ARCADIS U.S., Inc.
100 Montgomery Street, Suite 300
San Francisco, CA 94104
Tel 415.374.2744
Fax 415.374.2745
www.arcadis-us.com

Work Plan for Additional Soil Vapor Characterization
Former BP Service Station #4931
731 West MacArthur Boulevard
Oakland, California 94609
ACEH Case #RO000076

ENVIRONMENT

"I declare that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached document are true and correct."

Date:
November 4, 2011

Submitted by:

ARCADIS U.S., Inc

Hollis E. Phillips, PG
Project Manager

Contact:
Hollis E. Phillips

Phone:
415.374.2744 ext 13

Email:
Hollis.phillips@arcadis-us.com

Our ref:
GP09BPNA.C110

ARCADIS
Infrastructure, environment, buildings

ARCADIS
100 Montgomery Street
Suite 300
San Francisco
California 94104
Tel 415.374.2744
Fax 415.374.2745
www.arcadis-us.com

Paresh Khatri
Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Subject:
Work Plan for Additional Soil Vapor Characterization
Former Atlantic Richfield Company Station No. 4931
731 West MacArthur Boulevard
Oakland, California 94609
ACEH Case # RO0000076

ENVIRONMENT

Date:
November 4, 2011

Contact:
Hollis Phillips

Phone:
415.374.2744 X13

Email:
Hollis.Phillips@
arcadis-us.com

Our ref:
GP09BPNA.C110

Dear Mr. Khatri:

ARCADIS U.S., Inc. (ARCADIS) has prepared this Work Plan to describe additional soil vapor assessment activities associated with the former BP Service Station #4931 (Site) located at 731 West MacArthur Blvd in Oakland California (**Figure 1**). As required in the Alameda County Environmental Health (ACEH) directive dated May 12, 2011 ARCADIS installed six permanent soil vapor probes (SV-1 through SV-6) on May 31 and June 1, 2011 (**Figure 2).** Soil vapor probes were installed to five feet below ground surface (bgs). The soil vapor probes were sampled by ARCADIS on June 9 and 10, 2011. The vapor probe locations were selected based on the elevated soil and groundwater concentration results from an October 2010 investigation (ARCADIS 2010).

Results of the soil vapor monitoring indicated elevated concentrations of site contaminants of concern (COCs) exceeded their respective environmental screening levels (ESLs) in five of the six locations sampled. Refer to Table 1 for a summary of the analytical results. Based on the concentrations of soil vapor detected at five feet bgs additional characterization of soil vapor at the site is necessary.

Soil vapor can attenuate quickly within a couple of feet of soil, therefore ARCADIS is proposing to conduct a shallow (sub-slab) soil vapor investigation. The objective of the investigation is to evaluate if soil vapor is attenuating at a rate fast enough between five feet bgs and near grade to bring sub-slab vapor concentrations to levels that are not a threat to human health or the environment.

Proposed Scope of Work

ARCADIS will install three sub-slab soil vapor probes: two immediately adjacent to SV-2 and SV-5 and one approximately 10 feet south of SV-3 (**Figure 2)**. The locations adjacent

to SV-2 and SV-5 were chosen because they have elevated concentrations of COCs at five feet bgs and they are located in concrete. The location south of SV-3 was chosen because it is adjacent to the historic soil sample L-6 which contained elevated concentrations of COCs and it is located in concrete. Additionally it is approximately 10 feet south of SV-3 which contained elevated concentrations of COCs at five feet bgs.

Approximately 48 hours after the sub-slab vapor points are installed they will be sampled. If, by the time this work plan is approved, the rainy season has begun then soil vapor samples will also be collected from the five foot bgs vapor points per the May 12, 2011 ACEH directive.

All work will be conducted in accordance with the site specific Health and Safety Plan. All applicable permits will be obtained from ACEH and the City of Oakland, as necessary, prior to drilling.

Underground Service Alert (USA) will be notified a minimum of 48 hours prior to commencing field activities to identify any public utility alignments that may be in conflict with the proposed borings. ARCADIS is only going to hand auger 6-inches immediately below the concrete, therefore the photos and field notes from the private utility locator used during the installation of the five foot vapor points will be used to evaluate the best sub-slab vapor locations.

Soil Vapor Probe Installation and Sampling

Three sub-slab soil vapor probes (SS-SV-1, SS-SV-2, and SS-SV-3) will be installed immediately beneath the concrete adjacent to SV-2 and SV-5, and 10 feet south of SV-3, respectively. These soil vapor probe locations were chosen based on results of the soil vapor sampling conducted in June 2011 and historical soil data.

Concrete will be cored at each location until it the soil-concrete interface is encountered. The soil will be hand augered using either a 2-inch diameter hand auger to a maximum depth of 6-inches beneath the concrete. A soil vapor probe will be placed in the borehole and centered within a filter pack which will be brought to the bottom of the concrete. The probe will be attached to PVC which will be brought to near grade so samples can be collected. Approximately 1-inch of dry granular bentonite will be placed above the filter pack, hydrated bentonite will fill the borehole from the top of the dry granular bentonite to approximately 3-inches below grade. A traffic rated Christy box will be placed in borehole and concrete will be placed in and around the Christy box to secure it and ensure the sub-slab probe is effectively sealed. The Christy box will be not be set below the concrete-soil interface.

Soil vapor samples will be collected in accordance with the March 2010 Department of Toxic Substance Control Advisory - Soil Gas Investigation. Soil vapor samples will be submitted to a State of California certified laboratory under chain-of-custody documentation and analyzed for the following constituents:

- TPH-G, BTEX, MTBE, naphthalene and helium (tracer gas) by USEPA Method TO-15; and
- Oxygen, carbon dioxide, nitrogen, helium and methane by American Society for Testing and Materials Method 1946.

Reporting

Within 30 days of receipt of the laboratory samples a report that document the results of site investigation activities will be submitted to ACEH.

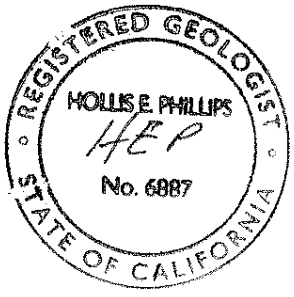
Schedule

ARCADIS is prepared to initiate field work upon approval of this Work Plan by ACEH, the execution of necessary access agreements and the issuance of required permits.

If you have any questions or comments regarding the contents of this Work Plan, please contact Hollis Phillips of ARCADIS at 415.374.2745 or by e-mail at Hollis.Phillips@arcadis-us.com.

Sincerely,

ARCADIS



Hollis E. Phillips, PG
Principal Geologist/PM

Enclosures:
Figure 1 – Site Location Map
Figure 2 – Site Map with Proposed Soil Vapor Sampling Points

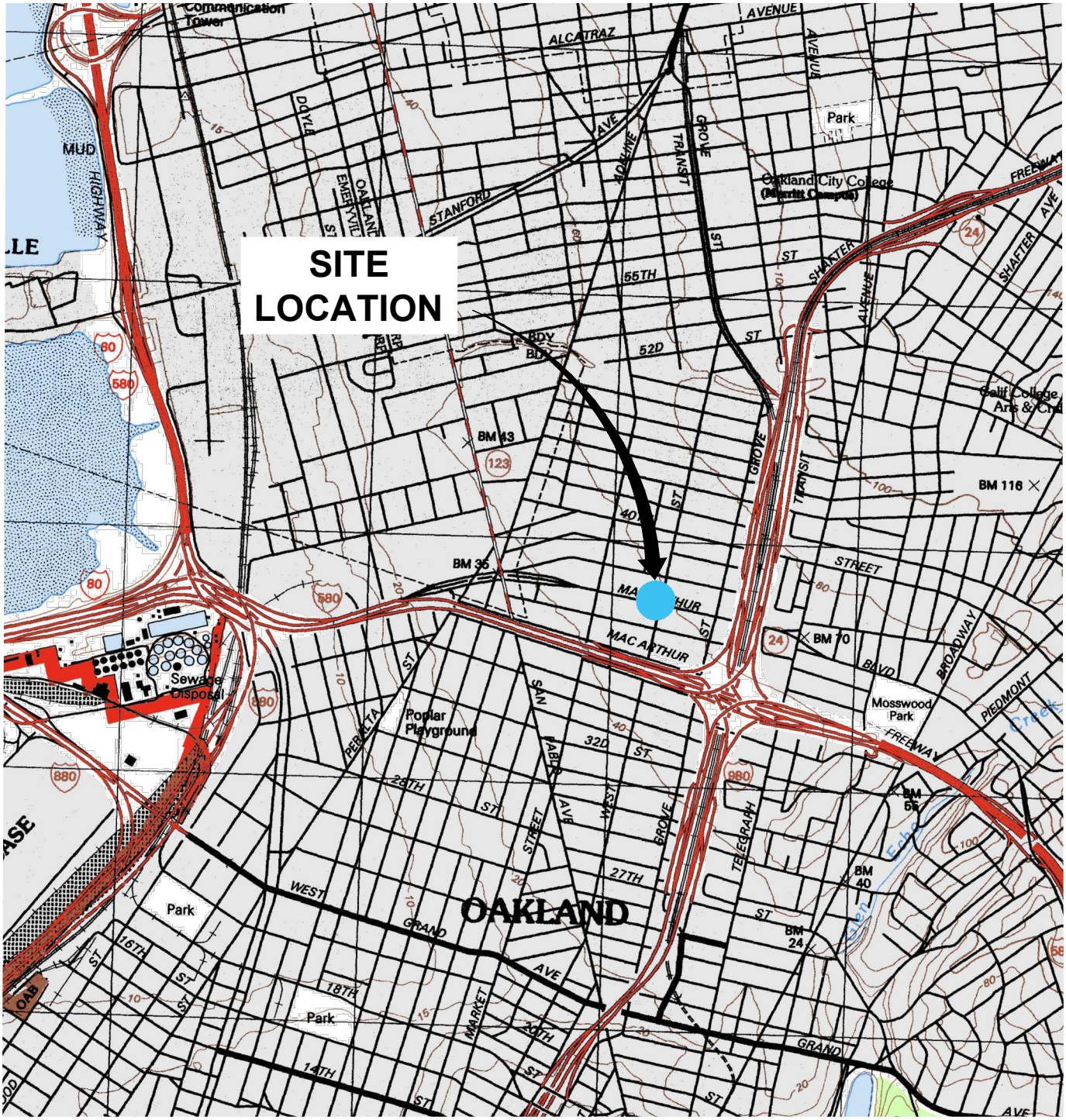
Copies:
File Copy

Table 1
Soil Vapor Analytical Data
Former BP Service Station 4931
731 West MacArthur Blvd
Oakland, California

Location ID	Date Collected	TO-15								ASTM D-1946			
		TPH-g	Benzene	Toluene	Ethyl	m,p-Xylene	o-Xylene	MTBE	Naphthalene	Nitrogen	Carbon Dioxide	Methane	Helium
	Residential ESLs	10,000	84	63	980	21,000	21,000	9,000	72	NA	NA	NA	NA
	Units	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)	%	%	%	%
SV-1-6911	6/9/2011	**4,100**	**8.7**	**19**	<5	<5	<5	**26**	<24	**83.00**	**2.50**	**0.01**	**4.40**
SV-1B-6911	6/9/2011	**16,000**	**16**	**9.4**	<5.6	<5.6	<5.6	**52**	<27	**94.00**	**4.80**	**0.02**	<0.13
SV-2-6911	6/9/2011	**42,000,000**	**130,000**	<2200	**6,000**	**3,500**	<2500	<2100	<12000	**54.00**	**12.00**	**31.00**	<0.2
SV-2B-6911	6/9/2011	**44,000,000**	**120,000**	<2300	**5,500**	**3,000**	<2700	<2200	<13000	**55.00**	**12.00**	**30.00**	<0.12
SV-3-6911	6/9/2011	**15,000,000**	**2,700**	<1200	<1300	<1300	<1300	**3,200**	<6500	**74.00**	**23.00**	**0.88**	<0.12
SV-3B-6911	6/9/2011	**14,000,000**	**2,500**	<2400	<2700	<2700	<2700	**3,500**	<13000	**75.00**	**22.00**	**0.82**	<0.13
SV-4-6911	6/9/2011	<260	<4	<4.7	<5.5	<5.5	<5.5	<4.5	<26	**80.00**	**1.70**	<.00025	**0.13**
SV-4B-6911	6/9/2011	<260	<4.1	<4.9	<5.6	<5.6	<5.6	<4.6	<27	**80.00**	**1.70**	<0.00026	<0.13
SV-5-6911	6/9/2011	**400,000**	**56**	<38	<44	<44	<44	**2,900**	<210	**89.00**	**1.00**	**1.50**	<1
SV-5B-6911	**Not Collected**												
SV-6-6911	6/9/2011	**36,000,000**	**4,800**	<2200	<2600	<2600	<2600	<2100	<12000	**83.00**	**7.20**	**6.10**	<0.12
SV-6B-6911	6/9/2011	**25,000,000**	<3800	<4500	<5200	<5200	<5200	<4300	<25000	**81.00**	**6.20**	**4.90**	**0.45**
Dup-01-6911	6/9/2011	**23,000,000**	<3700	<4400	<5000	<5000	<5000	<4200	<24000	**81.00**	**5.90**	**4.70**	**0.51**
Equip Blank-01	6/9/2011	<100	<1.6	<1.9	<2.2	<2.2	<2.2	<1.8	<10	**100.00**	<0.01	<0.0001	<0.05
Lab Blank	6/9/2011	<100	<1.6	<1.9	<2.2	<2.2	<2.2	<1.8	<10	<0.1	<0.01	<0.0001	<0.05

Notes:
Detected concentrations are in bold.
Concentrations exceeding residential ESLs are highlighted.
µg/m^3 = micrograms per cubic meter
< = The analyte was not detected above the reporting limit.
% = percent
-- = Not analyzed / not applicable
DUP-01-6911= duplicate sample of SV-6B collected on 6/9/11
MTBE = Methyl tert-butyl ether
NA = Not available
TPH-g = TPH ref. to Gasoline (MW=100)
UB= Compound considered non-detect at the listed value due to associated blank contamination.

Reference:
RWQCB (2008). San Francisco Bay Regional Water Quality Control Board. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. Table E-2. May.
Warm Data entered by RK on 7/5/11
Data QC by RK on 7/6/11



NOTE:
1. BASE MAP USGS 7.5 MIN. TOPO. QUAD, OAKLAND WEST CALIFORNIA 1997.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.

FORMER ARCO SERVICE STATION No. 4391
731 WEST MACARTHUR BOULEVARD, OAKLAND, CALIFORNIA

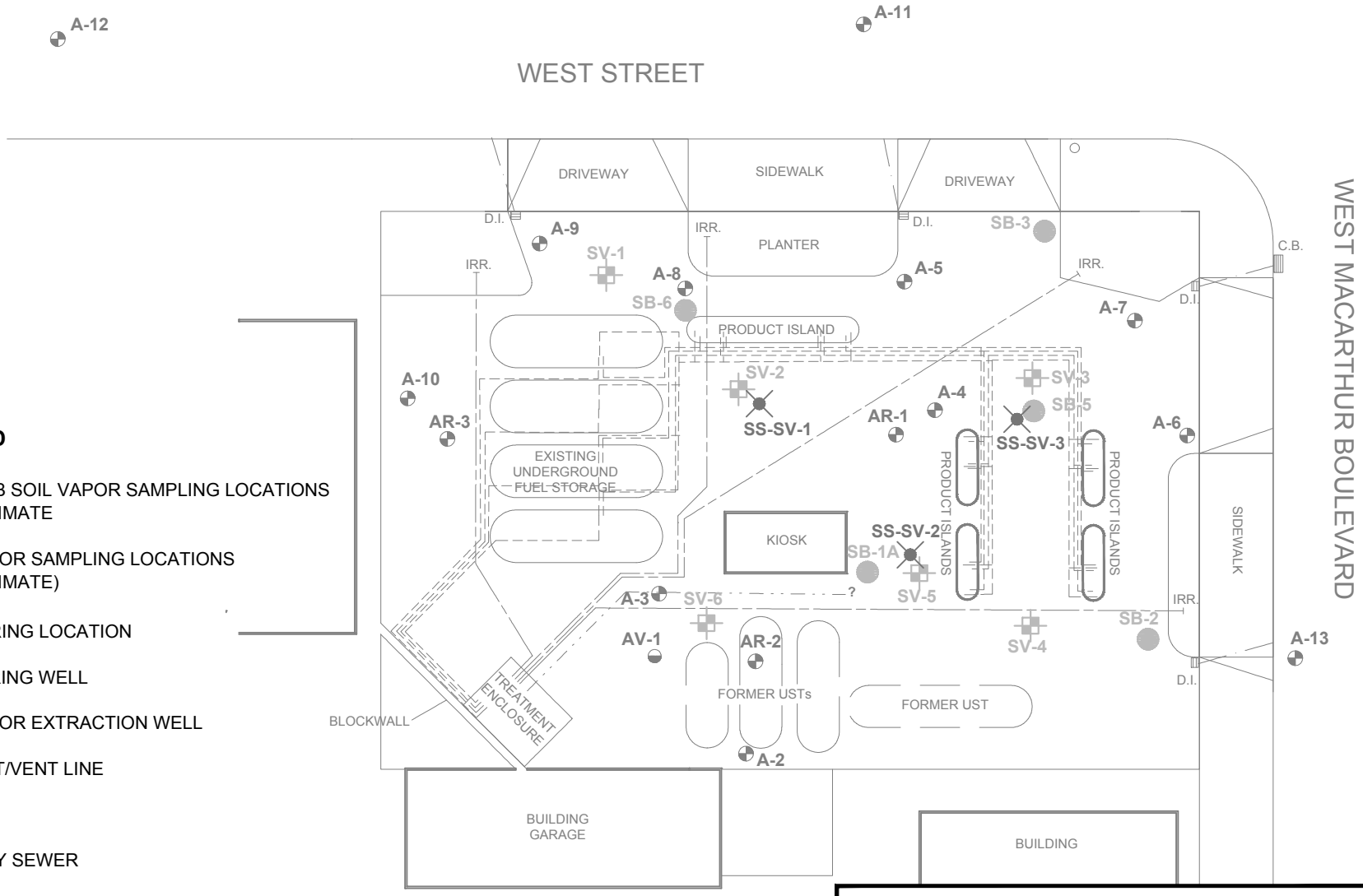
WORK PLAN FOR ADDITIONAL SOIL VAPOR CHARACTERIZATION

SITE LOCATION MAP

ARCADIS

FIGURE
1

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Emeryville\ACT\GP09BPNA\C110\C0000\WP Additional SV\GP09BPNAC110-B02.dwg LAYOUT: 2 SAVED: 11/4/2011 12:42 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 11/4/2011 12:56 PM BY: REYES, ALEC



LEGEND

- SB-3 — SUB-SLAB SOIL VAPOR SAMPLING LOCATIONS (APPROXIMATE
- SOIL VAPOR SAMPLING LOCATIONS (APPROXIMATE)
- SOIL BORING LOCATION
- MONITORING WELL
- SOIL VAPOR EXTRACTION WELL
- PRODUCT/VENT LINE
- WATER
- SANITARY SEWER
- STORM DRAIN

0 30' 60'

Approximate Scale: 1 in. =60 ft.

NOTE:
SITE MAP ADAPTED FROM FIGURES BY OTHERS.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

FORMER ARCO SERVICE STATION No. 4391
731 WEST MACARTHUR BOULEVARD, OAKLAND, CALIFORNIA

WORK PLAN FOR ADDITIONAL SOIL VAPOR CHARACTERIZATION

PROPOSED SUB-SLAB VAPOR SAMPLING LOCATIONS

ARCADIS

FIGURE
2