with a request for Site/Case Closure. ACEH issued a letter dated July 6, 2006, in response to the request for case closure, requesting a work plan to delineate the extents of contamination at the Property.

In October 2006, P&D Environmental conducted indoor air sampling. Two samples and one duplicate sample were recovered from inside the current structure. The analytical results from Air Toxics, Ltd. were compared OSHA Permissible Exposure Levels (PELs) and found not to exceed the established screening values for indoor air. A detailed report was not provided summarizing the indoor air quality assessment.

In December 2006, ENGEO prepared a work plan to conduct soil vapor sampling, and recover soil and groundwater samples across the Property. Soil vapor samples were recovered utilizing a mobile laboratory in January 2007 and an Interim Site Characterization Report was prepared and submitted to ACEH in February 2007. The report summarized the field activities and the analytical results. Results from the soil vapor assessment indicated elevated concentrations of volatile organic compounds (VOCs). All eight soil vapor samples, recovered from beneath the building and the associated parking areas had concentrations of VOCs exceeding their respective ESLs.

In March 2007, ENGEO advanced five borings to depths ranging between 25 and 35 feet below the ground surface for recovery of soil and groundwater samples. Analytical results indicated the presence of chlorinated VOCs and total petroleum hydrocarbons as diesel in the soils at the Property. The constituents were reported at concentrations below the ESLs established by the

SFRWQCB for commercial soil to indoor air and for commercial land use where groundwater is a current or potential drinking water resource. Soil impacts were generally limited to the area near the former dry cleaning machine and to a depth of approximately 10 feet. Several VOCs were detected in the groundwater beneath the Property exceeding the Maximum Contaminant Level of 5 micrograms per liter (ug/L) as established by the California Department of Health Services.

Current Soil Vapor, Soil and Groundwater Concentrations

Soil vapor samples were analyzed using an onsite mobile laboratory and a summary of soil vapor analytical results are presented in Table 4, and are compared to the San Francisco Regional Water Quality Control Board's (SFRWQCB's) environmental screening levels (ESLs[1]) for evaluation of potential indoor air impacts (Table E-2). Volatile organic compounds were detected in all soil vapor samples collected. Reported concentrations for tetrachloroethene (PCE) exceed the ESLs set forth by the SFRWQCB in all soil vapor samples recovered. In the soil vapor sample recovered from directly below the former dry cleaning machine, reported concentrations for *cis*- and *trans*-1,2-dichloroethene, trichloroethene and vinyl chloride exceed their respective environmental screening levels.

Several VOCs have been detected in soil samples recovered from the Property including acetone, *cis* 1,2 dichloroethene, *trans*-1,2-dichloroethene, trichloroethene, and PCE. Acetone was detected in sample S-3 at a depth of 4 feet below the ground surface (bgs) and a concentration of 0.049 mg/kg. In sample S-3 at 2 and 4 feet bgs, *cis*-1,2-dichloroethene was detected at concentrations of 0.054 mg/kg to 0.061 mg/kg and *trans*-1,2-dichloroethene was detected at concentrations of 0.015 mg/kg to 0.0065 mg/kg, respectively. PCE was detected in sample S-3 at depths of 4 and 8 feet bgs at concentrations of 0.013 mg/kg and 0.0066 mg/kg respectively. Additionally, PCE was detected at concentrations ranging from 0.012 to 0.079 mg/kg in sample S-3 at 4, 8, and 10 feet bgs. No VOCs were reported above laboratory detection limits for samples S-1, S-2, S-3, S-4 and S-5 at the saturated zone.

Total Petroleum Hydrocarbons (TPH) as diesel were reported at concentrations ranging from 1 to 13 mg/kg in soil samples recovered at sampling locations S-2, S-3, and S-5. TPH as gasoline was reported at a concentration of 0.33 mg/kg at sample location S-3 at a depth of 2 feet bgs. TPH as motor oil was not reported above laboratory detection limits in any of the samples. Analytical results for the shallow soil samples (recovered from 0 to 10 feet below the ground surface) are presented in Table 1 and deep soil samples (recovered from greater than 10 feet) are presented in Table 2.

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[1] San Francisco Bay Regional Water Quality Control Board; February 2005, Interim Final, Screening for Environmental Concerns at Site with Contaminated Soil and Groundwater, Volume 1, Table K-1, Direct-Exposure Screening Levels, Residential Exposure Scenario.

VOCs detected in the groundwater samples include *cis*-1,2-dichloroethene, trichloroethene, toluene, and PCE. *Cis*-1,2-dichloroethene was reported in samples S-3 and S-5 at concentrations of 1.6 micrograms per liter (µg/L) and 0.54 µg/L. Additionally, trichloroethene was reported in samples S-3 and S-5 at concentrations of 2 µg/L and 2.2 µg/L respectively. Analytical results indicated the presence of toluene in samples S-3 through S-5 at concentrations ranging from 0.86 µg/L to 1.8 µg/L. PCE was reported in samples S-2 through S-5 at concentrations ranging from 1.8 µg/L (sample S-2) to 36 µg/L (sample S-5).

Total Petroleum Hydrocarbons (TPH) as diesel was reported in the groundwater sample recovered at sample location S-4 at a concentration of 70 µg/L. TPH as gasoline and TPH as motor oil were not reported above laboratory detection limits in any of the groundwater samples. Groundwater analytical results are summarized in Table 3.

Sensitive Receptors

As part of the Soil and Groundwater Sampling Results report, a request was submitted to Zone 7 Water Agency to provide a ½-mile radius well search. Zone 7 provided a map depicting well locations (Figure 2), and two wells were identified approximately 360 feet southeast of the Property. In preparation of this work plan, additional information regarding the two wells was requested from Zone 7. According to Mr. Wyman Hong, the two wells located southeast of the Property are no longer in existence. Well 3S/2E-7C1 (open blue triangle) was destroyed on December 7, 1983, and it was an agricultural well with a 14-inch-diameter casing and 280 feet deep. Well 3S/2E-7D1 (yellow cross) cannot be located and most was likely destroyed by construction; this well was documented in a San Francisco Water Department report dated 1912. No other information regarding these two wells is available.

The nearest residence is located approximately 950 feet south of the Property, and Rancho Las Positas Elementary School is located approximately 1300 feet southeast of the site at 401 E Jack London Boulevard. Lake Del Valle, the local reservoir used for drinking water supply, is located approximately 6 miles southeast of the Property.

Exposure Pathways

A flowchart was created to evaluate potential exposure pathways as shown on Figure 3. The site is currently occupied by a vacant structure located in a commercial area. Impacts from the former dry cleaning facility are present in shallow soil below the building, in groundwater below and to the southwest of the building, and soil vapor throughout the site. The primary chemical of concern, PCE, was stored and used onsite as part of the previous dry cleaning operations. It is suspected that surface spills of PCE and discharge of PCE-impacted wastewater were the release mechanisms that allowed PCE to enter the subsurface soil beneath the site. Through leaching, PCE has migrated from soil to groundwater beneath the site. Through volatilization of the impacts in soil and groundwater, soil vapor has been also impacted.

According to the well search performed by Zone 7 Water Agency, there are no domestic wells within ½-mile of the site. This information was confirmed by a windshield survey completed by ENGEO on May 22, 2007. Given the lack of nearby domestic wells and the limited impacts to groundwater at the site, it is unlikely that the ingestion, direct contact, or inhalation exposure pathways are complete for groundwater; however, since the impacts to groundwater have not been completely delineated, these pathways are currently considered to be potentially complete.

Inhalation of impacted vapors created from volatilization within the building was identified as a complete exposure pathway. We believe the potential for exposure to vapor inhalation is limited due to the industrial use of the site and an existing ventilation system present in the structure.

The nearest surface water body identified is Lake Del Valle, the local reservoir used for drinking water supply, located approximately 6 miles southeast of the site. Due to the large distance between the site and Lake Del Valle, the potential migration of impacts to surface water or sediments was found to be incomplete.

Data Gaps

The following data gaps have been identified for the site:

- Delineation of soil vapor impacts
- Delineation of soil impacts
- Delineation of groundwater impacts
- Direction of groundwater flow and gradient
- Adequate indoor air assessment

The following additional sampling activities have been proposed to address the identified data gaps listed above.

SCOPE OF WORK

Additional Soil Vapor Sampling

Five additional soil vapor samples will be recovered from the Property as depicted on Figure 4. The soil vapor samples will be recovered from approximately 5 feet below the ground surface using direct-push technology. Small-diameter non-reusable sampling tubes will be utilized at each sampling location. Hydrated bentonite will be used to seal around the drive rod, and the inner soil gas pathway from probe tip to the surface will be continuously sealed. Leak detection compounds will be utilized at all system connections and seals prior to sampling. Soil gas samples will be collected using protocols and procedures consistent with "Advisory – Active Soil Gas Investigations" dated January 13, 2003 (Los Angeles Regional Water Quality Control Board and DTSC).

The soil gas samples will be submitted to a fixed-based laboratory and analyzed for VOCs (EPA TO-15). The results of the soil gas analysis will be compared to the applicable ESLs[2].

The property owner is currently attempting to gain access to abutting properties for the purposes of off-site characterization. Off-site soil vapor sampling will be addressed in a subsequent work plan once access agreements have been obtained.

Indoor Air Sampling

Prior to the implementation of an indoor air sampling program, additional soil vapor sampling will be conducted to further define the extent and sources of contamination.

Utility Corridor Assessment

A utility corridor assessment will be conducted in accordance with the December 15, 2004, DTSC *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air.* As part of the assessment, facility records including copies of the utility maps, historical use maps, building "as-built' drawings, and building construction specifications as well as municipalities utility corridor maps will be reviewed as available.

Based on the utility corridor information obtained from the file review, soil vapor sample locations will be identified in the subsequent work plan to determine presence or absence of vapor migration along the utility corridors.

Monitoring Well Installation

Three groundwater monitoring wells will be installed at locations MW1 through MW3 (Figure 4). Prior to installation, the well locations will be discussed and approved of by ACEH. The well borings will be advanced using a truck-mounted drill rig equipped with 8¼-inch-diameter hollow-stem augers.

The monitoring well borings will be logged in the field under the supervision of a registered Professional Geologist. Samples will be recovered at 5-foot intervals to the base of the boring and screened in the filed with a photoionization detector (PID). Samples exhibiting significant PID readings will be retained for laboratory analysis. In the event no significant PID readings are recorded, one soil sample will submitted from each of the well borings at the top of the saturated zone.

The monitoring wells will consist of 2-inch-diameter PVC casing with flush joints, installed down through the hollow-stem auger. The wells will be constructed with approximately 25 feet

[2] SFRWQCB ESLs, 2003: Table E-2 Shallow Soil Gas Screening Levels for Evaluation of Potential Indoor Air Impacts.

of screened casing (0.01-inch slot width) and an appropriate length of solid PVC well casing (2-inch-diameter Schedule 40 PVC). The wells will be installed to a total depth approximately 10 feet below the static water levels encountered during well installation. The total depth of the monitoring wells will be approximately 40 feet. A No. 2/16-sand-filter pack will be placed from the base of the well to approximately one foot above the top of the screened interval. A ±12-inch-thick bentonite seal will be placed at the top of the filter pack. The remaining annular space will be backfilled with a cement-bentonite grout seal. The wells will be completed with a flush-mounted 8-inch-diameter manhole. The top of the well casings will be surveyed and secured with a locking waterproof cap. The drill cuttings will be placed within sealed 55-gallon drums and upon review of the laboratory analyses, a disposal plan for the soil cuttings will be developed.

After the cement-bentonite grout has set for 48 hours, the wells will be developed through the use of purging and surge blocks to maximize the hydraulic connection between the well and the surrounding aquifer material and remove fine sediment to produce relatively non-turbid groundwater. We anticipate that ten to twenty well volumes of water will be removed during the development process. The purged water will be stored on-site in Department of Transportation approved drums until the results of the laboratory testing are available. At that time a remediation/disposal plan for the purged water will be developed.

Approximately 48 hours after well development, the three wells will be measured for depth to groundwater and then purged using a 12-volt submersible pump. Water quality parameters including dissolved oxygen, pH, and oxygen reduction potential will be measured using a hand-held Hanna 9828 Multi Parameter Water Quality Meter with flow through cell. The groundwater samples recovered in appropriate glassware and will be transported to Severn Trent Labs, Inc. for analysis of VOCs (EPA Method 8260).

Deep Soil Boring

As requested by ACEH, one deep soil boring will be advanced on the site to assess the vertical extent of contamination. Previously, five borings were advanced to approximately 25 to 35 feet, therefore, deeper site geology and the potential presence of a deeper aquifer is currently unknown. Previously, groundwater was encountered at the site at depths of approximately 22 to 26 feet below ground surface in silty clay/clayey sand zone that was saturated to a depth of at least 35 feet. A competent aquitard was not encountered during drilling.

The location of the proposed deep boring is shown on Figure 4, located directly down-gradient of the former dry-cleaning machine. This location was also identified by ACEH as a suspected secondary source of PCE, as a result of elevated soil vapor and groundwater concentrations noted from the previous subsurface assessment work.

We propose to advance the deep boring with a truck-mounted direct-push drill rig equipped with a dual wall sampling system. By using a dual wall sampling system, the inner and outer casings

are driven simultaneously, effectively sealing off the upper groundwater zone to avoid potential cross-contamination of the aquifers. Continuous core samples will be recovered and the boring will be logged under the supervision of a registered Professional Geologist. Soil samples will be recovered at 10-foot intervals to the base of the boring. Samples will be screened in the field with a photoionization detector (PID). Samples exhibiting significant PID readings will be retained for laboratory analysis.

According to the Annual Report for the Groundwater Management Program prepared by Zone 7 Water Agency and published June 14, 2007, the depth to the lower aquifer in a monitoring well located approximately 1,500 feet southwest of the site ranges from approximately 83 to 104 feet below the ground surface. Therefore, the deep boring will be advanced to approximately 100 feet below the ground surface. If no deeper groundwater-bearing zone is encountered in the upper 100 feet of soil, the boring will be terminated and no deep groundwater sample will be collected. If a deeper groundwater-bearing zone is encountered, a depth-specific grab water sample will be collected.

REPORTING

The results of above proposed activities will be summarized in a formal report for submittal to Alameda County Environmental Health. The report will document all of the procedures, techniques, and rationale of the completed activities and include recommendations for potential further investigation or corrective action.

SCHEDULE

We anticipate the additional soil vapor sampling, deep soil boring, monitoring well installation, and baseline groundwater sampling to be completed within six weeks following approval by Alameda County.

If you have any questions or comments regarding this workplan, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO INCORPORATED

Kelly Krohn
kk/smc

Shawn Munger, CHG, REA II

CERTIFIED HYDROGEOLOGIST
SHAWN MUNGER
No. HG 413
CERTIFIED HYDROGEOLOGIST
Exp. 3/31/2009
STATE OF CALIFORNIA

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Well Location Map
Figure 3 – Potential Exposure Pathways
Figure 4 – Site Plan

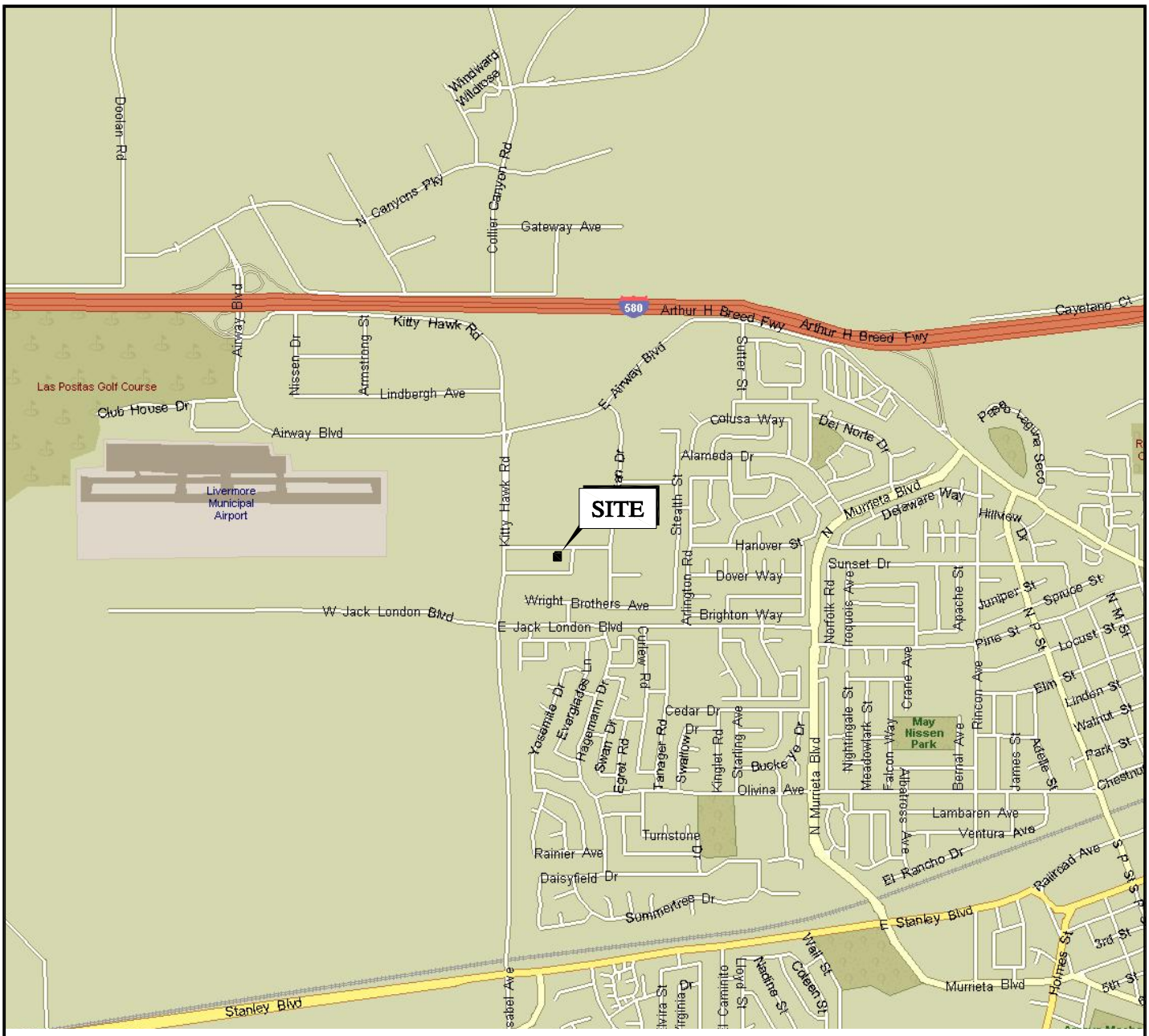
SELECTED REFERENCES

ENGEO Incorporated, Interim Site Characterization Report, 224 Rickenbacker Circle, Livermore, California; February 8, 2007.

ENGEO Incorporated, Soil and Groundwater Sampling Results, 224 Rickenbacker Circle, Livermore, California; March 15, 2007.

Norfleet Consultants, Preliminary Stratigraphic Evaluation, West Side of the Main Basin, Livermore-Amador Groundwater Basin; January 29, 2004.

Zone 7 Water Agency, Annual Report for the Groundwater Management Program, 2006 Water Year; June 14, 2007.



0 FEET 2000

0 METERS 1000

BASE MAP SOURCE: MS STREETS AND TRIPS

ENGEO INCORPORATED EXCELLENT SERVICE SINCE 1971	VICINITY MAP 224 RICKENBACKER CIRCLE LIVERMORE, CALIFORNIA	PROJECT NO.: 7584.1.001.01 DATE: JULY 2007 DRAWN BY: SRP CHECKED BY: SM	FIGURE NO. 1

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EXPLANATION

- WATER SUPPLY WELL
- UNKNOWN OR CATHODIC PROTECTION WELL
- MONITORING WELL
- ABANDONED SUPPLY WELL
- DESTROYED WELL

BASE MAP SOURCE: ZONE 7 WATER AGENCY

NO SCALE

ENGEO INCORPORATED
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WELL LOCATION MAP

224 RICKENBACKER CIRCLE
LIVERMORE, CALIFORNIA

PROJECT NO.: 7584.1.001.01	APPENDIX NO. 2
DATE: JULY 2007	
DRAWN BY: SRP	CHECKED BY: SM

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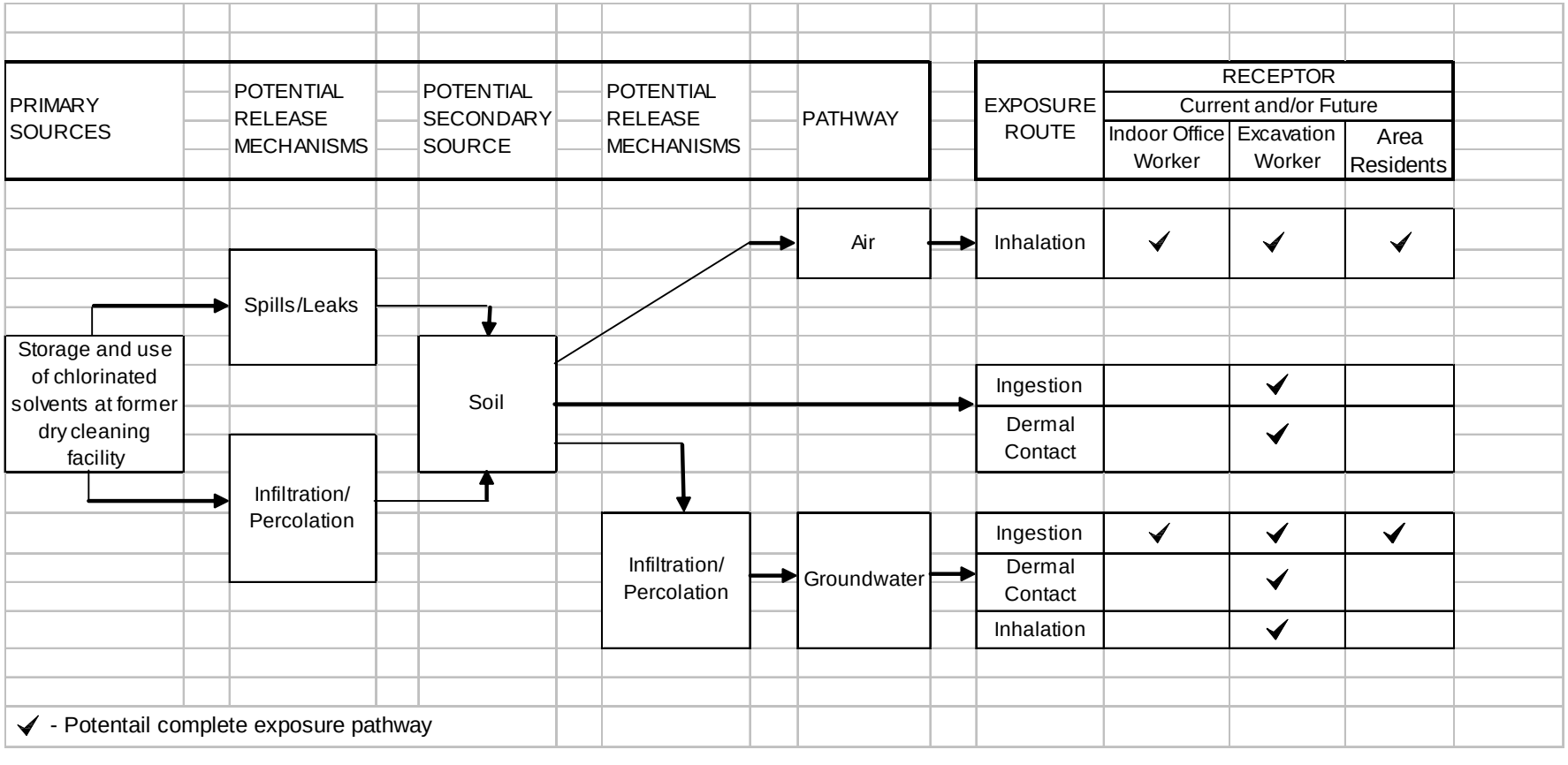

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POTENTIAL EXPOSURE PATHWAYS
224 RICKENBACKER CIRCLE
LIVERMORE, CALIFORNIA

PROJECT NO.: 7584.1.001.01
DATE: JULY 2007
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FIGURE NO. 3

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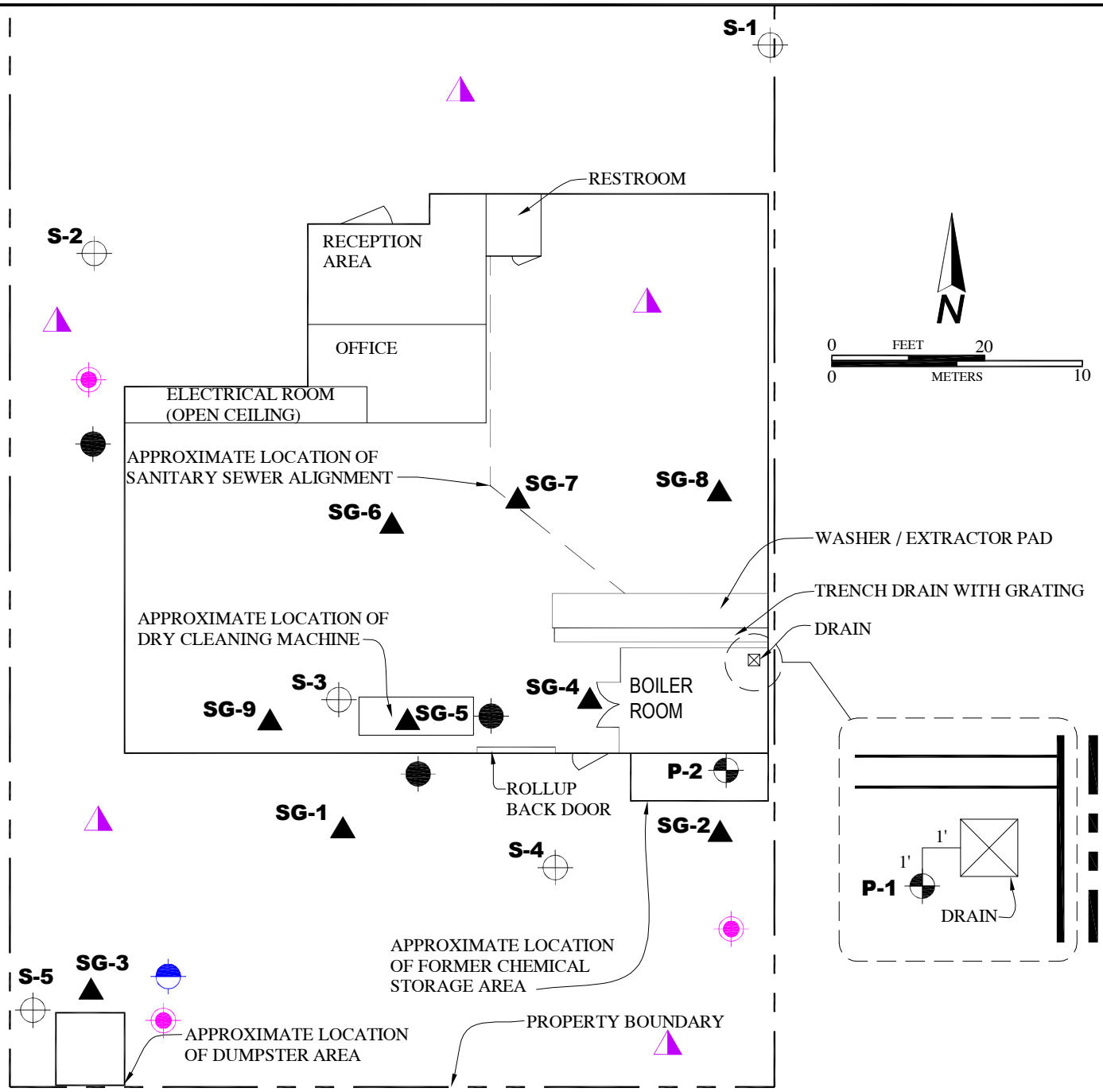

EXPLANATION

- SG-9 ▲ APPROXIMATE LOCATION OF SOIL GAS SAMPLE
- APPROXIMATE LOCATION OF BORING (BY JMK ENVIRONMENTAL, OCTOBER 2005)
- APPROXIMATE LOCATION OF PROPOSED DEEP BORING
- P-2 APPROXIMATE LOCATION OF SOIL AND GROUNDWATER SAMPLE (ENGEO, MARCH 2007)
- S-5 APPROXIMATE LOCATION OF SHALLOW SOIL SAMPLE (ENGEO, JANUARY 2007)
- APPROXIMATE LOCATION OF PROPOSED MONITORING WELL
- APPROXIMATE LOCATION OF PROPOSED SOIL GAS SAMPLE

BASE MAP SOURCE: CITY OF LIVERMORE BUILDING DEPARTMENT

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SITE PLAN

224 RICKENBACKER CIRCLE

LIVERMORE, CALIFORNIA

PROJECT NO.:	7584.1.001.01
DATE:	JULY 2007
DRAWN BY:	SRP
CHECKED BY:	SM

FIGURE NO. 4

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