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9:56 am, Sep 23, 2011

Alameda County
Environmental Health

September 22, 2011

Mr. Paresh Khatri
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway
Alameda, CA 9502-6577

Subject: Crow Canyon Dry Cleaners
7272 San Ramon Road Dublin, CA
RO# 000283

Dear Mr. Khatri:

This enclosed report has been prepared by Endpoint Consulting, Inc. on behalf of the Burrows Company, Dwight & Carleton Perry, Gabriel H. Chui & Lai H. Trust, the Lee Family, Nam Sun and Seung Hee Park, and the Roessler Investment Group.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge. If you have any questions, please contact Mr. Mehrdad Javaher. of Endpoint at 415-706-8935.

Sincerely,

Jim Roessl

Jim Roessler
Roessler Investment Group

DRAFT
CORRECTIVE ACTION PLAN

Crow Canyon Dry Cleaners
7272 San Ramon Road, Dublin, CA
Fuel Leak Case No. RO0002863

Prepared by
Endpoint Consulting, Inc.
98 Battery Street, Suite 200
San Francisco, CA 94111

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Mehrdad Javaherian

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1.0 INTRODUCTION

At the request of the Alameda County Health Care Services Agency (County) and Endpoint Consulting, Inc., (Endpoint) has prepared this Draft *Corrective Action Plan (CAP)* for the Crow Canyon Dry Cleaners located in Dublin, CA. This report documents the evaluation of remedial alternatives and outlines a preferred remedial alternative for addressing tetrachloroethene (PCE) impacts in soil vapor underlying the site.

Importantly, appended to this report (Appendix A) are formal responses to specific comments posed by the County (2011)[1] in support of resuming interim remediation activities previously performed at the site in 2009, while this Draft CAP undergoes formal review and acceptance. The purpose of reinitiating soil vapor extraction (SVE) activities as an interim measure is to maximize PCE mass removal and protection of human health and the environment during the Draft CAP review process. Endpoint understands that the County intends to review these responses prior to its full review of this Draft CAP, so that the interim measures may be initiated as soon as possible in order to achieve the above-referenced benefits.

1.1 General Site Information

Site name:	Crow Canyon Dry Cleaners
Site address:	7272 San Ramon Road, Dublin, CA
Current property owner:	Gabriel H. Chui and Lai H. Trust
Current site use:	Active Dry Cleaners
PCE Sources at site:	PCE no longer actively used onsite
Number of wells:	17

1.2 Site Contacts

Consultant:	Mehrdad Javaher Endpoint Consulting, Inc. 98 Battery Street, Suite 200 San Francisco, CA 94111 (415) 706-8935
Regulatory agency:	Paresh Khatri Alameda County Health Services Agency 1131 Harbor Bay Parkway, Suite 250 Alameda, CA 94502-6577 (510) 567-6746

[1] Alameda County Health Care Services Agency (2011). Summary of Meeting (August 26, 2011), Interim Remedial Action, and Feasibility Study/Corrective Action Plan, Crow Canyon Cleaners, 7272 San Ramon Road, Dublin, CA 94568, September 1.

1.3 Organization of the CAP

In addition to this introduction, this Draft CAP contains the following sections:

Section 2.0 Site Background: Provides a brief description of the physical setting at the site and its immediate vicinity, and summarizes historical investigations and interim remediation measures at the site.

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Section 3.0 Conceptual Site Model: Presents a brief description of the hydrogeologic conditions, primary contaminant sources at the site, chemicals of potential concern (COPCs), the nature and extent of the residual source area (including the primary impacted media), and potential exposure pathways and receptors.

Section 4.0 Remedial Action Objectives: Identifies the chemicals of potential concern and discusses the Remedial Action Objectives (RAOs) for the site. Included in this section is the delineation of the target remediation area at the site.

Section 5.0 Remedial Alternative Evaluation and Selection: Lists RAs to address petroleum hydrocarbons at the site; presents an evaluation of the effectiveness of the RAs in achieving the defined RAOs, and recommends the preferred remedial alternatives for the site.

Section 6.0 Remedial Action Implementation Plan: Presents the remedial approach for the site, including the proposed remedial and monitoring plan, and other remedial contingencies.

Section 7.0 Reporting and Schedule: Presents a preliminary schedule for implementation of the preferred remedial alternative and the related reporting.

Additional appendices are also included herein, such as Appendix A which outlines response to the County's specific questions in support of Endpoint's request to restart the interim remediation activities while review of the Draft CAP is in process; and Appendix B, which contains historical site investigation data from AEI Consultants and Ceres Associates.

2.0 SITE BACKGROUND

2.1 Site Description

The site is located in a suite within a commercial building located on the west side of San Ramon Road, within a mixed residential/commercial area of Dublin, CA. Historical resources and site reconnaissance have revealed that one of the units of the building (7272 San Ramon Road) has been occupied by a dry-cleaning facility since 1988. The dry-cleaning and solvent storage areas were located in the back of the building, with PCE used as the cleaning solvent until 2004 (AEI, 2007)[2]; current dry cleaning operations do not use any chlorinated solvents.

Immediately adjacent (to the south) to the suite housing the dry cleaners is an occupied commercial/retail space. The suite next to this commercial/retail space is a Montessori School serving preschool children from 3 to 6 years old.

2.2 Summary of Historical Site Investigations

Preliminary Subsurface Investigation- 2005: Following the recommendation for subsurface investigation outlined in a Phase I Environmental Site Assessment performed in 2004, AEI performed a preliminary subsurface investigation at the property in 2005 (AEI, 2005)[3]. A total of three soil borings (SB-1 to SB-3) were advanced to a maximum depth of 12 feet below ground surface (bgs). Three shallow soil samples and three groundwater samples were analyzed for halogenated volatile organic compounds (HVOCs). PCE was detected in all the soil and groundwater samples analyzed, with concentrations up to 0.071 milligrams per kilogram (mg/kg) in soil and 22 micrograms per liter (µg/L) in groundwater. In addition, TCE was detected in the groundwater up to 3.0 µg/L. Historical data generated from all AEI investigations are included as Appendix B herein.

Additional Subsurface Investigation & Utility Survey-2006. At the request of the County, AEI performed an additional subsurface investigation at the property in February 2006, including collection of soil, soil vapor, and groundwater samples from seven additional soil borings advanced through the property. PCE was detected in one soil sample at a concentration of 0.013 mg/kg (see Appendix B). PCE was detected in groundwater samples collected from the shallowest (A-Zone) and deeper (B-Zone) aquifers up to a concentration of 23 µg/L and 4.7 µg/L, respectively. PCE was detected in all three soil vapor samples, ranging in concentrations from 30 micrograms per cubic meter ($\mu g/m_3$) to 16,000 $\mu g/m_3$ (AEI, 2007).

Based on the results of this investigation, and considering the proximity of the adjacent Montessori School, the County requested that the release of HVOCs be investigated further.

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[2] AEI Consultants, (2007). Additional Site Investigation Report, 7272 San Ramon Road, Dublin, CA. February 1.

[3] AEI Consultants, (2005). Phase II Subsurface Investigation Report, 7272 San Ramon Road, Dublin, CA. February 8.

Additionally, the ACEHS requested a utility study to evaluate whether they may act as preferential migration pathways. A utility survey conducted in September 2006 (AEI, 2007) revealed that a sewer line runs from a drain within the dry-cleaner through Montessori School towards a cleanout in the direction of San Ramon Road (see Figure 1).

Additional Site Investigation- 2006 and 2007: Between December 2006 and January 2007, AEI performed another subsurface investigation by advancing five soil borings throughout the property; two borings (SB-14 and SB-15) were advanced near the front of the dry cleaning facility, down-gradient from the dry-cleaning facility. Two borings (SB-11 and SB-12) were advanced at the rear of the dry-cleaning facility. One boring (SB-13) was advanced adjacent to the sewer line trace inside the Montessori School. The soil borings were advanced to depths ranging from approximately 5 feet bgs to 30 feet bgs. Soil samples were collected from each boring, while groundwater samples were collected from borings SB-12 through SB-15. In addition, A total of four soil vapor samples were advanced from four soil borings (SB-11, SB-12, SB-13, and SB-15). Each vapor probe boring was advanced to approximately 5 feet bgs where a soil vapor sample was collected.

HVOCs were not detected in the soil sample during this investigation; however, PCE and trichloroethylene (TCE) were detected in groundwater at relatively low concentrations (PCE was detected at 0.78 to 2.5 ug/L in the shallow water-bearing zone, while TCE was detected in one sample at 1.1 ug/L; no other HVOCs were detected in either zone). In addition, PCE was detected in all four of the soil vapor samples analyzed, at concentrations ranging from 270 $\mu g/m^3$ to 380,000 $\mu g/m^3$ (SB-11-V-D). TCE was detected in three of the soil vapor samples at concentrations ranging from 4.4 $\mu g/m^3$ to 3,200 $\mu g/m^3$ (SB-11-V-D). The boring (SB-13-V-D) located along the sewer line trace within the footprint of the Montessori preschool contained PCE at a concentration of 6,800 $\mu g/m^3$.

Based on the results of this investigation, the County requested additional soil vapor investigation and indoor air sampling to evaluate potential risk to buildings occupants resulting from vapor intrusion. They further requested a complete investigation of the utility lines and their potential to act as preferential pathways for vapor migration, and an evaluation of the feasibility of potential remedial alternatives for the removal of PCE contamination.

Indoor Air Sampling- 2007: In October 2007, AEI collected two indoor air and one outdoor air samples at the Montessori school. The indoor air sampling results indicated the presence of PCE at concentrations of 1.1 and 1.3 $\mu g/m^3$, both exceeding the indoor air residential screening level of 0.41 $\mu g/m^3$ adopted by the Regional Water Quality Control Board (RWQCB). The outdoor air sample contained PCE at 0.34 $\mu g/m^3$.

In response to the County's concerns over laboratory analytical methods used in the previous indoor air sampling, on December 13, 2007, ERM reinvestigated indoor air and outdoor air quality at the Montessori preschool. All three indoor air samples contained PCE ranging from 1.2 to 1.3 $\mu g/m^3$, while the outdoor air sample contained PCE at 0.70 $\mu g/m^3$. No other VOCs were detected in the indoor or outdoor air samples, confirming the results of the previous indoor/outdoor air sampling.

Additional Soil Vapor Sampling-2008: Ceres Associates performed a soil vapor investigation and related sampling on April 7th and 8th, 2008. A total of 20 soil borings (SB-16 through SB-37) were advanced at the site. Soil vapor samples were collected from all 20 locations and soil samples were collected from two locations (SB-19 and SB-23); the targeted depth of sampling for both media was 5 feet bgs.

Concentrations of PCE during this investigation ranged from below detection limits in several vapor samples to 17,000 µg/m^3 in the soil vapor sample collected from SB-23-05 (see Figure xxx and Appendix A herein). The sub-slab samples taken from the borings inside the Montessori Preschool were found to have concentrations of PCE ranging from below the laboratory detection limits in SB-16-0.5 to 2,300 µg/m^3 in SB-19-0.5.

Also worth noting Benzene was reported in two of the samples collected from SB-18-05 at concentrations of 230 and 160 µg/m^3. Toluene was reported in two of the samples collected from SB-18-05 at concentrations of 420 and 310 µg/m^3. Ethylbenzene was found at 180 µg/m^3 in SB-29-05; m, p-xylene at 300 µg/m^3 in SB-25-05 and at 680 µg/m^3 in SB-29-05; and o-xylene at 130 µg/m^3 in SB-25-05 and at 360 µg/m^3 in SB-29-05. No other VOCs were detected at above laboratory detection limits in the soil vapor samples.

The laboratory reported that VOCs were not detected above the method reporting limits in the two soil samples (SB-19-05 and SB-23-05) collected and analyzed during this assessment.

2.3 Summary of Interim Remedial Action Activities

From August through October 2009, Endpoint performed an SVE pilot test at the site as a County-approved interim measure; the interim remediation activities were preceded by installation and baseline sampling of 10 vapor wells (extraction and monitoring wells) at the site in support of SVE activities[4].

Because of the significant drop in PCE concentrations in response to the two-month-long SVE pilot test and supported by a reduction in observed mass removal rates from the SVE system across the two months of SVE operation, the system was subsequently turned off and monitoring of soil vapor quality was performed across the site. Initially, this post-pilot test monitoring took place one month following cessation of SVE operations; this data revealed that PCE concentrations across the site had remained at significantly reduced levels, with limited rebound. Following discussions with the County, monitoring of soil vapor quality was conducted during two additional events within the next 12 months (i.e, semi-annual events), yielding data some 17 months after the termination of the SVE operations. Combined, the interim measure data of record indicate:

[4] Seven additional vapor monitoring wells (yielding a total of 17 vapor wells) were later added per the County's request in support of semi-annual vapor monitoring following cessation of SVE activities as discussed in more detail below. .

- Six wells (VE1S, VE1D, VE2S, VM1S, VM1D, and VM3D) who's concentrations declined from baseline levels during the SVE operations and thereafter, but then rebounded after cessation of the SVE based on the latest available concentration in each well. Note that despite the rebound, the latest concentration in four of these six wells remains below the highly conservative Commercial Environmental Screening Level (ESL) for protection of indoor air quality.

- Four wells (VE2D, VE3S, VE3D, VM3S, and VM4S) who's concentrations declined as a result of SVE operations without rebound based on available data. The latest data point from each of these wells, including at VM4S which was the primary target of the pilot test (due to proximity to the Montessori School) and which declined from 10,000 ug/m^3 to 1,100 ug/m^3 seventeen months after cessation of the SVE), all remain below the Commercial ESLs.

- Seven wells were newly installed after the SVE operations, so only data post pilot testing was available for these wells. Nevertheless, six of these seven wells (VM5SS, VM6SS, VM2SS, VM7, VM8, and VM10) all recorded concentrations below the ESL. Only one of these wells (VM-9SS) yields a concentration above the Commercial ESL.

These data are summarized in Table 1, with well locations shown on Figure 1 attached herein.

Based on the above data and considering the latest round of monitoring, of the 17 site wells, 14 report concentrations below the Commercial ESL (1,400 ug/m^3); this includes 10 wells that were positively affected by the limited, 2-month long SVE pilot test. If residential ESLs are used for screening of vapor concentrations, then the latest data indicate that 6 of the 17 wells exceed the residential ESL (410 ug/m^3). Lastly, if school exposure for children is assumed over the length of time children are known to spend time at the Montessori School adjacent to the site, then the same three wells which exceed the commercial ESL also exceed the school-use screening level (2,600 ug/m^3)[5]. All data summarized above have been previously reported to the County through submittal of the Interim Remediation Action Report (January 2010) and two subsequent semi-annual monitoring reports (September 2010 and February 2011).

As previously referenced herein and as discussed with the County during the August 26, 2011 meeting, Endpoint recommends restarting the SVE operations to further reduce PCE soil vapor concentrations which have rebounded to levels above the residential and commercial ESLs; this measure is intended until such time that this Draft CAP undergoes the formal review process and is finalized. It is understood that the County will review the response to

[5] As discussed during a meeting held with the County on August 26, 2011, as a conservative measure, the residential screening level of 410 ug/m3 will be used for screening of PCE concentrations in soil vapor at the site, until such time that the Montessori School may no longer be present adjacent to the site; at that time, the commercial screening level of 1,400 ug/m3 may be used as the relevant screening level for PCE in soil vapor.

its questions, presented herein as Appendix A, related to resuming SVE operations as an interim measure in advance of its initial review of this Draft CAP.

3.0 CONCEPTUAL SITE MODEL

Data from past site investigation and interim remediation activities have been used to develop a conceptual site model (CSM) as summarized below. The CSM documents the site hydrogeology, primary sources, COPCs, and the extent of the residual source area marking impacts to soil, soil vapor, and groundwater.

Site Hydrogeology: In general, the site is underlain by three units of soils; silty clay overlying sandy clay with interbedded sandy gravel (AEI, 2007). Two permeable, water-bearing zones have been identified within the total explored depth of 30 feet bgs. Both aquifers were found within permeable sandy gravels. The upper (shallow) water-bearing zone is approximately 2 feet thick, consists of sandy gravel with groundwater typically encountered at a depth of approximately 8 to 10 feet bgs (AEI, 2007).

The deeper water-bearing zone is approximately 1.5-feet thick, similarly consists of sandy gravel encountered at a depth of approximately 25 feet bgs. These two water-bearing zones are separated by an approximately 12-foot thick sandy clay layer. The topography of the area is relatively flat, with an overall slope toward the east. An unnamed creek is located to the north which appears to be at a slightly lower elevation. Groundwater is expected to flow in an easterly or northerly direction.

Primary Sources: Consistent with historical dry cleaning operations at the site, the primary source of contamination at the site is considered to consist of historical spills, leaks, or disposal of PCE used as a dry cleaning solvent.

Constituents of Potential Concern: Data generated from several rounds of sampling across the site's 17 vapor monitoring wells confirm the presence of PCE as the primary COPC at the site. TCE detections in soil vapor have been largely sporadic and below the residential ESL for protection of indoor air. For example, during the latest vapor monitoring event, TCE was detected in three of the 12 wells sampled (at maximum concentration of 41 ug/m^3), but all at levels below the residential ESL; no other HVOCs were detected in the soil vapor samples.

Residual Source Area and Media of Concern: Based on the afore-mentioned investigation data, the general area at and in the vicinity of the historical dry cleaning machine (same location as the current dry cleaning machine which does not use PCE) is considered the residual source area at the site. The basis for this conceptualization is the historical PCE soil vapor data collected at the site, plus those supplemented by Endpoint's monitoring well sampling efforts.

To summarize, the lateral extent of the source area may be defined by a triangle of wells (and adjacent former borings):

- VM-9SS: as high as 14,000 ug/m^3
- VE-2S: as high as 13,000 ug/m^3
- SB-11/VE-1S: Historically as high as 380,000 ug/m^3 in SB-11, but reduced significantly to 19,000 ug/m^3 in immediately adjacent monitoring well VE-1S.

Correspondingly, based on the most recent round of sampling at existing monitoring wells, the remaining source area may be defined within the triangular area bounded by wells VM-9SS (14,000 ug/m^3, VE-2S (13,000 ug/m^3), and VE-1S (19,000 ug/m^3).

Away from this residual source area, PCE concentrations occur at significantly lower concentrations (see Figure 1), including only three wells (VM-4S, VM-5SS, and VM-8) which exceed the residential ESL; none of the wells outside the residual source area exceed the commercial ESL for PCE.

Vertically, the residual source area is characterized by peak PCE vapor concentrations in shallow soils (2.5 to 5 feet bgs), with additional accumulation of vapors in the sub-slab of the existing buildings (1 to 2 feet bgs); this accumulation is expected since building occupancy results in reduced pressure inside the building and underlying sub-slab, inducing movement of vapors in shallow soils toward the building sub-slab (i.e from areas of higher pressure to lower pressure).

A comparison of PCE vapor concentrations in shallow-screened wells (typically screened from 2.5 feet to 5.5 feet bgs) and deeper screened wells (typically screened from 6 to 9 feet bgs) indicates a consistent pattern of lower vapor concentrations in deeper wells than in shallow wells. Moreover the highest detected concentrations of PCE vapors to date at the site remain in shallow soils, suggesting that shallow soils are the primary source of vapors with contribution to immediately overlying sub-slab locations.

In addition to the soil vapor sampling used to define the source area described above, the soil sampling conducted to date by AEI (2007) indicates that within and beyond the above-referenced triangular source area, PCE remains largely below detection limits and where detected, below residential and commercial soil ESLs (see Appendix B herein for data tables from AEI, 2007). The primary residual detections of PCE in soil center around 5 feet below ground surface (bgs) at former borings SB-1, SB-2, and SB-3 located in the immediate vicinity of the former dry cleaning machine; while these detections show evidence of a historical PCE release (maximum detected concentration of 0.071 mg/kg), they occur at levels well below both the residential (0.37 mg/kg) and commercial (0.7 mg/kg) soil ESLs.

Corresponding to the above observations for soil and soil vapor, the occurrence of PCE in groundwater is also primarily limited to the triangular residual source area. Specifically, AEI (2007) data (see Appendix B) show the highest concentrations of PCE in groundwater coincide with those in soil and soil vapor in the immediate vicinity of the former dry cleaning machine, with the maximum detected concentration of 23 ug/L. This value is above the drinking water standard of 5 ug/L for PCE, but remains well below levels that may pose a vapor intrusion risk from groundwater under commercial (420 ug/L) or residential (120 ug/L) land uses. TCE has also been sporadically detected in groundwater, but at levels below the maximum contaminant level drinking water standard (MCL). Away from the residual source are, grab groundwater sampling results confirm the predominant absence of both PCE and TCE at above detection limits or above MCLs (see Appendix B).

Based on the above rationale, PCE remains the primary COPC, with soil vapor serving as the primary media of concern within the localized residual source area at the site. Since localized exceedance of the PCE MCL has been noted within the residual source area, groundwater is considered as secondary media of concern; as previously indicated, the relatively low PCE concentrations in groundwater are not considered the source of PCE in soil vapor.

Potential Exposure Pathways and Receptors: Based on the components of the CSM discussed above, the primary potential exposure pathway to PCE at the site is indoor air intrusion of vapors. Soils underlying the site remain under paved surfaces with limited potential for direct exposure; more importantly, with PCE soil concentrations detected to date remaining below direct exposure ESLs for residential land use, the potential for direct exposure to daily site occupants or construction workers is considered negligible.

Lastly, in the absence of water supply wells at the site and with PCE (and TCE) concentrations reducing to below MCLs away from the residual source area at the site, potential direct exposure to groundwater is considered incomplete under current site use; although highly unlikely, should shallow groundwater resources be developed for potable purposes within the residual source area, potential direct exposure to PCE in groundwater may theoretically be considered complete under such future usage.

4.0 REMEDIAL ACTION OBJECTVES

Identification and evaluation of potential RAs for the site requires identification of RAOs, representing site-specific goals for source abatement and for protecting human health and the environment, emphasizing protection of indoor air quality; these are evaluated using applicable or relevant and appropriate requirements (ARARs). The following presents an evaluation of COPCs, ARARs, and RAOs for the site.

4.1 Chemicals of Potential Concern

As previously indicated, the primary COPC at the site PCE, which occurs primarily in soil vapor at elevated levels within the residual source area. Away from the residual source area, PCE concentrations in soil vapor reduce significantly, but continue to warrant reduction to ensure protection of indoor air quality at the adjacent suites.

4.2 Applicable or Relevant and Appropriate Requirements

ARARs are the promulgated laws and regulations that specifically address, or may address, a hazardous substance, remedial action, location, or other circumstance at the Site. ARARs generally fall into three categories as defined below:

Chemical-Specific Requirements: Health- or risk-based concentration limits or a range in concentration of specific chemicals present in different site media.

Action-Specific Requirements: Govern the design and performance of remedial systems or activities associated with the remedial/removal action.

Location-Specific Requirements: Restrict concentrations of chemicals or otherwise govern cleanup activities based on the location of the site.

Also presented are non-promulgated regulatory (i.e., To-Be-Considered [TBC]) criteria which may be considered when selecting a remedy. ARARs and TBCs considered for the site are summarized in Table 2.

4.3 Remedial Action Objectives

The RAOs for the site are evaluated utilizing both the qualitative and quantitative objectives; this is particularly critical since numerical RAOs may not be achievable due to technology and/or site-related limitations.

The following considerations were taken into account in the development of these objectives:

- The site is currently zoned under commercial land use, with the nearest residents located sufficiently for so as to not be significantly impacted.

- To the extent that the Montessori School remains in its present location at 7238 San Ramon Road (i.e, two suites south of the dry cleaners within the same building), potential exposure of children is considered more sensitive than potential commercial exposure and therefore warrants consideration for RAO selection. In the absence of the Montessori School, RAOs should coincide with commercial exposure.

- No known shallow water supply wells exist near the site, but more importantly, PCE groundwater concentrations do not exceed MCLs outside of the residual source area, including within the deeper water-bearing zone; this notwithstanding, shallow groundwater beneath the site may be considered as having beneficial uses based on designation within the Basin Plan.

4.3.1 Qualitative Objectives

Qualitative RAOs for the Site include the following considerations:

- Removal of PCE mass to the extent practicable;

- To the extent practicable, establishment of a reducing trend in PCE concentrations in soil vapor within the residual source area and in areas near adjacent suites; and

- Although no water supply wells exist at the site, consideration for elimination of potential direct exposure to groundwater under any potential future reuse of the site.

4.3.2 Quantitative Objectives

As previously indicated, the primary impacted media at the site is soil vapor, with groundwater serving as a secondary impacted media. Correspondingly, numerical goals for PCE are accordingly defined herein.

Quantitative objectives for PCE in soil vapor depend on the aforementioned land use. Specifically, should the Montessori School remain in its current location, the quantitative RAO corresponding to the residential ESL of 410 ug/m^{3}for protection of indoor air quality is proposed as a conservative cleanup goal. Conversely, should the Montessori School move from its current location, the commercial ESL of 1,400 ug/m^3 for PCE in soil vapor is considered applicable.

While groundwater is considered a secondary media, development of a numerical RAO for PCE in groundwater is necessary for evaluation of potential RAs. Although shallow groundwater beneath the site is unlikely to be developed for potable purposes, technically, shallow groundwater at and in the vicinity of the site may have beneficial uses per the designation within the Basin Plan. Based on the above logic, the proposed numerical RAO for PCE in groundwater is the MCL of 5 ug/L.

Since all PCE (and TCE) detections in soil remain below their respective residential ESLs, soils are not considered a media of concern and no RAOs are defined for PCE in soils.

4.4 Potential Extent of Areas Warranting Remediation

The primary area warranting remediation corresponds to the residual source area, bounded by existing vapor monitoring wells VM-9SS (PCE at 14,000 ug/m^3), VE-2S (PCE at 13,000 ug/m^3), and VE-1S: (PCE as high at 19,000 ug/m^3 in immediately adjacent well VE-1S). As previously indicated, PCE concentrations at these locations remain above numerical RAOs regardless of whether the residential or commercial ESLs are used.

Away from this residual source area, PCE levels remain consistently below the commercial ESL for PCE; however, three wells (VM-4S, VM-5SS, and VM-8) have reported PCE concentrations exceeding the residential ESL, thereby warranting remediation under the scenario where the Montessori School remains in its current location.

As previously discussed, the minor exceedances of the MCL for PCE in groundwater are also limited to the above-referenced residual source area, with data beyond these locations remaining below MCLs; hence, consideration of the extent of any potential groundwater remediation is limited to the residual source area.

5.0 EVALUATION AND SELECTION OF REMEDIAL ALTERNTIVES

Evaluation of RA's for achieving the RAOs at the site are evaluated below. Four RAs, including a no-action alternative and three engineered alternatives, were evaluated. This evaluation included an assessment of effectiveness, time frame, advantages and disadvantages of the alternative, and potential costs. The four alternatives evaluated include:

- No remedial action/long-term monitoring
- Excavation and offsite disposal
- Enhanced in-situ bioremediation (EISB)
- Soil Vapor extraction

The above RA's are evaluated for the residual source area.

5.1 Remedial Alternatives

<u>Alternative 1: No Remedial Action/Long-Term Monitoring</u>

Effectiveness: In the absence of active engineered controls, this alternative relies on natural attenuation and related monitoring for reduction of PCE levels to below RAOs. The effectiveness of this methodology is in part tied to the extent of PCE impacts in soil vapor and groundwater, and the potential for natural attenuation over time. Often, reliance on this alternative requires implementation of an institutional control prohibiting groundwater resource development, to be recorded as a land use covenant (LUC).

Under conditions where sufficient mass has been removed from the subsurface and biological conditions are appropriate, natural attenuation over time may be effective and the related monitoring may be sufficient to reach RAOs as a corrective action alternative. Alternatively, under conditions where significant mass remains in the subsurface and/or biological conditions at the site are not conducive to full dehalogenation and breakdown of PCE, natural attenuation and related monitoring are typically insufficient to minimize impacts; especially within a reasonable amount of time.

Based on available data at the subject site, PCE has shown limited ability to naturally degrade in both groundwater and soil vapor based on the consistent absence of PCE daughter products. Moreover, the residual source area remains highly elevated with PCE in soil vapor, suggesting the presence of sufficient mass which further limits the practical applicability of a no-action alternative to reach the RAOs for the site.

Time Frame: The time frame for achieving full natural attenuation, including reaching the RAOs, may be significant.

Advantages: The advantage of this approach is a low annual cost and the ease of implementability, with negligible interference with potential future daily site activities.

Disadvantages: Disadvantages of this approach include the fact that existing PCE impacts are likely to continue to persist over time, with resulting impacts remaining above RAOs for the foreseeable future. In addition, this approach limits the ability to define a reasonable time frame for project closure.

Cost: In the absence of remedial actions, the cost for this alternative is considered low.

Conclusion**:** Since the residual source area is characterized by elevated PCE impacts in soil vapor and given the lack of evidence for natural degradation of PCE in both soil vapor and groundwater beneath the site, a no-action alternative or long-term monitoring are not considered appropriate as means of meeting the RAOs for soil vapor.

While not likely to meet the numerical RAO for PCE in groundwater within a reasonable time frame, a no action alternative, requiring a deed restriction on shallow groundwater resource development, is considered potentially applicable to address the qualitative RAO (i.e, eliminating potential exposure to groundwater) for PCE in groundwater within the residual source area at the site.

Alternative 2: Excavation and Offsite Disposal

Effectiveness: This alternative relies on excavation of PCE-impacted soil and offsite disposal as the means of removing PCE source material at the site. In cases where groundwater is shallow, this alternative may also require extraction and offsite disposal of groundwater to lower the water table in support of soil excavation.

This technology is widely recognized as a preferred alternative for direct and effective removal of source material from the subsurface; however, at the subject site, PCE impacts in soil are limited to levels below residential ESLs. Similarly, groundwater impacts, while slightly above MCLs within the residual source areas, are unlikely to be significantly benefited from groundwater extraction.

Time Frame: This alternative is not likely to positively affect the PCE mass present in soil vapor present within the residual source area; hence, it will not result in achievement of RAOs within a reasonable time frame.

Advantages: The primary advantage of this approach is direct removal of source material. At this site, this source does not exist in soil or groundwater; hence, this advantage is accordingly nullified at this site.

Disadvantages: Disadvantages of this approach include the inability to remove the primary source which exists in soil vapor. Moreover, since the residual source area at the site encompasses a portion of the dry cleaner suite and areas immediately outside of the building, implementing a practical approach to excavation is extremely challenging; impacts to the building foundation and significant efforts toward shoring are among the disadvantages of applying this alternative at the site.

Cost: With the disadvantages mentioned above, the cost of this alternative is considered high.

Conclusion**:** The potential effectiveness of this RA in the residual source area is considered negligible, given the lack of effectiveness of this technology on removing PCE in soil vapor and given the practical limitations and disadvantages listed above.

Alternative 3: Enhanced In-Situ Bioremediation

Effectiveness: Alternative 3 consists of in-situ anaerobic bioremediation of PCE in the subsurface. Specifically, this process entails stimulation of indigenous or inoculated microorganisms (bacteria and other microbes) through the addition of a substrate in order to degrade or metabolize PCE in the subsurface. EISB accelerates the otherwise naturally occurring biodegradation of PCE by providing nutrients, electron donors, electron acceptors, and, if necessary, competent degrading microorganisms to convert organic contaminants to innocuous end-products. While EISB can be implemented under both aerobic and anaerobic conditions, the latter is considered more favorable due to the chlorinated nature of PCE.

EISB has been shown to be highly effective for PCE dissolved in groundwater, with injection of the reagent directly into groundwater. At sites where elevated PCE concentrations in groundwater are contributing to elevated vapor concentrations, then reduction of dissolved PCE via EISB also results in reduction of PCE vapor concentrations; however, at the subject site, since PCE in groundwater is not significantly affected and not considered a significant contributor to the PCE present in soil vapor, the effectiveness of this technology may be limited.

Time Frame: Typically, the duration for this alternative is considered to be medium-term, with multiple injections to (bio-stimulate and bio-augment) the plume followed by multiple rounds of monitoring typically required to reach RAOs. Given the limited role of groundwater impacts on vapor concentrations, the time frame for this technology at this site would be potentially very significant.

Advantages: Typical advantages of this approach include: 1) potential for significant dissolved mass reduction in a relatively short period of time; 2) imposition of favorable declining concentration trends toward RAOs beyond injection events; 3) limited construction, and O&M requirements; and 4) low to moderate costs. However, these advantages are largely applicable to EISB application to groundwater, which is not considered beneficial to address the PCE impacts in soil vapor at the site.

Disadvantages: The typical disadvantages of this approach is the potential for stalling of the degradation process and generation of more toxic daughter products such as vinyl chloride. This typically leads to the need for additional bio-stimulation and bio-augmentation to help push the stalled degradation process toward completion, such that vinyl chloride is also degraded. As previously mentioned, the primary disadvantage for this technology at the subject site is the lack of significant groundwater impacts contributing to observed vapor concentrations.

Cost: The cost of this alternative is considered moderate.

Conclusion**:** Based on the fact that PCE impacts in groundwater are limited and not considered the primary contributor to the soil vapor impacts, application of this technology to address the primary impacted media at the site is not considered feasible.

Alternative 4: Soil Vapor Extraction

Effectiveness: SVE is an effective method for reducing PCE mass in soil vapor. SVE relies on creation of pressure gradients induced by applying vacuum to extraction wells, thereby pulling into the extraction wells vapor from areas surrounding such wells. As previously indicated, an SVE pilot test was conducted at the site for a two-month period in 2009, initially resulting in significant concentration declines (to below RAOs) in monitoring and extraction wells across the site. Subsequent monitoring of vapor concentrations across the next 17 months after cessation of SVE pilot testing has indicated that PCE concentrations in three wells in the residual source area have rebounded to levels above the commercial ESL for PCE in soil vapor. Six wells (including the three exceeding commercial ESLs) have rebounded to levels above residential ESL for PCE; the remaining wells reported PCE below both ESLs, including six wells who’s post-SVE PCE concentration remains below the levels observed prior to initiation of pilot testing.

While rebounding concentrations, especially in the residual source area, are not unusual after only 2 months of operation, the observed reductions in PCE levels after only two months of operation and the demonstrated ability to achieve the necessary vacuum to reduce vapor concentrations at least 30 feet away from extraction wells (see discussion in Appendix A) suggest that this technology may be effective for longer-term application at the site.

Time Frame: The time frame for reaching RAOs using SVE will depend on the extent of continuous operations at the site, and on the amount of mass present. It is not uncommon to operate the SVE system in a pulsed mod, where extraction occurs for several months, but is ceased to allow PCE vapors to re-emerge, to be extracted once again with system restart. Overall, the time frame estimated to achieve RAOs using this technology is considered short to moderate.

Advantages: The primary advantage of this approach is that the methodology directly targets the primary media impacted with PCE at the site.

Disadvantages: Typical disadvantages of this approach include reduced vapor extraction rates resulting in reduced radius of influence around extraction wells due to low soil permeability. As previously discussed, radius of influence estimates from the pilot testing are on the order

of 30 feet, which are considered reasonable. Moreover, extraction from 7 wells, as performed during the pilot testing, allows for significant lateral coverage across and beyond the residual source area at the site.

Other disadvantages of this technology include less efficient system operation during wet weather conditions resulting in the presence of increased moisture in soil.

Cost: The cost of this alternative is considered relatively low at this site, since the majority of the infrastructure in the form of vapor extraction wells and monitoring wells are already in place.

Conclusion**:** In conclusion, this alternative is considered as a viable alternative for achieving RAOs for PCE in soil vapor at the site.

5.2 Preferred Remedial Alternatives

Identification of preferred RA's included consideration of the goal of achieving the RAOs and meeting the ARARs, while accounting for effectiveness, implementability, and costs. Based on the evaluation RA's summarized above, two RA's are recommended:

- SVE for addressing PCE in soil vapor at the site; and
- No action for PCE in groundwater, incorporating necessary deed restrictions prohibiting development of shallow groundwater beneath the site for beneficial uses. An LUC will accordingly be necessary.

The first alternative targets the numerical RAO for PCE in soil vapor; the primary impacted media at the site. The second alternative helps meet the qualitative RAO of eliminating the potential for direct exposure to groundwater in the future by formally restricting development of shallow water resources at the site.

Details for proposed application of the preferred RA alternatives for the site are summarized below.

6.0 REMEDIAL ACTION IMPLEMENTATION PLAN

6.1 Proposed Remedial Approach

As previously indicated, the primary goals for remediation include reduction of PCE in soil vapor to levels at or below the numerical RAOs, and elimination of potential exposure to the residual levels of PCE in groundwater which slightly exceed MCLs within the localized residual source area. Therefore, the proposed remedial approach for the site consists of SVE to address PCE in soil vapor, and establishment of a deed restriction to ensure that shallow groundwater onsite will not be developed for beneficial uses in the future.

The details for these activities are defined in detail below.

6.2 SVE for Addressing PCE in Soil Vapor

SVE activities in concert with those implemented as an interim measure at the site is proposed as a longer-term measure to address PCE in soil vapor at the site. Specifically, the same approach previously approved by the County and implemented at the site as an interim measure will be followed, including system setup, permitting, and O&M activities as outlined below:

- System permitting (Bay Area Air Quality Management District [BAAQMD] and City of Dublin permits) and installation, including two 200-pound carbon vessels connected in series as previously installed at the site per the County-approved IRAP activities;

- Collection and laboratory analysis of baseline vapor samples from all existing site wells to establish pre-remediation conditions; vapor samples will follow DTSC vapor sampling guidelines previously performed by Endpoint at the site as part of IRAP activities and in concert with the previous County-approved workplan (Endpoint, 2010)[6]. PID readings from tedlar bag vapor samples will be concurrently performed to provide a baseline based on PID measurements;

- Conducting an 8-hour shakedown test, including step testing to optimize system flow rates and operations, incorporating PID (from tedlar bag vapor samples) and vacuum readings at all site wells;

- Application of SVE to existing shallow extraction wells VE-1S/D, VE-2S/D, and VE-3/D as previously performed during IRAP activities. These wells are located within the residual source area, with their respective radii of influence (20 to 30 feet based on SVE operations to date) extending to all wells with remaining PCE levels which

[6] Endpoint Consulting, Inc., (2010). Addendum Letter to Vapor Well Installation and Monitoring Workplan. Crow Canyon Dry Cleaners., June 21st.

exceed the numerical RAOs;

- Weekly O&M visits for the first month of system operation, including vacuum and PID measurements at all site wells and system influent and effluent concentrations in concert with the BAAQMD permit requirements;

- After the first month of operation, transition to monthly O&M visits, incorporating vacuum and PID measurements at all site wells and carbon change-out as necessary based on influent and influent concentrations;

- Initial SVE operations will continue for an estimated minimum period of 6 months, unless system performance reveals a significant reduction in vapor flow rates and/or PCE mass removal rates. Under such circumstances, the system will be turned off and key site wells VE-1S, VE-2S, VE-3S, VM-4S, VM-56SS, VM-6SS, VM-9SS, and VM-1S will be monitored via PID for rebound on a monthly basis for no more than two months. Should rebound occur, the system will be restarted and operations will continue per the above procedures. Each system stoppage and restart scenario will be reported to the County within five days of occurrence;

- Pulsing of the SVE system will be performed as necessary to maximize extraction efficiency; this may involve SVE operation for 3 to 4 months, followed by one or 2 months of system termination to allow for PCE vapors to rebound prior to system restart. Each system stoppage and restart scenario will be reported ot the County within five days of occurrence;

- Numerical RAOs (410 ug/m^3 should the Montessori School remain in place or 1,400 ug/m^3 should the school be no longer present at its current location) will be used as the basis for ultimate system termination. Once O&M PID readings suggest sufficient PCE mass removal and potential readiness for system shutdown, vapor sampling and laboratory analysis per the previously approved by the County (Endpoint, 2010) will be performed across all site wells, with results compared to the relevant RAO;

- If the relevant RAO is reached, the results will be presented to the County and the system may be turned off[7]. After one month of system turnoff, semi-annual monitoring of all site wells will be conducted, with well sampling and laboratory analysis following the previous County-approved procedures implemented at the site (Endpoint, 2010) ;

- Alternatively, if the relevant RAOs are not reached, the system operations will continue and the procedures above will be repeated until such time that the RAOs are reached.

[7] System turnoff will also depend on observed trends in vapor flow rates and mass removal rates . For example, even if vapor concentrations are protective of RAOs, should mass removal rates continue to trend toward levels which suggest continued mass removal, the system operations may be continued to maximize mass removal.

Based on the above-summarized procedures, SVE operations will continue until two semi-annual events of sampling demonstrate compliance with the relevant RAO at each of the site wells.

6.2.1 SVE Operation Contingency

Additional Vapor Extraction Wells or Alternate Well Screen Intervals

As previously discussed in Section 3 herein, vertically, the source area is characterized by peak PCE vapor concentrations in shallow soils (2.5 to 5 feet bgs), with additional accumulation of vapors in the sub-slab of the existing buildings (1 to 2 feet bgs). Moreover, a comparison of PCE vapor concentrations in shallow-screened wells (typically screened from

2.5 feet to 5.5 feet bgs) and deeper screened wells (typically screened from 6 to 9 feet bgs) indicates a consistent pattern of lower vapor concentrations in deeper wells than in shallow wells. Moreover the highest detected concentrations of PCE vapors to date at the site remain in shallow soils, suggesting that shallow soils are the primary source of vapors with contribution to immediately overlying sub-slab locations.

As such, vapor extraction wells at the site, which include clustered wells screened in both deep (6 to 9 feet bgs) and shallow soils (2.5 to 5.5 feet bgs), address both the higher concentrated source areas in shallow soils (2.5 feet bgs), while providing additional capability of inducing shallower vapors in the sub-slab (1 To 2 feet bgs) to flow into the extraction wells.

Based on the above logic, the existing vapor extraction wells are considered adequate for the full-scale SVE application per the preferred alternative selected herein; however, as longer-term application of SVE per the preferred RA is implemented, should data suggest the need for additional extraction wells and/or extraction directly from the sub-slab, an additional sub-slab well may be installed within the residual source area; the location and details of this well will be identified per concurrence from the County.

6.3 Institutional Controls and Deed Restrictions for PCE in Groundwater

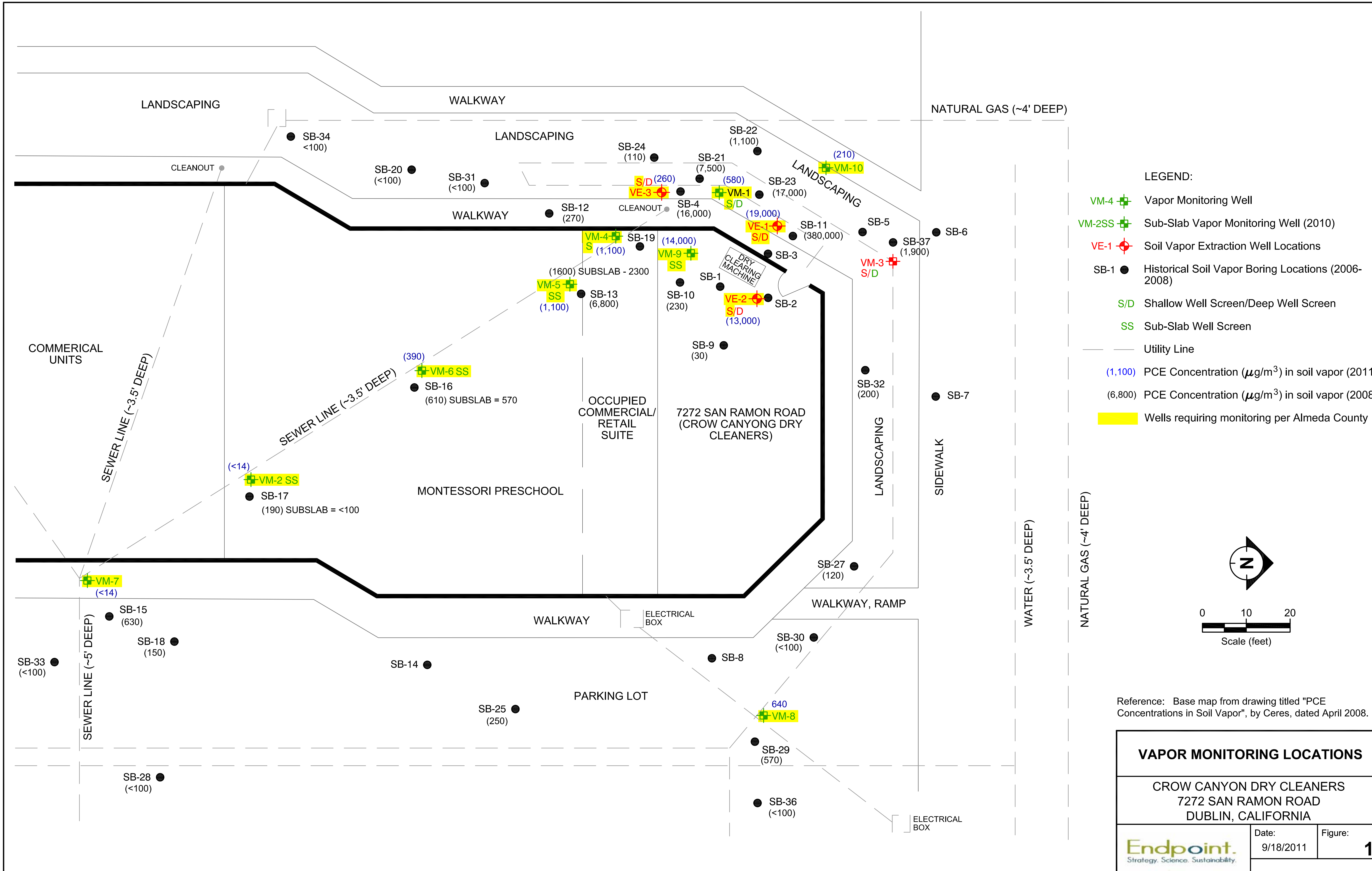
Per the preferred RA for eliminating the potential for water resource development for shallow groundwater at the site, an LUC incorporating institutional controls restricting placement of shallow groundwater water supply wells at the site will be necessary. To this end, an Operations & Maintenance (O&M) Plan will be prepared to outline the details of institutional controls mentioned above and the LUC will be filed for the property in collaboration with the County.

7.0 REPORTING AND SCHEDULE

The CAP activities will be primarily documented in four technical documents to be prepared and submitted to the County. The first is a Remediation Implementation Report documenting SVE activities through the period where the relevant RAO is reached and the system operation is terminated. The second report will reflect the first of two semi-annual monitoring events conducted approximately 6 months after system termination. The third report will reflect the final of the two semi-annual monitoring events. Should this event prove that PCE levels have remained below the relevant RAO twelve months after system termination, then this report will include a formal request for site closure. The fourth report will correspond to a brief O&M plan to be used in support of the LUC for implementing institutional controls preventing groundwater resource development at the site.

The CAP activities outlined herein may be initiated immediately upon the County's approval of the CAP. Overall, the referenced remedial activities are expected to be completed within a 12-month period following approval of the CAP, falling back on semi-annual monitoring thereafter.

FIGURES


LANDSCAPING
WALKWAY
LANDSCAPING
NATURAL GAS (~4' DEEP)
SB-34 <100
CLEANOUT
SB-20 (<100)
SB-31 (<100)
SB-24 (110)
SB-22 (1,100)
SB-21 (7,500)
(210) VM-10
S/D (260) VE-3
(580) VM-1 S/D
SB-23 (17,000)
LANDSCAPING
CLEANOUT
SB-4 (16,000)
WALKWAY
SB-12 (270)
(19,000) VE-1 S/D
SB-11 (380,000)
SB-5
SB-6
SB-37 (1,900)
VM-3 S/D
VM-4 S (1,100)
SB-19
(14,000) VM-9 SS
SB-3
DRY CLEANING MACHINE
(1600) SUBSLAB - 2300
VM-5 SS (1,100)
SB-13 (6,800)
SB-10 (230)
SB-1
VE-2 S/D (13,000)
SB-2
SB-9 (30)
SB-32 (200)
SB-7
COMMERICAL UNITS
SEWER LINE (~3.5' DEEP)
(390) VM-6 SS
SB-16 (610) SUBSLAB = 570
SEWER LINE (~3.5' DEEP)
OCCUPIED COMMERCIAL/ RETAIL SUITE
7272 SAN RAMON ROAD (CROW CANYON DRY CLEANERS)
LANDSCAPING
SIDEWALK
(<14) VM-2 SS
SB-17 (190) SUBSLAB = <100
MONTESSORI PRESCHOOL
SB-27 (120)
VM-7 (<14)
WALKWAY, RAMP
SB-15 (630)
ELECTRICAL BOX
WALKWAY
SB-18 (150)
SB-30 (<100)
SB-33 (<100)
SB-14
SB-8
SEWER LINE (~5' DEEP)
PARKING LOT
SB-25 (250)
640 VM-8
SB-29 (570)
SB-28 (<100)
SB-36 (<100)
ELECTRICAL BOX
WATER (~3.5' DEEP)
NATURAL GAS (~4' DEEP)
LEGEND:
VM-4 Vapor Monitoring Well
VM-2SS Sub-Slab Vapor Monitoring Well (2010)
VE-1 Soil Vapor Extraction Well Locations
SB-1 Historical Soil Vapor Boring Locations (2006-2008)
S/D Shallow Well Screen/Deep Well Screen
SS Sub-Slab Well Screen
Utility Line
(1,100) PCE Concentration (μg/m³) in soil vapor (2011)
(6,800) PCE Concentration (μg/m³) in soil vapor (2008)
Wells requiring monitoring per Almeda County
N
0 10 20
Scale (feet)
Reference: Base map from drawing titled "PCE Concentrations in Soil Vapor", by Ceres, dated April 2008.
VAPOR MONITORING LOCATIONS
CROW CANYON DRY CLEANERS
7272 SAN RAMON ROAD
DUBLIN, CALIFORNIA
Endpoint. Strategy. Science. Sustainability.
Date: 9/18/2011
Figure: 1

TABLES

Table 1
PCE Vapor Concentrations-Baseline and Post-IRAP Activities

Crow Canyon Dry Clenaers
7272 San Ramon Road,
Dublin, California

Well I.D.	PCE Concentrations (ug/m^3) 7/18/2009 to 7/30/2009 Baseline-Purge Test-SVE Shakedown Sampling Events	9/1/2009 1 Month after operation of SVE system	9/28/2009 2 Months after operation of SVE system	11/4/09 ~ 1 month after shutdown of SVE system	8/26/10 ~ 11 months after shutdown of SVE system	1/12/11 ~ 17 months after shutdown of SVE system
VE-1S	1,200	23	<14	970	1,100	19,000
VE-1D	420	300	<14	770	NS	NS
VE-2S	5,900	<14	200	500	3,400	13,000
VE-2D	1,100	<14	<14	350	NS	NS
VE-3S	2,200	30	38	<14	870	260
VE-3D	3,800	24	51	<14	NS	NS
VM-1S	<73	-	<14	20	2,600	580
VM-1D	160	-	16	140	NS	NS
VM-3S	8,100	-	55	81	NS	NS
VM-3D	34J	-	<14	300	NS	NS
VM-4S	10,000	-	180	310	1,100	1,100
VM-5SS	-	-	-	-	1,300	1,100
VM-6SS	-	-	-	-	650	390
VM-2SS	-	-	-	-	28	<14
VM-7	-	-	-	-	310	<14
VM-8	-	-	-	-	1,300	640
VM-9SS	-	-	-	-	11,000	14,000
VM-10	-	-	-	-	450	210
95% UCL Concentration (1)	**7,642**	**270**	**115**	**489**	**4,111**	**7,751**
Carcinogneic Risk-Residential Land Use (2)	**1.9E-05**	**6.6E-07**	**2.8E-07**	**1.2E-06**	**1.0E-05**	**1.9E-05**
Carcinogneic Commercial Land Use (3)	**5.5E-06**	**1.9E-07**	**8.2E-08**	**3.5E-07**	**2.9E-06**	**5.5E-06**
Carcinogneic Risk-School Land Use (4)	**2.4E-06**	**8.6E-08**	**3.7E-08**	**1.6E-07**	**1.3E-06**	**2.2E-06**
ESLs Residential Exposure: 410 ug/m^3						
ESLs Commercial/Industrial Land Use: 1,400 ug/m3						
Site-Specific Screening Level for School Children: 2,600 ug/m^3						

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Table 1
PCE Vapor Concentrations-Baseline and Post-IRAP Activities
Crow Canyon Dry Clenaers
7272 San Ramon Road,
Dublin, California

Abbreviations:
SVE = Soil Vapor Extraction
ug/m^3 = microgram per cubic meter
"-" or "NS" = not available or not sampled
"<" = less than laboratory reporting limit
ESLs = Environmental Screening Levels developed by RWQCB, San Francisco Bay Region, May 2008 (Table E).

Notes:
(1) 95% UCL calculation is detailed in Appendix D.
(2) Since the residential ESL for PCE in soil vapor is 410 ug/m^3 derived from a target risk level of 1E-06, and the risk is approximately directly proportional to concentration, a potential risk posed by site PCE concentration (95% UCL) is estimated as follows:

$$risk \approx 4{,}111 ug/m^3 \times \frac{1E-06}{410 ug/m^3} \approx 1E-05$$

(3) Since the commercial ESL for PCE in soil vapor is 1,400 ug/m^3 derived from a target risk level of 1E-06, and the risk is approximately directly proportional to concentration, a potential risk posed by site PCE concentration (95% UCL) is estimated as follows:

$$risk \approx 4{,}111 ug/m^3 \times \frac{1E-06}{1{,}400 ug/m^3} \approx 2.94E-06$$

(4) A potential risk to children posed by site PCE concentration (95% UCL) for school use scenario is calculated based on J&E Model (Appendix E) and the equation below.

Risk = (Indoor air concentration x Inhalation Rate x Exposure Frequency x Exposure Duration x Inahlation Cancer Slope Factor)/(Body Weight x Averaging Time for Carcinog

Table 2. Potentially Applicable or Relevant and Appropriate Requirements (ARARS) and To Be Considered (TBC) Criteria
Crow Canyon Dry Cleaners, Dublin, CA

Type	Standard, Requirement, Criteria, Limitation	Citation	Description
Chemical	Chemical Hazardous Waste Identification	40 CFR 261.24	Establishes criteria to determine whether solid waste exhibits hazard characteristics of federal hazardous waste
Chemical/ Action	Classification and regulation of hazardous waste	40 CFR 260	Establishes criteria for the determination of hazardous waste and its regulation.
Action	Drinking Water Standards	40 CFR Part 141	Establishes maximum contaminant levels to protect water quality in public drinking water systems
Action	Occupational Health and Safety	29 CFR 1910.120	Establishes requirements for health and safety training.
Action	Resource Conservation and Recovery Act (RCRA)	40 CFR 239-299	Primary federal law governing the disposal of solid and hazardous waste.
Chemical	Ambient Air Quality Standards	HSC 39000-44071	Establishes standards for emissions of chemical vapors and dust.
Action	Clean Air Act	42 USC 7401-7642	Emission standards from stationary and mobile sources
Action	Determination of Characteristic Wastes	22 CCR 66261.24	Establishes criteria for identifying characteristic wastes.
Chemical	Determination of Characteristic Wastes	22 CCR 66261.24	Establishes criteria for identifying characteristic wastes.
Action	Hazardous Waste Control	HSC 25100-25250.26 Establishes hazardous waste control measures.	Establishes hazardous waste control measures.
Action	Hazardous Waste Generator Requirements	22 CCR 66262.11 et seq.	Establishes standards applicable to generators of hazardous waste
Action	Drinking Water Standards	22 CCR 64431 and 64444	Establishes maximum contaminant levels to protect drinking water in public water supply systems
Action	Porter-Cologne Water Quality Control Act	RWQCB California Water Code, Division 7. Water Quality	Establishes policies and procedures for investigation and remediation decisions for preservation and protection of water of the state for benefecial uses
Action	Water Quality Control Plan	RWQCB California Water Code, Division 7. Water Quality	Establishes water quality objectives for the San Francisco Bay
Action	California Occupational Health and Safety	8 CCR 1500, 2300, and 3200 et seq.	Establishes standards for working conditions and employees matter; and notification requirements
Action	Land Use- California Environmental Quality Act	Pbulic Resources Code Sections 21000-21177	Mandates environmental impact review of projects approved by government agencies.
Action	Land Use Covenants	22 CCR 67391.1	Specify that a land use covenant imposing appropriate restrictions on land use shall be executed and recorded when hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.
TBC/Action	Health Risk Assessment	USEPA Risk Assessment Guidance for Superfund, 1989	Guidance and framework to assess health risk.
TBC/chemical	Health Risk Screening Assessment	Enviornmental Screening Levels (ESLs) for protection of indoor air quality (RWQCB, 2007)	Establishes screening levels for indoor iar quality based on health risk assessment
TBC	Soil Screening Guidance	USEPA Soil Screening Guidance, July 1996	Methodology for developing site-specific screening levels
TBC	Health Risk Screening Assessment	USEPA Region 9 Regional Screening Levels (RSLs)	Guidance and framework to assess health risk.

NOTES:

CCR California Code of Regulations
CFR Code of Federal Regulations
HSC California Health and Safety Code
RWQCB Regional Water Quality Control Board, San Francisco Bay Region
RCRA Resource Conservation and Recovery Act
USC United States Code
TBC To Be Considered

Appendix A

Response to County Questions: Request for Resumption of Interim Remedial Action Activities through CAP Review Process

Appendix A

Response to County Questions: Request for Resumption of Interim Remedial Action Activities through CAP Review Process

This appendix has been prepared in response to a request by the Alameda County Health Care Services Agency (County) in support of continuing soil vapor extraction (SVE) operations previously approved by the County as an interim measure for the above-referenced site. In a letter dated September 1, 2011, the County requested that several technical comments be addressed via this document in support of the County's decision as to whether the SVE system may be restarted. The responses to each of these technical comments are included herein.

BACKGROUND

By way of background, an SVE pilot test was conducted as a County-approved interim measure from August through October 2009, yielding significant reductions in tetrachloroethene (PCE) concentrations in soil vapor across the site's monitoring wells. Because of the significant drop in PCE concentrations in response to the SVE pilot test and supported by a reduction in observed mass removal rates from the SVE system across the two months of operation, the system was subsequently turned off and monitoring of soil vapor quality was performed across the site. Initially, this post-pilot test monitoring took place one month following cessation of SVE operations; this data revealed that PCE concentrations across the site had largely remained at reduced levels, with limited rebound. Following discussions with the County, monitoring of soil vapor quality was conducted during two additional events within the next 12 months, yielding data some 17 months after the termination of the SVE operations. Combined, the data of record indicate:

- Six wells (VE1S, VE1D, VE2S, VM1S, VM1D, and VM3D) who's concentrations declined from baseline levels during the SVE operations and thereafter, but then rebounded after cessation of the SVE based on the latest available concentration in each well. Note that despite the rebound, the latest concentration in four of these six wells remains below the highly conservative Commercial Environmental Screening Level (ESL) for protection of indoor air quality.

- Four wells (VE2D, VE3S, VE3D, VM3S, and VM4S) who's concentrations declined as a result of SVE operations without rebound based on available data. The latest data point from each of these wells, including at VM4S which was the primary target of the pilot test (due to proximity to the Montessori School) and which declined from 10,000 ug/m^3 to 1,100 ug/m^3 seventeen months after cessation of the SVE), all remain below the Commercial ESLs.

- Seven wells were newly installed after the SVE operations, so only data post pilot testing was available for these wells. Nevertheless, six of these seven wells (VM5SS, VM6SS, VM2SS, VM7, VM8, and VM10) all recorded concentrations below the ESL. Only one of these wells (VM-9SS) yields a concentration above the Commercial ESL.

These data are summarized in Table 1 of the Draft CAP, with well locations shown on Figure 1 of the Draft CAP.

Based on the above data and considering the latest round of monitoring, of the 17 site wells, 14 report concentrations below the Commercial ESL (1,400 ug/m^3); this includes 10 wells that were positively affected by the limited, 2-month long SVE pilot test. If residential ESLs are used for screening of vapor concentrations, then the latest data indicate that 6 of the 17 wells exceed the residential ESL (410 ug/m^3). Lastly, if school exposure for children is assumed over the length of time children are known to spend time at the Montessori School adjacent to the site, then the same three wells which exceed the commercial ESL also exceed the school-use screening level (2,600 ug/m^3). <u>As discussed during a meeting held with the County on August 26, 2011, as a conservative measure, the residential screening level of 410 ug/m^3 will be used for screening of PCE concentrations in soil vapor at the site, until such time that the Montessori School may no longer be present adjacent to the site; at that time, the commercial screening level of 1,400 ug/m^3 may be used as the relevant screening level for PCE in soil vapor</u>.

Lastly, all data summarized above have been previously reported to the County through submittal of the Interim Remediation Action Report (January 2010) and two subsequent semi-annual monitoring reports (September 2010 and February 2011).

RESPONSE TO TECHNICAL COMMENTS

Responses to each of the technical comments provided by the County in the letter dated September 1, 2011 are summarized below. The County’s comment is stated first, followed by the response.

Comment 1. **Interim Remedial Action –** As mentioned above, Mr. Roessler and Mr. Javaherian requested to re-start the SVE system and continue IRA while the FS/CAP is being prepared. At this time, please submit a brief, but concise Technical Memorandum that justifies restarting the SVE system. To that end, please address the following:

a. In the “Interim Remedial Action Report” dated January 26, 2010, Endpoint stated that “the SVE operation has met its primary objective of PCE concentration reduction in both the source area and near the Montessori School. The system operational data (e.g. mass removal rates and influent samples) indicated that continued operation of the SVE system yields minimal returns in terms of mass removal.” Please justify that SVE is the most cost-effective interim measure and should be re-started while the FS/CAP is being prepared.

b. Endpoint refers to the former dry cleaning machine as the source area. Please elaborate in detail the nature and extent of the source area. Include a discussion on whether PCE vapor contamination is primarily in the shallow vadose zone near the former dry cleaning machine (based on soil vapor samples collected at the site) or whether there is a potential PCE source that is residing directly below the concrete and within the baserock and above the shallow vadose zone soil, which has resulted in PCE vapor detections in sub-slab sampling locations or a combination of both. Adequate comprehension of the source area is necessary to precisely target the contaminated zone, support extraction well locations and screened intervals, and ultimately, cost-effective and successful cleanup of the site. Please include figures/cross-sections that illustrate the source area(s) and support your conclusions.

c. During our meeting on August 26, 2011, Mr. Javaherian stated that induced vacuum was measured to determine the radius of influence during the IRA operation. I apologize in advance, but please direct ACEH to the report(s) and page(s) where this and other SVE system analysis information/discussion can be found. If information is not available in previous submittals, please include the information in the Technical Memorandum.

Response to Comment 1: **Part a).** As indicated by the County's letter dated September 1, 2011, a corrective action plan (CAP) which will formally evaluate multiple potential remedial alternatives in terms of effectiveness, implementability, and cost, has not yet been prepared for the site; this CAP has been requested by September 30th, 2011 and work to this end is currently underway. This notwithstanding, short of a no-action alternative where no action is taken in response to the observe levels of PCE, and short of a monitoring only alternative where the sole measure taken is to periodically monitor vapor concentrations, restart of the SVE operations in accordance with the County-approved interim remediation action plan (IRAP) for the is considered the most cost-effective alternative. The reasons are:

1) The infrastructure for operation of the SVE system per the approved workplan is largely in place, including existing extraction wells and monitoring wells. Needed are a new air permit and mobilization of a mobile SVE unit and related carbon vessels to accommodate treatment of extracted vapors; the implementability and costs for such needed items are considered relatively minor, especially compared to other potentially applicable technologies which will potentially require significant more infrastructure (e.g., injection wells, monitoring wells, monitoring frequency, building permits, etc.).

2) A workplan outlining SVE operation and monitoring procedures already approved by the County already exists. No added time and costs are required to prepare a new workplan will be needed with the SVE alternative.

With respect to the second part of the comment related to why the system should be restarted, the following rationale holds:

3) Remediation of any kind during the lengthy period of CAP preparation, regulatory review, public review, and formal adoption is considered far more protective of human health and the environment than the alternative of no remedial action during the CAP process. Moreover, as discussed during the August 26, 2011 meeting, at best, the CAP process is unlikely to be completed until February of 2012, delaying actual initiation of any remediation until the Spring of 2012. Instead, the proposed re-initiation of the SVE operations while the CAP process is in place can help implement remediation by as much as five months prior to remediation called for by the CAP. Hence, the proposed option will help provide more protection to human health and the environment.

4) As outlined in aforementioned reports and summarized in the Background Section of this Memo, after only two months of SVE operations, significant reductions in PCE concentrations were observed across the site wells; this demonstrates that SVE as previously implemented is able to induce the movement of vapor across the large area being monitored at the site, and to remove PCE at a rate that results in reduced concentrations for several months. Note that 4 of the 10 original wells monitored both before and after SVE operations have PCE levels which did not rebound. The rebound was limited to 6 of the 10 wells (see background section herein).

5) Among the key wells that have been highly positively impacted by SVE operations is monitoring well VM-4S. This is a shallow vapor monitoring well located in the narrow suite which separates the dry cleaner from the Montessori School (see Figure 1). This well has been identified as a key monitoring well as it is located immediately adjacent to the eastern wall of the Montessori School and in the path of potential migration of vapors from the former PCE release area at the Dry Cleaners to the Montessori School. Also, the pre-remediation concentration in this well was the highest compared to the pre-remediation concentration in any of the other site wells (see Table 1).

   As indicated in Table 1, the PCE concentration in this well was as high as 10,000 ug/m^3 prior to the initiation of the SVE operations. After only two months of SVE operation, the PCE concentration in this well declined from 10,000 ug/m^3 (well above the residential and commercial ESL) to 180 ug/m^3 (well below both residential and commercial ESL). One month after shutdown of the SVE system, PCE in this well was reported at 310 ug/m^3 (again, below both ESLs). Data collected in this well 11 months after the shutdown of the SVE and then again 17

   months after the shutdown of the SVE system reported PCE at 1,100 ug/m^3. This shows that while some rebound has occurred since the shutdown of the SVE system after only two months of operation, the remaining PCE concentration in this well (i.e., 1,100 ug/m^3) is far below the pre-remediation level (10,000 ug/m^3) and has remained stable (with no additional rebound) over the six month period between the two most recent sampling events. Moreover, while the most recent detected concentration is above the residential ESL, it remains below both the commercial ESL and the school-exposure screening level.

The results in this well shows that the SVE system, despite only two months of operation, were highly effective in permanently (at least up to 17 months after terminating SVE operations) reducing the PCE concentrations at a critical location at the site. Additional vapor extraction via the proposed continuation of the interim measure while the CAP is being prepared is expected to further contribute to reducing PCE concentrations at this location, thereby further reducing the potential public health risks to both the suite neighboring the dry cleaners, and to the Montessori School.

6) Observations similar to those for VM-4S described above can be made for the results of pre- and post-SVE sampling at wells VE2D, VE3S, VE3D, VM3S (see Table 1). Specifically, these data show that despite minor rebounds, post-remediation sampling yield PCE levels that are below pre-remediation levels based on the most recent data collected at each of these wells. This data further points to the positive effects of the SVE operations, despite being limited to only two months.

7) While monitoring well VM-5SS, located in the eastern portion of the Montessori School, was not present prior to and during SVE activities, the results of the sampling at this well at 11 and 16 months after termination of SVE operations has yielded relatively stable levels of PCE at 1,300 ug/m^3 and 1,100 ug/m^3, respectively. This well is located a few feet away from the location of former boring SB-13 (see Figure 1) installed by AEI Consultants (2007), which reported a pre-SVE operation PCE concentration of 6,800 ug/m^3. Compared to data from the immediately adjacent well VM-5SS, this data suggests that SVE operations have significantly reduced PCE concentrations at this location within the Montessori School. Restart of the SVE operations as outlined in the County-approved IRAP is therefore expected to further reduce PCE levels and contribute to the protection of human health and the environment at this location. Worth noting is that VM-5SS is located in the location of a sewer line defined by AEI Consultants and which may serve as a potential preferential migration pathway for PCE vapors; hence, the restart of the SVE operations as outlined in the County-approved IRAP is expected to further minimize the potential for preferential migration of vapors in this area.

8) The fore-mentioned observation of significant reductions in PCE concentration in key monitoring well MW-4S further shows that the effects of SVE operations as implemented per the IRAP extent to a distance of at least 20 feet away from extraction locations. Specifically, the positive and consistent effects of reducing

PCE concentrations in MW-4S as a result of vapor extraction at extraction well VE-3S located closest to this well (VE-3S is located approximately 20 feet from VM-4S) confirms an effective radius of influence of at least 20 feet for the SVE system as currently designed. An even greater radius of influence may in fact exist and may be assessed should the system be restarted and should influence in newly installed well VM5SS be observed (this well was not present prior to or during SVE activities).

Using the pre-remediation data from the aforementioned SB-13 boring and the significantly reduced PCE concentration (post-remediation) in adjacent well MW-5SS, the radius of influence Lastly, it should be noted that an even greater radius of influence (at least 30 feet) was observed between extraction at VE-2S and monitoring wells VM-3S/D.

Combined, these data support the fact that a reasonable radius of influence was achieved with the SVE system as implemented in the IRAP and its restart achieves the afore-mentioned benefits, including reduction of vapor concentrations at and adjacent to the Montessori School.

Response to Comment 1: **Part b).** The general area at and in the vicinity of the historical dry cleaning machine (same location as the current dry cleaning machine which does not use PCE) has been identified as the primary likely release area of PCE in past documents prepared by previous consultants and submitted to the County; Endpoint is in general agreement with this observation. The basis for this conceptualization is the historical PCE soil vapor data collected at the site, plus those supplemented by Endpoint's well sampling efforts.

To summarize, the lateral extent of the source area may be defined by a triangle of wells (and adjacent former borings):

- VM-9SS: as high as 14,000 ug/m^3
- VE-2S: as high as 13,000 ug/m^3
- SB-11/VE-1S: (as high as 380,000 ug/m^3 in SB-11, but reduced significantly to 19,000 ug/m^3 in immediately adjacent well VE-1S)

Correspondingly, based on the most recent round of sampling at existing monitoring wells, the remaining source area may be defined within the triangular area bounded by

wells VM-9SS (14,000 ug/m^3, VE-2S (13,000 ug/m^3), and VE-1S (19,000 ug/m^3). Away from this residual source area, PCE concentrations occur at significantly lower concentrations (see Figure 1), including only three wells (VM-4S, VM-5SS, and VM-8) which exceed the residential ESL and none which exceed the commercial ESL for PCE. All of these wells are either direct SVE extraction points or within the radius of influence of extraction wells already in place and operated previously under the IRAP. Hence, restart of the SVE system would directly affect this residual source area.

Vertically, the source area is characterized by peak PCE vapor concentrations in shallow soils (2.5 to 5 feet bgs), with additional accumulation of vapors in the sub-slab of the existing buildings (1 to 2 feet bgs); this accumulation is expected since building occupancy results in reduced pressure inside the building and underlying sub-slab, inducing movement of vapors in shallow soils toward the building sub-slab (i.e from areas of higher pressure to lower pressure). A comparison of PCE vapor concentrations in shallow-screened wells (typically screened from 2.5 feet to 5.5 feet bgs) and deeper screened wells (typically screened from 6 to 9 feet bgs) indicates a consistent pattern of lower vapor concentrations in deeper wells than in shallow wells. Moreover the highest detected concentrations of PCE vapors to date at the site remain in shallow soils, suggesting that shallow soils are the primary source of vapors with contribution to immediately overlying sub-slab locations. As such, vapor extraction wells at the site, which include clustered wells screened in both deep (6 to 9 feet bgs) and shallow soils (2.5 to 5.5 feet bgs), address both the higher concentrated source areas in shallow soils (2.5 feet bgs), while providing additional capability of inducing shallower vapors in the

sub-slab (1 To 2 feet bgs) to flow into the extraction wells. <u>Based on the above logic, the existing wells are considered adequate for proposed continuation of SVE activities as an interim measure while the CAP is under preparation; further evaluation of the adequacy of existing extraction wells for longer-term application of SVE, including the potential need for additional wells and related screen intervals, will be performed as part of the forthcoming CAP.</u>

In addition to the soil vapor sampling used to define the source area described above, the soil sampling conducted to date by AEI (2007) indicates that within and beyond the above-referenced triangular source area, PCE remains largely below detection limits and where detected, below residential and commercial soil ESLs (see Appendix B of Draft CAP for data tables from AEI, 2007). The primary residual detections of PCE in soil center around 5 feet below ground surface (bgs) at former borings SB-1, SB-2, and SB-3 located in the immediate vicinity of the former dry cleaning machine; while these detections show evidence of a historical PCE release (maximum detected concentration of 0.071 mg/kg), they occur at levels well below both the residential (0.37 mg/kg) and commercial (0.7 mg/kg) soil ESLs.

Corresponding to the above observations for soil and soil vapor, the occurrence of PCE in groundwater is also primarily limited to the triangular source area. Specifically, AEI (2007) data (see Appendix B of Draft CAP) show the highest concentrations of PCE in groundwater coincide with those in soil and soil vapor in the immediate vicinity of the former dry cleaning machine, with the maximum detected concentration of 22 ug/L. This value is above the drinking water standard of 5 ug/L for PCE, but remains well below levels that may pose a vapor intrusion risk from groundwater under commercial (420 ug/L) or residential (120 ug/L) land uses.

Based on the above soil vapor, soil, and groundwater data, the extent of the source area is defined as a triangular area in the immediate vicinity of the former dry cleaning machine. In this source area, PCE occurs primarily in soil vapor within shallow soils (2.5 feet bgs) and secondarily within the immediately overlying sub-slab areas (1 to 2 feet bgs). Existing extraction wells directly target the shallow soils (2.5 to 5 feet bgs) and are also able to induce vapor flow and capture from the sub-slab zone located 1 to 2 feet bgs and immediately above the shallow soils. Further evaluation of the extraction well network will be performed as part of the CAP requested by the County.

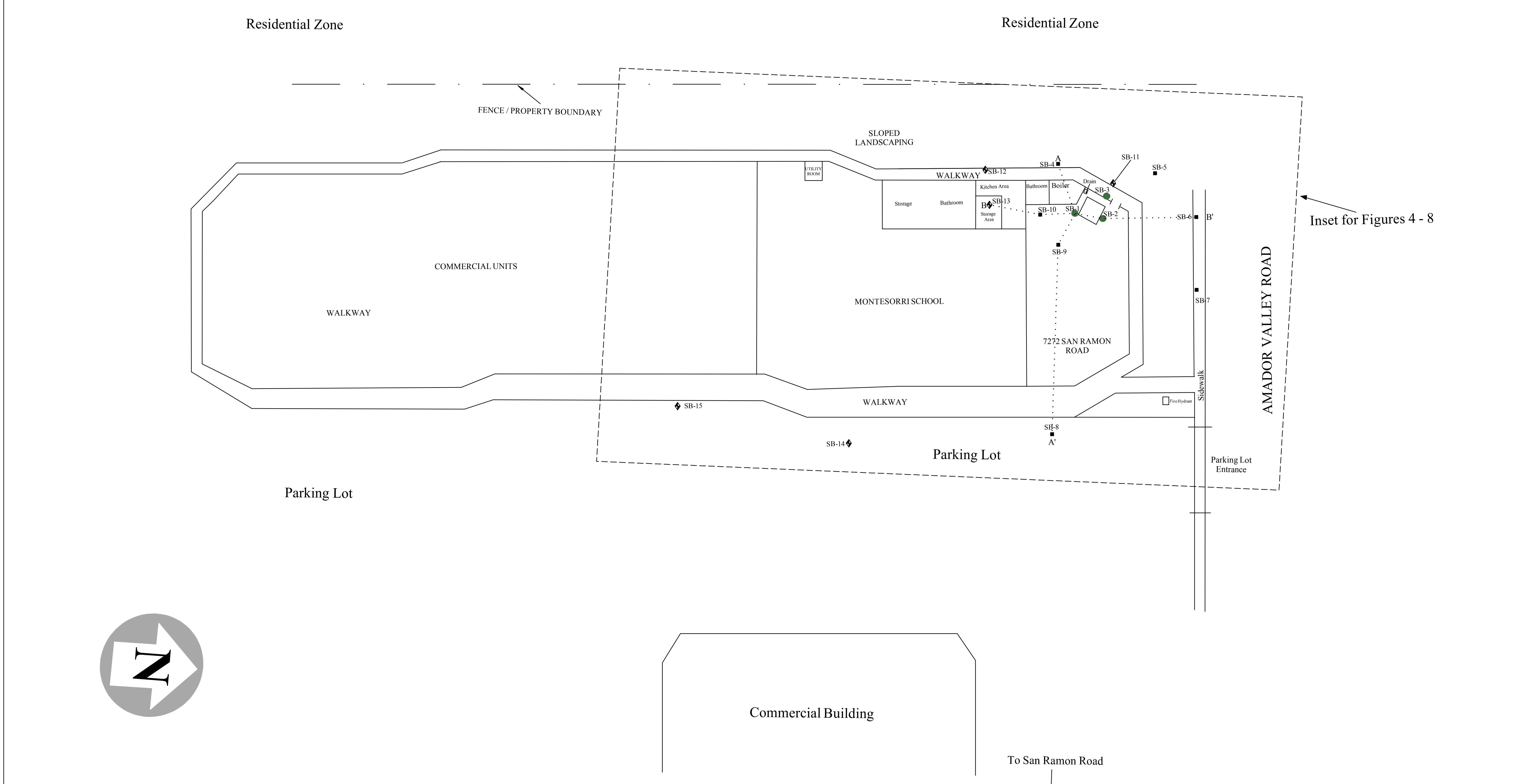
Part c. In addition to the radius of influence discussion earlier herein, induced vacuum data, which was measured throughout the SVE operations, were reported as Appendix B to the IRAP report dated January 2010; these data were referenced on page 4 of the IRAP report as being contained in Appendix B.

Response to Comment 2: Per the County's request, following the submittal of the CAP, an updated Fact Sheet describing the selected remedial alternative will be prepared and sent out to the affected stakeholders in the vicinity of the subject site, including parents of the children attending the Montessori School. In an effort to expedite review of the CAP and to move this case forward, a List of Recipients will be submitted to the County by September 23, 2011. This list may be different than the previously compiled List of Recipients since some children may have left the Montessori School and new children may have since been enrolled. Therefore, to aid in the County's review, the Previous List of Recipients will be submitted along with the newly revised list.

Response to Comment 3: As discussed during the August 26, 2011 meeting with the County, it was decided that the CAP will include two cleanup goals; one reflecting the commercial ESL for PCE (i.e, 1,400 ug/m^3) and one reflecting the residential ESL of 410 ug/m^3. It was further decided that the former cleanup goal would be applicable if/when the Montessori School is moved and is no longer at its current location. In turn, the latter goal would remain in effect if the school remains at its current location. Based on this direction provided during the referenced meeting, the CAP will incorporate this approach. The same approach will be implemented in screening PCE sampling results stemming from the proposed restart of SVE operations as a continuing interim measure while the CAP preparation/review process is underway.

Response to Comment 4: Via an email on September 3, 2011 to Mr. Paresh Khatri, Mr. Jim Roessler confirmed the email addresses for the Responsible Parties.

Appendix B
Historical Site Investigation Data



Drafted By: Adrian Angel (Revised Feb 2007)

Legend:

- ▪ Soil Boring Locations (02/2-6/06)
- ● Soil Boring Locations (01/27/05)
- ◆ Soil Boring (12/27/06 and 1/15/07)
- .... Fence Line (See Figs 10 and 11)

0 15 30 45

SCALE 1" = 30'

AEI CONSULTANTS
2500 CAMINO DIABLO BLVD, SUITE 200, WALNUT CREEK, CA

SITE PLAN

7272 San Ramon Road
Dublin, CA 94568

FIGURE 2
PROJECT NO. 263294

Table 1
Soil Sample Analytical Data

Sample ID	**Date**	**Sample Depth** feet bgs	**PCE** mg/kg	**TCE** mg/kg *EPA Method SW8260B*	**All other HVOCs** mg/kg
SB-1 5'	1/27/05	5	0.023	<0.005	<MDL
SB-2 5'	1/27/05	5	0.071	<0.005	<MDL
SB-3 5'	1/27/05	5	0.029	<0.005	<MDL
SB-4-5'	2/6/06	5	<0.005	<0.005	<MDL
SB-4-9'	2/6/06	9	<0.005	<0.005	<MDL
SB-4-16'	2/6/06	16	<0.005	<0.005	<MDL
SB-6-15'	2/2/06	15	<0.005	<0.005	<MDL
SB-9-5'	2/6/06	5	<0.005	<0.005	<MDL
SB-9-8'	2/6/06	8	<0.005	<0.005	<MDL
SB-10-5'	2/6/06	5	<0.005	<0.005	<MDL
SB-10-8.5'	2/6/06	8.5	0.013	<0.005	<MDL
SB-10-12'	2/6/06	12	<0.005	<0.005	<MDL
SB-12-3'	1/16/07	3	<0.005	<0.005	<MDL
SB-12-4'	12/27/06	4	<0.005	<0.005	<MDL
SB-12-6'	12/27/06	6	<0.005	<0.005	<MDL
SB-13-3'	1/16/07	3	<0.005	<0.005	<MDL
SB-13-6'	1/16/07	6	<0.005	<0.005	<MDL
SB-15-6'	12/27/06	6	<0.005	<0.005	<MDL
ESL - DE	-	-	0.43	2.9	-
ESL - GP	-	-	0.70	0.46	
RL	-	-	0.005	0.005	varies

PCE = tetrachloroethylene
TCE = trichloroethylene
ESLs = Environmental Screening Levels for shallow soils where groundwater is current or potential source of drinking water in residential zones, California Regional Water Quality Control Board, February 2005
DE = direct exposure
GP = groundwater protection
Soil values reported in milligrams per kilogram (mg/kg)
RL = laboratory reporting limit (with no dilution)
MDL = method detection limit

Table 2
Groundwater Sample Analytical Data

Sample ID	Date	Screen Interval feet bgs	PCE µg/L	TCE µg/L	All other HVOCs µg/L
				EPA Method SW8260B	
SB-1-W	1/27/05	-	22	<0.5	<MDL
SB-2-W	1/27/05	-	14	0.62	<MDL
SB-3-W	1/27/05	-	19	3.0	<MDL
SB-4-W-1	2/6/06	(11 - 13)	0.90	<0.5	<MDL
SB-4-W-2	2/6/06	(31 - 34)	0.56	<0.5	<MDL
SB-5-W-1	2/3/06	(9 - 12)	<0.5	<0.5	<MDL
SB-5-W-2	2/3/06	(37 - 39)	<0.5	<0.5	<MDL
SB-6-W-1	2/3/06	(11-14)	<0.5	<0.5	<MDL
SB-6-W-2	2/3/06	(31 - 34)	<0.5	<0.5	<MDL
SB-7-W-1	2/3/06	(9 - 12)	<0.5	<0.5	<MDL
SB-7-W-2	2/3/06	(37 - 39)	<0.5	<0.5	<MDL
SB-8-W-1	2/2/06	(9 - 12)	<0.5	<0.5	<MDL
SB-8-W-2	2/2/06	(23 - 26)	<0.5	<0.5	<MDL
SB-9-W-1	2/6/06	(9 - 12)	4.9	<0.5	<MDL
SB-9-W-2	2/6/06	(28 - 32)	0.50	<0.5	<MDL
SB-10-W-1	2/6/06	(9 - 12)	23	<0.5	<MDL
SB-10-W-2	2/6/06	(28 - 32)	4.7	<0.5	<MDL
SB-12-W-1	1/16/07	(9 - 12)	<0.5	<0.5	<MDL
SB-12-W-2	1/16/07	(24 - 28)	<0.5	<0.5	<MDL
SB-13-W-1	1/16/07	(9 - 12)	0.78	<0.5	<MDL
SB-13-W-2	1/16/07	(24 - 28)	<0.5	<0.5	<MDL
SB-14-W-1	12/27/06	(9 - 12)	2.5	<0.5	<MDL
SB-14-W-2	12/27/06	(23 - 27)	<0.5	1.1	<MDL*
SB-15-W-1	12/27/06	(9 - 12)	<0.5	<0.5	<MDL
SB-15-W-2	12/27/06	(24 - 28)	<0.5	<0.5	<MDL**
ESL - DWT	-	-	5.0	5.0	-
RL	-	-	0.5	0.5	Varies

PCE = tetrachloroethylene
TCE = trichloroethylene
VC = vinyl chloride
ESLs = Environmental Screening Levels for shallow soils where groundwater is current or potential source of drinking water in residential zones, California Regional Water Quality Control Board, February 2005
DWT = drinking water toxicity
Groundwater values reported in micrograms per liter (ug/L)
RL = laboratory reporting limit (with no dilution)
Number following "W" designation indicates water-bearing zone (1 - A Zone, 2 - B Zone)
MDL = method detection limit
*= Toluene detected at 0.88 ug/L and xylenes at 1.0 ug/L
**= Chloroform, dibromochloromethane, and bromodichloromethane detected at 0.54, 0.91, and 0.97 ug/L, respectively

Table 3
Soil Vapor Sample Analytical Data

Sample ID	Date Collected	PCE $\mu g/m^3$	TCE $\mu g/m^3$	All other target HVOCs $\mu g/m^3$
			EPA Method TO-15	
SB-4-V	2/6/06	13000	<2.7	<MDL
SB-4-V-D	2/6/06	16000	<2.7	<MDL
SB-9-V	2/6/06	30	<2.7	<MDL
SB-10-V	2/6/06	230	<2.7	<MDL
SB-11-V	12/27/06	320,000	2,900	<MDL
SB-11-V Duplicate	12/27/06	380,000	3,200	<MDL
SB-12-V	12/27/06	270	12	<MDL
SB-13-V	1/15/07	6,700	<23	<MDL
SB-13-V-Duplicate	1/15/07	6,800	<23	MDL
SB-15-V	12/27/06	630	4.4	<MDL*
ESL - Res	-	410	1,200	-
RL		0.5	varies	varies

PCE = tetrachloroethylene
TCE = trichloroethylene
HVOCs = halogenated volatile organic compounds
ESLs = Environmental Screening Levels for shallow soil gas in residential zones,
California Regional Water Quality Control Board, February 2005
Soil vapor concentrations reported in micrograms per cubic meter (ug/m^3)
RL = laboratory reporting limit (with no dilution)
* = The lead check compound, 2-Propanol, detected at 3,200 ug/m^3

Table 2
Results of Soil Vapor Sampling
Micrograms per cubic meters (µg/m³)

Soil Vapor Sample	Tetrachloroethylene (PCE)	Benzene	Toluene	Ethylbenzene	m, p-Xylenes	o-Xylenes
SB-16-0.5 (sub-slab)	**570**	<100	<200	<100	<200	<100
SB-16-05	**610**	<100	<200	<100	<200	<100
SB-17-0.5 (sub-slab)	<100	<100	<200	<100	<200	<100
SB-17-05	**190**	<100	<200	<100	<200	<100
SB-18-05, purge volume 1	**120**	**230**	420	<100	<200	<100
SB-18-05, purge volume 3	**140**	**160**	310	<100	<200	<100
SB-18-05, purge volume 7	**150**	<100	<200	<100	<200	<100
SB-19-0.5 (sub-slab)	**2,300**	<100	<200	<100	<200	<100
SB-19-05	**1,600**	<100	<200	<100	<200	<100
SB-20-04	<100	<100	<200	<100	<200	<100
SB-21-05	**7,500**	<100	<200	<100	<200	<100
SB-22-03	**1,100**	<100	<200	<100	<200	<100
SB-23-05	**17000**	<100	<200	<100	<200	<100
SB-24-3.5	**110**	<100	<200	<100	<200	<100
SB-25-05	**250**	<100	<200	<100	**300**	**130**
SB-27-04	**120**	<100	<200	<100	<200	<100
SB-28-03	<100	<100	<200	<100	<200	<100
SB-29-05	**470**	<100	<200	**180**	**680**	**360**
SB-30-03	<100	<100	<200	<100	<200	<100
SB-31-04	<100	<100	<200	<100	<200	<100
SB-32-03	**200**	<100	<200	<100	<200	<100
SB-33-03	<100	<100	<200	<100	<200	<100
SB-34-04	<100	<100	<200	<100	<200	<100
SB-36-05	<100	<100	<200	<100	<200	<100
SB-37-04	**1,900**	<100	<200	<100	<200	<100
Residential ESLs	410	84	210,000	63,000	21,000*	21,000*

ESLs = Soil vapor environmental screening levels for protection of indoor air quality adopted by the Regional Water Quality Control Board, San Francisco Bay Region
Other compounds were not detected above the method detection limits
Bolded values reflect detections above laboratory detection limits
Boxed values reflect exceedance of residential ESLs
* denotes residential ESL for total xylenes

Table 2
Results of Soil Sampling
Milligrams per kilogram (mg/kg)

Soil Sample	Tetrachloroethylene (PCE)	Ethylbenzene	m, p-Xylene	o-Xylene
SB-19-5	<0.005	<0.005	<0.005	<0.005
SB-23-5	<0.005	<0.005	<0.005	<0.005