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Environmental Services Company
4096 Piedmont Avenue #194
Oakland, California 94611
510.547.8196
510.547.8706 Fax
jennifer.c.sedlachek@exxonmobil.com

Jennifer C. Sedlachek
Project Manager

November 30, 2018

Ms. Karel Detterman
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

RE: Former Mobil RAS #99105/6301 San Pablo Avenue, Oakland, California.

Dear Ms. Detterman:

Attached for your review and comment is a letter report entitled ***Work Plan for Sub-Slab Soil Vapor Assessment,*** dated November 30, 2018, for the above-referenced site. The letter was prepared by Cardno, of Petaluma, California, and details activities at the subject site.

I have read and acknowledge the content, recommendations, and/or conclusions contained in the attached document or report submitted on my behalf to the State Water Board's GeoTracker website.

If you have any questions or comments, please contact me at 510.547.8196.

Sincerely,

Jennifer C. Sedlachek
Project Manager

Attachments: GeoTracker Upload Certification
Cardno's ***Work Plan for Sub-Slab Soil Vapor Assessment,*** dated November 30, 2018

cc: w/ attachment
Oakland Fire Department
Messrs. On Dan and Nathan Lam

w/o attachment
Mr. Scott Perkins, Cardno

GeoTracker Upload Certification

Former Mobil Service Station 99105
6301 San Pablo Avenue, Oakland, California

GeoReport Upload

Report Title	Sample Period	GeoReport
Work Plan for Sub-Slab Soil Vapor Assessment	not applicable	✓

Note: EDF, GeoWell, GeoMap, GeoZ, GeoXY, and GeoBore not applicable for this report.

November 30, 2018
Cardno 2783C.W05

Cardno

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Petaluma, CA 94954
USA

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Contractor: #997036

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Ms. Jennifer C. Sedlachek
ExxonMobil Environmental Services Company
4096 Piedmont Avenue #194
Oakland, California 94611

SUBJECT **Work Plan for Sub-Slab Soil Vapor Assessment**
Former Exxon Service Station 99105
6301 San Pablo Avenue, Oakland, California

Alameda County Department of Environmental Health RO 445

Ms. Sedlachek:

At the request of ExxonMobil Environmental Services (EMES), on behalf of Exxon Mobil Corporation, Cardno prepared this work plan for sub-slab soil vapor assessment in response to a directive from the Alameda County Department of Environmental Health (ACDEH) dated October 23, 2018 (Appendix A). The ACDEH issued the directive in response to Cardno's *Groundwater and Soil Vapor Assessment, Updated Site Conceptual Model, and Work Plan for Additional Assessment,* dated August 24, 2018 (Cardno, 2018), which was submitted to address the data gap discussed at the February 2, 2018 meeting attended by representatives from the ACDEH, EMES, and Cardno. At the time of the meeting, sub-slab sampling was not requested due to the land use and the occupational exposures at the site.

In addition to the previously-proposed work, Cardno proposes to install two sub-slab soil vapor sampling wells in the portion of the on-site building without the underlying basement. One well will be installed in the space used as an office and storage area and one well will be installed in the bathroom. The purpose of the work is to assess further concentrations of fuel hydrocarbons and related constituents in soil vapor beneath the commercial building at the site and to evaluate potential risks to workers or patrons posed by the potential intrusion of soil vapor to indoor air.

A site description as well as summaries of the site geology and previous work are included in Cardno's *Groundwater and Soil Vapor Assessment, Updated Site Conceptual Model, and Work Plan for Additional Assessment,* dated August 24, 2018 (Cardno, 2018). A site vicinity map and generalized site plan are included as Plates 1 and 2, respectively.

PROPOSED WORK

Cardno proposes to advance two sub-slab wells (SS1 and SS2) 1 to 2 inches into the sub-slab material underlying the slab of the commercial building at the site. The proposed sub-slab well locations were selected to assess soil vapor conditions beneath the site building. Soil vapor samples collected to date from soil vapor wells VW4 and VW5 have consistently exceeded ESLs established by the California Regional Water Quality Control Board, San Francisco Bay Region (CRWQCB-SFB, 2016). Wells VW4 and VW5 are located on the east and west sides of the on-site building and screened at approximately 5.5 feet bgs. The proposed locations are shown on Plate 2. The proposed locations are approximate and may be moved based on subsurface obstructions. The majority of the subsurface soil underlying the building was excavated to accommodate the subsurface basement used for vehicle maintenance. The primary activity performed at the site is vehicle maintenance that is performed in large service bays with roll-up doors; however, a small portion of the southern end of the building is enclosed. The southern end of the building is also the portion that was not completely excavated for construction of the basement.

Cardno will perform the soil vapor assessment survey in accordance with the protocol presented in the following guidance documentation:

- *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (DTSC, 2011).
- *Advisory – Active Soil Gas Investigations* (DTSC, 2015).
- *Collecting and Interpreting Soil Gas-Samples from the Vadose Zone, A Practical Strategy for Assessing the Subsurface Vapor-to-Indoor Air Migration Pathway of Petroleum Hydrocarbon (API, 2005).*
- *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* (CRWQCB-SFB, 2016).

Additionally, the fieldwork will be conducted under the advisement of a professional geologist and in accordance with applicable regulatory guidelines.

Pre-Field Activities

Permits are not required for the proposed sub-slab wells. Underground Service Alert, ACDEH, and the respective property owners and tenants will be notified at least 48 hours prior to the onset of field activities.

Building Use

The on-site building is used for vehicle service and is known to house numerous chemicals including petroleum hydrocarbons. Due to the ongoing vehicle service activities, the indoor air at the site likely contains concentrations related to current site operations that may be difficult to differentiate from concentrations related to historic operations. Based on the use of the building, indoor air sampling for petroleum hydrocarbons originating in the subsurface is not practical.

Selection of Sub-Slab Well Locations and Utility Clearance

Cardno personnel will visit the site to check for obstructions and to mark the proposed locations. Prior to conducting invasive work, Cardno will obtain the services of a licensed underground utility locator to identify potential underground utilities or other obstructions in the proposed well locations. Sub-slab well locations may be adjusted based on subsurface installations.

Sub-Slab Well Installation

Cardno will install Vapor Pin™ devices distributed by Cox-Colvin & Associates, Inc. (Cox-Colvin) in the sub-slab wells. Cardno will follow the standard operating procedures established by Cox-Colvin. These procedures and additional information for the devices are included in Appendix B. The procedures for drilling, decontamination, and well construction are also included in Appendix B.

Sub-Slab Vapor Sample Collection

Wells SS1 and SS2 will be purged and sampled following a waiting period of at least 48 hours after installation. The purge volume will be calculated based on the volume of each sub-slab well and the sample collection tubing. One purge volume will be removed from each well prior to sampling.

Prior to purging each sub-slab well, Cardno will conduct a vacuum leak test on the sampling equipment. For the leak test, Cardno will attach the sample vessel, purging manifold, and vacuum pump to an airtight valve on the sub-slab well. With the airtight valve closed, Cardno will apply a vacuum of approximately 25 to 28 inches of mercury (in Hg) to the sample collection system and turn off the vacuum pump. Cardno will then monitor the vacuum for 5 minutes. If the vacuum is not maintained, Cardno will isolate the leak and remount the fittings and tubing until the vacuum is held for 5 minutes.

Purging will be performed with a sample manifold equipped with a vacuum gauge and flow regulator and vacuum pump. The flow regulator will be set to a rate of no more than 200 milliliters per minute (ml/min). After purging, Cardno will close the vapor-tight valve and remove the purge device. Laboratory supplied Summa™ canisters (1 liter or smaller), sorbent tubes, and flow regulators will be used to collect the samples. The Summa™ canister will be opened and allowed to fill. The canister vacuum readings at the beginning and end of sampling will be recorded. Leak detection will be performed during vapor sampling by covering the surface completion of the well and the Summa™ canister with a shroud, and introducing helium into the shroud. The concentration of helium will be maintained at approximately 10%; the helium concentration in the shroud will be monitored with a helium meter. Cardno will end sample collection when the vacuum within the sample canister is approximately 5 in Hg. Cardno will label the sample containers, store the samples at ambient temperature in laboratory-supplied containers, and initiate COC records.

One duplicate sample will be collected. In addition, a trip blank supplied by the laboratory will be stored with the sample containers during sampling and transport. Both these samples will be analyzed in the same manner as the sub-slab vapor samples.

Laboratory Analyses

The sub-slab soil vapor samples will be submitted for analysis to a California state-certified laboratory, under COC protocol. The samples will be analyzed for full-scan VOCs (including but not limited to BTEX, fuel oxygenates, lead scavengers, and naphthalene) using EPA Method TO-15M, TPHg using EPA Method TO-3M, TPHd using EPA Method TO-17, methane using EPA Method 8015M, oxygen and carbon dioxide using American Society of Testing and Materials (ASTM) Method D-1946; and helium using ASTM Method D-1946 (M).

Site Safety Plan

Fieldwork will be performed in accordance with a site-specific safety plan.

RISK EVALUATION

Cardno will assess potential risk from vapor intrusion by comparing the reported vapor concentrations to ESLs established by the California Regional Water Quality Control Board, San Francisco Bay Region (CRWQCB-SFB, 2016). If the published screening levels indicate a potential risk, risk modelling may be performed using the Johnson and Ettinger Model, as modified by the DTSC in December 2014 (DTSC, 2014). A minimum of two sampling events will be performed prior to the risk determination.

SCHEDULE

Cardno anticipates initiating the notification process following approval of this work plan.

CONTACT INFORMATION

The responsible party contact is Ms. Jennifer C. Sedlachek, ExxonMobil Environmental Services Company, 4096 Piedmont Avenue #194, Oakland, California, 94611. The consultant contact is Mr. Scott Perkins, Cardno, 601 North McDowell Boulevard, Petaluma, California, 94954. The agency contact is Mr. Mark Detterman, Alameda County Health Care Services Agency, Environmental Health Services, 1131 Harbor Bay Parkway, Suite 250, Alameda, California, 94502-6577.

LIMITATIONS

For documents cited that were not generated by Cardno, the data taken from those documents is used “as is” and is assumed to be accurate. Cardno does not guarantee the accuracy of this data and makes no warranties for the referenced work performed nor the inferences or conclusions stated in these documents.

This document and the work performed have been undertaken in good faith, with due diligence and with the expertise, experience, capability, and specialized knowledge necessary to perform the work in a good and workmanlike manner and within all accepted standards pertaining to providers of environmental services in California at the time of investigation. No soil engineering or geotechnical references are implied or should be inferred. The evaluation of the geologic conditions at the site for this investigation is made from a limited number of data points. Subsurface conditions may vary away from these data points.

Please contact Mr. Scott Perkins, Cardno's project manager for this site, at scott.perkins@cardno.com or at (707) 766-2000 with any questions or comments regarding this work plan.

Sincerely,

Scott Perkins
Senior Project Manager
for Cardno
707 766 2000
Email: scott.perkins@cardno.com

David R. Daniels
P.G. 8737
for Cardno
707 766 2000
Email: david.daniels@cardno.com

Enclosures:

References

Acronym List

Plate 1	Site Vicinity Map
Plate 2	Generalized Site Plan

Appendix A	Correspondence
Appendix B	Field Protocols

cc: Ms. Karel Detterman, Alameda County Health Care Services Agency, Environmental Health Services, 1131 Harbor Bay Parkway, Suite 250, Alameda, California, 94502-6577

Oakland Fire Department, 250 Frank H. Ogawa, Suite 3341, Oakland, California, 94612

Messrs. On Dan and Nathan Lam, 200 El Dorado Terrace, San Francisco, California, 94112

REFERENCES

American Petroleum Institute (API). November 2005. *Collecting and Interpreting Soil Gas Samples from the Vadose Zone, A Practical Strategy for Assessing the Subsurface Vapor-to-Indoor Air Migration Pathway for Petroleum Hydrocarbon Sites*. Publication Number 4741.

California Regional Water Quality Control Board, San Francisco Bay Region (CRWQCB-SFB). February 2016. *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater.*

California Department of Toxic Substances Control of the California EPA (DTSC). October 2011. *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (Final).

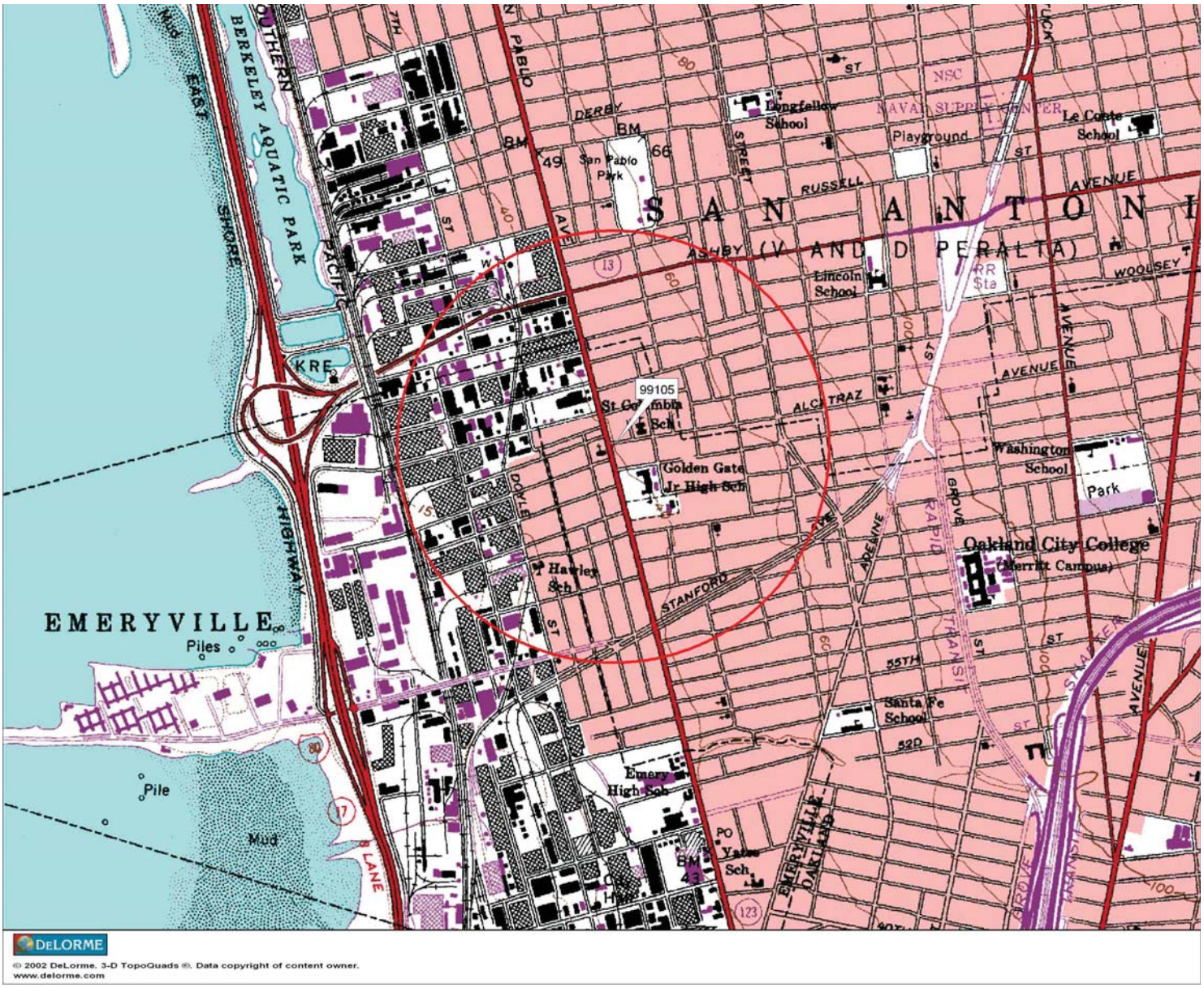
California Department of Toxic Substances Control (DTSC). December 2014. *Screening-Level Model for Soil Gas Contamination*.

California Department of Toxic Substances Control of the California EPA, Department of Toxic Substances Control, California Regional Water Quality Control Board, Los Angeles Region and San Francisco Region (DTSC). July 2015. *Advisory – Active Soil Gas Investigations*.

Cardno. August 24, 2018. *Groundwater and Soil Vapor Assessment, Updated Site Conceptual Model, and Work Plan for Additional Assessment, Former Exxon Service Station 79374, 990 San Pablo Avenue, Albany, California*

ACRONYM LIST

µg/L	Micrograms per liter
µg/m^3	Micrograms per cubic meter
µs	Microsiemens
1,2-DCA	1,2-dichloroethane
acfm	Actual cubic feet per minute
AS	Air sparge
AST	Aboveground storage tank
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
cfm	Cubic feet per minute
COC	Chain-of-Custody
CPT	Cone Penetration (Penetrometer) Test
DIPE	Di-isopropyl ether
DO	Dissolved oxygen
DOT	Department of Transportation
DPE	Dual-phase extraction
DTW	Depth to water
EDB	1,2-dibromoethane
EPA	Environmental Protection Agency
ESL	Environmental screening level
ETBE	Ethyl tertiary butyl ether
FID	Flame-ionization detector
fpm	Feet per minute
GAC	Granular activated carbon
gpd	Gallons per day
gpm	Gallons per minute
GWPTS	Groundwater pump and treat system
HIT	High-intensity targeted
HVOC	Halogenated volatile organic compound
J	Estimated value between MDL and PQL (RL)
LEL	Lower explosive limit
LPC	Liquid-phase carbon
LRP	Liquid-ring pump
LUFT	Leaking underground fuel tank
LUST	Leaking underground storage tank
MCL	Maximum contaminant level
MDL	Method detection limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mg/m^3	Milligrams per cubic meter
MPE	Multi-phase extraction
MRL	Method reporting limit
msl	Mean sea level
MTBE	Methyl tertiary butyl ether
MTCA	Model Toxics Control Act
NAI	Natural attenuation indicators
NAPL	Non-aqueous phase liquid
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
ORP	Oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OVA	Organic vapor analyzer
P&ID	Process and Instrumentation Diagram
PAH	Polycyclic aromatic (or polyaromatic) hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene or perchloroethylene
PID	Photo-ionization detector
PLC	Programmable logic control
POTW	Publicly-owned treatment works
ppmv	Parts per million by volume
PQL	Practical quantitation limit
psi	Pounds per square inch
PVC	Polyvinyl chloride
QA/QC	Quality assurance/quality control
RBSL	Risk-based screening levels
RCRA	Resource Conservation and Recovery Act
RL	Reporting limit
scfm	Standard cubic feet per minute
SSTL	Site-specific target level
STLC	Soluble threshold limit concentration
SVE	Soil vapor extraction
SVOC	Semi-volatile organic compound
TAME	Tertiary amyl methyl ether
TBA	Tertiary butyl alcohol
TCE	Trichloroethene
TOC	Top of well casing elevation; datum is msl
TOG	Total oil and grease
TPH	Total petroleum hydrocarbons
TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
TPHmo	Total petroleum hydrocarbons as motor oil
TPHs	Total petroleum hydrocarbons as stoddard solvent
TRPH	Total recoverable petroleum hydrocarbons
UCL	Upper confidence level
USCS	Unified Soil Classification System
USGS	United States Geologic Survey
UST	Underground storage tank
VCP	Voluntary Cleanup Program
VOC	Volatile organic compound
VPC	Vapor-phase carbon



FN 2783TOPO NL 2

EXPLANATION

1/2-mile radius circle

N

APPROXIMATE SCALE

0 0.5 1 mile

SOURCE:
Modified from a map
provided by
DeLorme 3-D TopoQuads

Cardno

SITE VICINITY MAP

FORMER MOBIL SERVICE STATION 99105
6301 San Pablo Avenue
Oakland, California

PROJECT NO.
2783

PLATE
1

FN 27830001 W05

Cardno

GENERALIZED SITE PLAN

FORMER MOBIL SERVICE STATION 99105
6301 San Pablo Avenue
Oakland, California

EXPLANATION

- MW8 Groundwater Monitoring Well
- VW5 Soil Vapor Sampling Well
- SVS5 Proposed Soil Vapor Sampling Well
- AB13 Soil Boring
- B10 Proposed Soil Boring Location
- SS1 Proposed Sub-Slab Well
- PLI-5 Excavation samples
- MW4 Destroyed Groundwater Monitoring Well
- MP6 Destroyed Observation Well
- 1994 Areas of Excavation (11 feet bgs)
- 1996 Area of Excavation (5 feet bgs)
- 1996 Product Line Excavation (3 feet bgs)
- 1999 Area of Excavation (8 feet bgs)

PROJECT NO. 2783

PLATE 2

APPENDIX A

CORRESPONDENCE

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
COLLEEN CHAWLA, Director

DEPARTMENT OF ENVIRONMENTAL HEALTH
LOCAL OVERSIGHT PROGRAM (LOP)
For Hazardous Materials Releases
1131 HARBOR BAY PARKWAY, SUITE 250
ALAMEDA, CA 94502
(510) 567-6700
FAX (510) 337-9335

October 23, 2018

Jennifer Sedlachek
ExxonMobil
4096 Piedmont, Ave., #194
Oakland, CA 94611
(Sent via e-mail to: jennifer.c.sedlachek@exxonmobil.com)

Dan On and Nathan and Binh Lam, etal
200 El Dorado Terrace
San Francisco, CA 94112-1757

Subject: Fuel Leak Case No. RO0000445 and Geotracker Global ID T0600101855, Mobil#99-105/Cars Rent A Car, 6301 San Pablo Avenue, Oakland, CA 94608

Ladies and Gentlemen:

Alameda County Department of Environmental Health (ACDEH) staff has reviewed the case file including the *Groundwater and Soil Vapor Assessment, Updated Site Conceptual Model, and Work Plan* for Additional Assessment (Work Plan) dated August 24, 2018, prepared on your behalf by Cardno, your consultant. The goal of the *Work Plan* is to assess potential vapor intrusion (VI) to neighboring and immediately downgradient businesses and residences due to the persistent and elevated benzene concentrations in shallow groundwater at the site.

ACDEH has evaluated the case against the State Water Resources Control Board's (SWRCBs) Low Threat Underground Storage Tank Case Closure Policy (LTCP). ACDEH has determined that the site does not meet the LTCP Media-Specific Criteria for Groundwater, Media-Specific Criteria for Vapor Intrusion to Indoor Air, and the Media-Specific Criteria for Direct Contact.

In 1994, four 2,000 gallon gasoline underground storage tanks (USTs) and a 350 gallon waste oil UST were removed from the site. In early 1999, prior to site redevelopment as an oil change facility, the former UST pit was over excavated. In 2014, the results of a dual-phase extraction (DPE) feasibility study concluded that DPE did not produce a significant reduction in soil vapor concentration.

ACDEH is concerned that the potential risk of vapor intrusion to both on- and off-site receptors persists due to a bioattenuation zone that is less than 5 feet in thickness, the presence of elevated Total Petroleum Hydrocarbons (TPH) in soil vapor in VW-4 and VW-5, and in groundwater at MW-5 and MW-8, and the potential of TPH contamination adjacent to the former waste oil UST.

The referenced work plan proposes a series of actions with which ACDEH is in general agreement; however, in the interest of maximizing efficiency of the drilling event, the proposed scope of work is conditionally approved for implementation provided that all of the technical comments below are addressed and/or incorporated during the proposed work. Submittal of a revised work plan or a work plan addendum is not required unless an alternate scope of work outside that described in the work plan or these technical comments is proposed. We request that you address the following technical comments, perform the proposed work, and send us the report described below. Please provide 72-hour advance written notification to this office (e-mail preferred to: karel.detterman@acgov.org) prior to the start of field activities.

TECHNICAL COMMENTS:

1. **Work Plan Request to assess On-Site Vapor Intrusion in the Oil Change Facility Bathroom/Office:** The Work Plan states that "while the on-site building in not an active fueling facility, the vehicle service operations conducted in the building result in similar small surface spills and fugitive vapor releases, as the ongoing activities in the on-site building likely poses a greater risk than the historical release, further evaluation of soil vapor in the vicinity of the on-site building

is not warranted given the current land use." Based on the data, ACDEH does not agree with this rationale because the small surface spills and fugitive vapor releases from today's site usage as an oil change facility are essentially non-volatile compounds and previous historical releases were volatile fuel compounds as demonstrated by the recent soil vapor sample results. The site does not fit the active fueling facility exemption.

A *Work Plan for Additional Soil Vapor Assessment* was submitted in September 2016 and proposed the installation of three soil vapor probes at depth of two feet depth around the southern building perimeter. The installation of soil vapor probes outside the building is not technically acceptable due to the potential of oxygen exclusion below slabs (Figure 4, LTCP Technical Justification for VI to IA) and the consequent potential for higher vapor concentrations below slabs. Additionally, soil vapor samples collected at depths less than five feet bgs may be subject to barometric pressure effects and prone to breakthrough of ambient air through the soil column (Department of Toxic Substances Control's (DTSC's) *Advisory Active Soil Gas Investigations,* July 2015). Soil vapor sample data collected from outdoor soil vapor probes installed at two feet bgs would provide questionable data compared to subslab probes installed within the building footprint including the bathroom as previously requested.

ACDEH understands the desire not to impact the property owner, patrons, and tenants and appreciates the suggested alternatives, however, three sampling events of VW4 detected benzene, ethylbenzene, and naphthalene soil vapor concentrations in exceedance of the LTCP's Vapor Intrusion to Indoor Air criteria for commercial use with no bioattenuation zone. ACDEH requires preparation of a Work Plan proposing the installation and seasonal (wet-dry) sample collection of a permanent sub-slab vapor probe in the bathroom and office located in southern end of the oil change facility. Although the installation of a sub-slab probe in the office area appears unnecessary at this time because the office was being used for storage including storage of automotive chemicals, as reported in the *Work Plan,* the usage can change.

2. **DTCS Guidance Documents**: Please conduct all soil vapor sampling work in accordance with the Department of Toxic Substances Control's (DTSC's) *Advisory Active Soil Gas Investigations* (July 2015) and Guidance for the Evaluation and Migration of Subsurface Vapor Intrusion to Indoor Air (DTCS 2011). ACDEH does not accept other guidance, unless mitigating circumstances indicate it is appropriate and the supporting rationale is provided in advance.

3. **Boring B9 Former Waste Oil UST Laboratory Analysis**: For soil samples only, please request analysis for Poly-Aromatic Hydrocarbons (PAHs) with the Selected Ion Monitoring (SIM) mode to ensure that the detection levels of PAHs are below the concentrations specified in the LTCP for Direct Contact and Outdoor Air Exposure. It is not necessary to analyze groundwater samples for EPA Method 8270.

TECHNICAL REPORT REQUEST

Please upload the technical reports to the State Water Resources Control Board's Geotracker website, in accordance with the following specified file naming convention and schedule and send copies of the reports to karel.detterman@acgov.org to facilitate timely review.

- **November 30, 2018** – Sub-Slab Installation Work Plan
  File to be named: RO445_WP_R_yyyy-mm-dd

- **December 24, 2018** – Soil, Soil Vapor, and Groundwater Investigation Report and updated SCM
  File to be named: RO445_SWI_SCM_R_yyyy-mm-dd

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request. Online case files are available for review at the following website: http://www.acgov.org/aceh/lop/ust.htm

Thank you for your cooperation. Should you have any questions or concerns regarding this correspondence or your case, please send me an e-mail message at karel.detterman@acgov.org or call me at (510) 567-6708.

Sincerely,

Karel Detterman, PG 5628
Senior Hazardous Materials Specialist

Enclosures: Attachment 1 - Responsible Party(ies) Legal Requirements/Obligations
ACDEH Electronic Report Upload (ftp) Instructions

cc: Scott Perkins, Cardno, 601 N. McDowell Blvd., Petaluma, CA 94954, (Sent via e-mail to: Scott.Perkins@cardno.com)

Paresh Khatri, ACDEH, (Sent via e-mail to: paresh.khatri@acgov.org)
Dilan Roe, ACDEH (Sent via E-mail to: dilan.roe@acgov.org)
Karel Detterman, ACDEH (Sent via E-mail to: karel.detterman@acgov.org)
GeoTracker, Electronic Case File

APPENDIX B

FIELD PROTOCOLS

Standard Operating Procedure Leak Testing Vapor Pin™ Via Mechanical Means

December 3, 2013

Scope:

The operating procedure describes the methodology to test a Vapor Pin™ or equivalent sub-slab sampling device and sample train for leakage of indoor air. Mechanical leak testing is generally simpler and less costly than testing with tracer gases such as helium, but relevant state, program, or other guidance documents should be consulted to determine if a specific type of leak test is needed.

Purpose:

The purpose of this procedure is to ensure that indoor air does not leak past the Vapor Pin™ or associated tubing and hardware and dilute the sub-slab soil gas sample with indoor air.

Equipment Needed:

Stick-up installation: 2-inch diameter plastic pipe couple, Play-Doh, Sculpey, or modeling clay (clay) free of volatile organic compounds (VOCs). Stick-up and flush-mount installations: distilled water; Vapor Pin™; vacuum pump (hand-operated or peristaltic); vacuum gauge; stopcock; and sample train, including sample tubing, tee fittings, vacuum gauge and other hardware, and sample container.

Procedures:

1. Drill a 5/8" diameter hole in the concrete slab and install the Vapor Pin™ as per the Standard Operating Procedure (SOP). For a flush-mount installation, drill the 1-1/2" diameter hole first, and follow Use of the Vapor Pin™ Drilling Guide and Secure Cover. Testing evacuated ("Summa") canisters and regulators in accordance with ASTM standard D7663-11 or Restek Corporation's *A Guide to Whole Air Canister Sampling* prior to starting field work eliminates most risk of leakage when sampling with the Vapor Pin™.

2. Install the Vapor Pin™ as described in the SOP Installation and Extraction of the Vapor Pin™.

3. Clean the slab within a 2-inch radius of the Vapor Pin™ to remove all dust. Avoid wetting the concrete or wait until the concrete is dry before proceeding, and avoid cleaning with VOC-containing substances. A whisk broom or shop vacuum is recommended. Remaining dust can be picked up with a scrap of clay.

4. For a flush-mount installation, water is poured directly into the 1-1/2" depression without the need for a water dam - proceed to the next step. For a stick-up installation, roll a 1-inch diameter ball of clay between your palms to form a "snake" approximately 7 inches long and press it against the end of the 2" pipe couple. Push the couple against the slab to form a seal between the pipe and the concrete. Notice that water soluble clays such as Play-Doh may absorb enough water to be unsuitable for tests lasting more than one hour.

5. Assemble the sample train (tubing, sample canister, tee fittings, stopcock, vacuum pump, etc.) separately from the Vapor Pin™ and impose a vacuum of 15" mercury equivalent (in Hg). Close the stopcock and verify that the sample train can hold a vacuum for one to five minutes with no more than 0.5 in Hg loss of vacuum. Depending on sample configuration, the stopcock might or might not remain in the sample train during sampling. An example is shown in Figure 1.

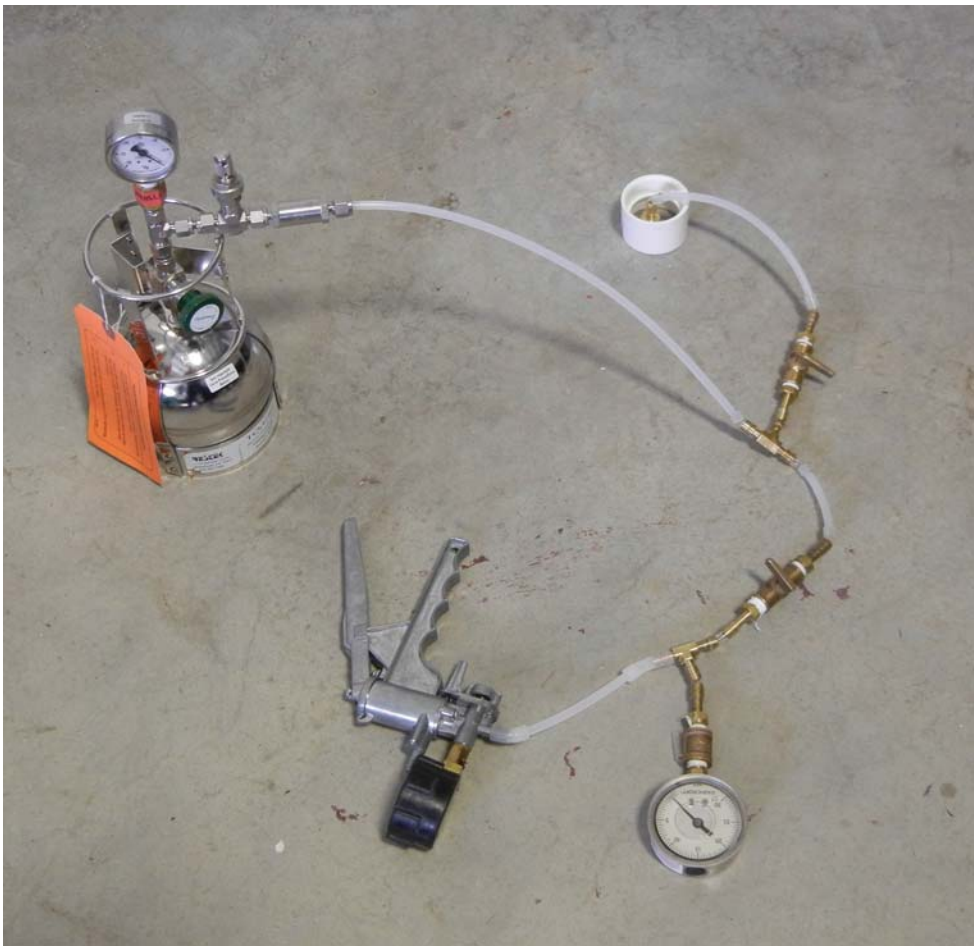


Figure 1. Example of Sub-Slab Sampling and Leak-Test Setup

6. Attach the sample tubing to the top of the Vapor Pin™ and pour enough distilled water into the pipe couple or flush-mount depression to immerse the tubing connection to the Vapor Pin™.

7. Purge and sample the sample point as required by the data quality objectives. Water level might drop slightly due to absorption into the concrete, but if there is a sudden drop in water level, the appearance of water in sample tubing, or other indication of water entering the sub-slab, remove the distilled water from the couple or depression, and reposition the Vapor Pin™ to stop the leakage before resuming the leak test and sampling. In Figure 1, the stopcocks are used to isolate the Vapor Pin™ during vacuum testing and subsequently to allow the vacuum gauge and hand pump to be removed prior to sampling.

Soil Vapor Sampling Well Installation and Sampling Field Protocol

Preliminary Activities

Prior to the onset of field activities at the site, Cardno obtains the appropriate permit(s) from the governing agency(s). Advance notification is made as required by the agency(s) prior to the start of work. Cardno marks the borehole locations and contacts the local one call utility locating service at least 48 hours prior to the start of work to mark buried utilities. Borehole locations may also be checked for buried utilities by a private geophysical surveyor. Prior to drilling, the borehole location is cleared in accordance with the client's procedures. Fieldwork is conducted under the advisement of a registered professional geologist and in accordance with an updated site-specific safety plan prepared for the project, which is available at the job site during field activities.

Well Construction

The borehole is advanced to the desired depth using either a direct-push rig, hand auger, or air vacuum rig. Lithologic conditions are recorded on a boring log during borehole advancement, and select soil matrix sampling may be conducted based on soil characteristics.

Each soil vapor sampling (SVS) well is constructed using inert screen material attached to $^1/_8$- to ¼-inch outer diameter inert tubing. A gas-tight vacuum fitting or valve is attached to the top of each length of tubing using a female compression fitting. Each screen is set within a minimum of a 12-inch thick appropriately sized sand pack, with a minimum of 3 inches of sand pack above the top of the screen. A minimum of 4 inches of dry granular bentonite is set above each screen and associated sand pack. In SVS wells with multiple and separate casings and screens, the annular space between the top of the dry granular bentonite above the deep screen and the bottom of the sand pack associated with the shallow screen is sealed with a minimum of 18 inches of hydrated bentonite. The remainder of the annular space of the well is sealed with hydrated bentonite to 1 foot below ground surface. Wellheads are finished with traffic-rated well boxes set in concrete flush with the surrounding grade. No glues, chemical cements, or solvents are used in well construction.

A boring log is completed with the construction details for each well, including the materials of construction, depth of the borehole, screen length, and annular seal thickness.

Soil Vapor Sampling

Samples are collected using a soil vapor purging and sampling manifold consisting of a flow regulator, vacuum gauges, vacuum pump, shroud, and laboratory-prepared, gas-tight, opaque containers such as Summa™ canisters. Samples may also be collected using a syringe and analyzed by a mobile laboratory. Prior to use, Summa™ canisters are checked to ensure they are under the laboratory induced vacuum between 31 and 25 inches of mercury (in. Hg). New inert tubing is used to purge and sample each well. Prior to purging and sampling each SVS well, the sampling manifold is connected to the gas-tight vacuum fitting or valve at the wellhead, and the downstream tubing and fittings are vacuum tested at approximately 24 to 28 in. Hg. Purging and sampling are conducted only on SVS wells when the tubing and fittings hold the applied vacuum for 5 minutes per vacuum gauge reading.

When required, Cardno conducts a purge volume versus constituent concentration test on at least one SVS well prior to purging and sampling activities. The purge volume test well is selected based on the location of the anticipated source of chemical constituents at the site and on the location of anticipated maximum soil vapor concentrations based on lithologic conditions. If the SVS well has been in place for more than 1 week, it is assumed that soil vapor in the sand pack has equilibrated with the surrounding soil, and only the screen and tubing volumes are included in the purge volume calculation. If the SVS well has been in place for less than 1 week, the volume of the sand pack around the screen is included in the purge volume calculation. A photo-ionization detector (PID) or on-site mobile laboratory is used to evaluate concentrations of chemical constituents in the vapor stream after 1, 3, and 10 volumes of vapor have been purged from the SVS well. Purging is conducted at a rate of 100 to 200

milliliters per minute (ml/min). The purge volume exhibiting the highest concentration is the volume of vapor purged from each SVS well prior to sampling. If the three separate purge volumes produce equal concentrations a default of 3 purge volumes is extracted prior to sampling.

Prior to sampling, a helium leak test is performed at each SVS well, including a summa canister and its fittings, to check for leaks in the SVS annulus. To assess the potential for leaks in the SVS well annulus, a shroud is placed over the SVS well and summa canister and the shroud is filled with a measured amount of helium. Helium screening is performed in the field by drawing soil gas into a Tedlar bag via a lung-box and screening the contents of the Tedlar bag with a helium meter. The concentration of helium in the sample divided by the concentration of helium in the shroud provides a measure of the proportion of the sample attributable to leakage. A leak that comprises less than 5% of the sample is insignificant. Helium screening is also performed using laboratory analysis of the contents of the summa canister collected under the shroud. Sampling is conducted at approximately the same rate of purging, at 100 to 200 ml/min. Soil vapor samples are submitted under chain-of-custody protocol for the specified laboratory analyses.

At a minimum, weather conditions (temperature, barometric pressure and precipitation), the sampling flow rate, the purge volume, the helium leak detection percentage results, the sample canister identification number, the method of sample collection, and the vacuum of the sampling canister at the start and end of sample collection (if applicable) are recorded on a log for each SVS well purged and sampled.

Decontamination Procedures

If soil samples are collected, Cardno or the contracted driller decontaminates the soil sampling equipment between each sampling interval using a non-phosphate solution, followed by a minimum of two tap water rinses. De-ionized water may be used for the final rinse. Downhole drilling equipment is steam-cleaned or triple-rinsed prior to advancing each borehole.

Waste Treatment and Disposal

Soil cuttings generated from the well installation are stored on site in labeled, Department of Transportation-approved, 55-gallon drums or other appropriate storage container. The soil is removed from the site and transported under manifest to a client- and regulatory-approved facility for recycling or disposal. Decontamination water is stored on site in labeled, regulatory-approved storage containers, and is subsequently transported under manifest to a client- and regulatory-approved facility for disposal or treated with a permitted mobile or fixed-base carbon treatment system.