CALIFORNIA
Water Boards

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ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

August 21, 2013

Douglas J. Weimer, PG
Shell Oil Products US
Environmental Services Company
20945 S. Wilmington Avenue
Carson, CA 90810

SUBJECT: REVIEW OF SITE-SPECIFIC CLEANUP GOAL REPORT

SITE: FORMER KAST PROPERTY TANK FARM, CARSON, CALIFORNIA (SCP NO. 1230, SITE ID NO. 2040330, CAO NO. R4-2011-0046)

Dear Mr. Weimer:

The Former Kast Property Tank Farm (Site) is located southeast of the intersection of Marbella Avenue and East 244th Street in Carson, California. Shell Oil Company (Shell) owned and operated a crude oil tank farm at the Site from the 1920s until the mid-1960s when it was redeveloped into the Carousel residential housing tract (Carousel Tract). Residual oil from the tank farm was not completely removed prior to or during Site redevelopment and thus remains in the soils beneath the existing houses. Environmental investigations to date indicate that, in addition to crude oil detected in shallow soils at the Site, hydrocarbons and other constituents of concern (COCs) have also been detected in the soil, soil vapor, and groundwater at the Site.

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) is the primary state agency that regulates discharges of wastes to ground and surface waters in the Los Angeles Region, including Los Angeles and Ventura Counties, under the authority of the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) (Cal. Wat. Code §§ 13000 *et seq*). The Regional Board has served as the lead agency overseeing the environmental investigation and remediation of the Site since 2008. The Regional Board's oversight is supported by other public agencies, including the state Office of Environmental Health Hazard Assessment (OEHHA), the Los Angeles County Department of Public Health, and the Los Angeles County Fire Department.

On March 11, 2011, the Regional Board issued Cleanup and Abatement Order No. R4-2011-0046 (CAO), pursuant to California Water Code section 13304. The CAO directed Shell to completely investigate the Site, continue to conduct groundwater monitoring and reporting, and conduct remedial action to cleanup and abate the waste in the soil, soil vapor, and groundwater at the Site. As part of conducting remedial action, Shell was required to evaluate cleanup methodologies through pilot testing, assess any potential environmental impacts of the residual concrete slabs of the former reservoir, submit and implement a remedial action plan (RAP) to cleanup the wastes at and below the Site, and continue to conduct residential surface and

subsurface soil and sub-slab soil vapor sampling. The CAO directed Shell to submit cleanup goals, including site-specific cleanup goals (SSCGs), for all COCs for residential (i.e., unrestricted) land use. Proposed SSCGs were required to include detailed technical rationale and assumptions underlying each goal. The CAO required Shell to apply the following guidelines and policies to the proposed cleanup goals: (i) cleanup goals must comply with various state and federal policies and guidance identified in the CAO; (ii) groundwater cleanup goals shall achieve applicable water quality objectives in the Regional Boards' Water Quality Control Plan for the Los Angeles Region (Basin Plan), including California's Maximum Contaminant Levels (MCLs) or Action Levels for drinking water as established by the California Department of Public Health and the state's "anti-degradation policy" in State Water Resources Control Board (State Water Board) Resolution No. 68-16 ("Statement of Policy With Respect to Maintaining High Quality of Waters in California"); (iii) all cleanup goals must comply with the State Water Board's "anti-degradation policy"; and (iv) all cleanup goals must comply with State Water Board Resolution No. 92-49 ("Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304") (Resolution 92-49).

In accordance with the CAO, Shell timely submitted proposed SSCGs to the Regional Board in a report entitled "Site-Specific Cleanup Goal Report" (Report) on February 22, 2013. The Regional Board circulated the Report for a 30-day public review and comment period, and received comments from interested persons. In addition, the Regional Board received a memorandum from OEHHA dated July 22, 2013 (OEHHA Memorandum), as well as a report from the Expert Panel from the University of California, Los Angeles (UCLA Expert Panel) that was convened to provide recommendations to the Regional Board on various technical aspects of the Site investigation and cleanup. The UCLA Expert Panel's report is entitled "Interim Review of the Site-Specific Cleanup Goal Report and Human Health Screening Risk Evaluation" (UCLA Expert Panel Interim Report) and is dated July 24, 2013. The Regional Board agrees with all of the comments in the OEHHA Memorandum and the UCLA Expert Panel Interim Report. Regional Board staff also prepared a memorandum dated August 14, 2013 regarding vapor intrusion (Regional Board Staff Memorandum). The Regional Board[1] reviewed the Report taking into account applicable law and policy, the requirements of the CAO, and the comments received from interested persons, OEHHA, and the UCLA Expert Panel.

The Regional Board acknowledges that Shell has conducted a thorough investigation of the Site in compliance with the CAO. This investigation includes the collection of extensive site data that characterized soil, soil vapor, indoor air and vapor intrusion on a parcel-by-parcel basis; groundwater underlying the Site; and soil and ambient air conditions at reference sites in the vicinity of the Site to evaluate ambient outdoor air and background soil conditions for COCs. The Regional Board finds that the site investigation provided reliable, comprehensive, and high quality data. Based on the data collected, Shell proposed SSCGs largely based on human health screening risk evaluations (HHSREs). Shell has submitted HHSREs for individual parcels based on environmental investigation data collected during the Site investigation. The Regional Board

[1] Note that for purposes of this letter, the term "Regional Board" refers to the staff, including the Executive Officer. Consistent with the Porter-Cologne Act, the Regional Board members themselves have not taken action with respect to the CAO or Report.

supports the use of human health considerations for sites with residential uses, such as the Carousel Tract. In their comments on the Report, OEHHA and the UCLA Expert Panel generally agree with the methodology used to calculate the HHSREs, but noted that some areas of the HHSREs require greater clarity. Although the proposed SSCGs are generally consistent with applicable practices regarding calculation of HHSREs, the proposed SSCGs require revision for the reasons described in this letter. The proposed SSCGs also do not appear to take into account Resolution 92-49, the Basin Plan, and other federal and state policies and guidance as required by the CAO, and may not be fully protective of unrestricted residential land use.

This letter provides the Regional Board's reasons for not approving the SSCGs and directs Shell to revise the Report and the SSCGs, as appropriate. This letter is organized by the following topics: Regulatory Requirements for Establishing SSCGs; Comments and Directives on the Proposed Remedial Action Objectives and SSCGs; and Directive to Revise the Report. Additionally, the OEHHA Memorandum and the UCLA Expert Panel Interim Report regarding the HHSREs, as well as the Regional Board Staff Memorandum regarding vapor intrusion, are all attached to this letter. As indicated below, Shell is directed to address the comments in all three attachments when revising the Report.

Regulatory Requirements for Establishing SSCGs

Key regulations and policies governing establishment of cleanup goals, including SSCGs, for the Site are set forth in the CAO. These include: Resolution 92-49 (which incorporates California Code of Regulations (CCR), title 23, section 2550.4), the Regional Board's Basin Plan, the California Department of Public Health's MCLs, State Water Board Resolution No. 68-16 (the state's "anti-degradation policy"), and other state and federal policies and guidance for establishing cleanup goals. An overview of these policies and regulations is provided below.

State Water Board Resolution No. 92-49

The CAO requires all cleanup goals to comply with Resolution 92-49. In determining cleanup levels for sites subject to the Porter-Cologne Act, the Regional Board is required to implement Resolution 92-49. Resolution 92-49 requires the Regional Board to assure that waste is cleaned up to background conditions[2], or if that is not reasonable, to an alternative level that is the most stringent level that is economically and technologically feasible in accordance with CCR, title 23, section 2550.4. Any alternative cleanup level to background must: (1) be consistent with the maximum benefit to the people of the state; (2) not unreasonably affect present and anticipated beneficial uses of such water; and (3) not result in water quality less than that prescribed in the Basin Plan and applicable Water Quality Control Plans and Policies of the State Water Board.

[2] Background conditions mean the water quality that existed before the discharge of waste.

California Code of Regulations, Title 23, Section 2550.4

Resolution 92-49 incorporates, by reference, CCR, title 23, section 2550.4. Section 2550.4 guides the establishment of concentration limits for COCs in corrective action programs in California. Section 2550.4, states, in part:

> *(c) For a corrective action program, the regional board shall establish a concentration limit for a constituent of concern that is greater than the background value of that constituent only if the regional board finds that it is technologically or economically infeasible to achieve the background value for that constituent and that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the concentration limit greater than background is not exceeded. In making this finding, the regional board shall consider that factors specified in subsection (d) of this section, the results of the engineering feasibility study submitted pursuant to subsection 2550.9(c) of this article, data submitted by the discharger pursuant to section 2550.9(d)(2) of this article to support the proposed concentration limit greater than background, public testimony on the proposal, and any additional data obtained during the evaluation of the monitoring program.*
>
> *(d) In establishing a concentration limit greater than background for a constituent of concern, the regional board shall consider the following factors:*
>
> *(1) potential adverse effects on ground water quality and beneficial uses, considering:*
>
> *……*
>
> *(G) the potential for health risks caused by human exposure to waste constituents;*
>
> *……*
>
> *(I) the persistence and permanence of the potential adverse effects……..*

Regional Board's Basin Plan

The CAO requires that groundwater cleanup goals achieve the applicable water quality objectives set forth in the Basin Plan, including California's MCLs or Action Levels for drinking water established by the California Department of Public Health and the State Water Board's "anti-degradation policy" in State Water Board Resolution No. 68-16. Groundwater beneath the Site is designated for municipal supply.[3] The Basin Plan sets forth water quality objectives to protect beneficial uses, including MCLs for drinking water.

[3] Note that the residents of the Carousel Tract are not being supplied drinking water from the underlying groundwater at the Site.

State Water Board Resolution No. 68-16

The CAO requires that all cleanup goals comply with the State Water Board's "anti-degradation policy." This policy requires attainment of background levels of water quality, or the highest level of water quality that is reasonable in the event that background levels cannot be restored. Cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of water, and not result in exceedance of water quality objectives in the Regional Board's Basin Plan.

State and Federal Policies and Guidance

The CAO requires that cleanup goals for all COCs shall support residential (i.e. unrestricted) land use and be consistent with the following state and federal policies and guidance:

- Soil cleanup goals set forth in the Regional Board's *Interim Site Assessment and Cleanup Guidebook, May 1996*
- Human health protection levels set forth in *USEPA Regional Screening Levels (Formerly Preliminary Remediation Goals)*
- California Environmental Protection Agency's (CalEPA) *Use of Human Health Screening Levels (CHHSLS) in Evaluation of Contaminated Properties*, dated January 2005, or its latest version
- Total Petroleum Hydrocarbon Criteria Working Group, Volumes 1 through 5, 1997, 1998, 1999
- San Francisco Bay Regional Water Quality Control Board's Environmental Screening Levels (ESL) document
- Commonwealth of Massachusetts, Department of Environmental Protection, *Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of MADEP VPH/EPH approach*; MADEP 2002
- Commonwealth of Massachusetts, Department of Environmental Protection, *Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology*; MADEP 2003
- Commonwealth of Massachusetts, Department of Environmental Protection, *Method for the Determination of Air-Phase Petroleum Hydrocarbons (APH) Final*, MADEP 2008
- *Department of Toxic Substances Control (DTSC) Interim Guidance* and the Regional Board's *Advisory - Active Soil Gas Investigations*, dated January 28, 2003, or its latest version
- DTSC's *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, revised February 7, 2005, or its latest version
- U.S. Environmental Protection Agency's (USEPA) *Risk Assessment Guidance for Superfund, Parts A through E*
- USEPA's *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings*, 2003

- USEPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, 2002
- USEPA's *Supplemental Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*, 2002
- CalEPA's *Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities*, CalEPA DTSC, February 1997
- CalEPA's *Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbons (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process*, CalEPA DTSC, July 2009

The Regional Board's *Interim Site Assessment and Cleanup Guidebook, May 1996*, recommends taking into consideration the waste concentrations, depth to the water table, the nature of the chemicals, soil conditions and texture, and attenuation trends, and human health protection levels set forth in *USEPA Regional Screening Levels (Formerly Preliminary Remediation Goals)*.

Comments and Directives on the Proposed Remedial Action Objectives and SSCGs

The Report sets forth both proposed remedial action objectives (RAOs) and proposed SSCGs for COCs in soil, soil vapor, indoor air (including but not limited to methane), and groundwater. The COCs at the Site include total petroleum hydrocarbons (TPH); TPH-related volatile organic compounds (VOCs); TPH-related semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs); metals (lead and arsenic); and methane. This section summarizes Shell's proposed RAOs and SSCGs. After each summary, the Regional Board provides comments on the proposed RAOs and SSCGs and provides directives to Shell for revision.

Summary of Shell's Proposed RAOs

The Report proposes RAOs that define the basis and methodology for deriving the proposed SSCGs. Shell proposed the following RAOs for the Site:

- Prevent human exposures to on-site residents and construction and utility maintenance workers to concentrations of COCs in soil, soil vapor, and indoor air such that total lifetime incremental carcinogenic risks are within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) risk management range of 10^{-6} to 10^{-4} and non-cancer hazard indices are less than 1 or concentrations are below background, whichever is higher;

- Prevent fire/explosion risks in indoor air and/or enclosed spaces due to the generation of methane;

- Remove light non-aqueous phase liquid (LNAPL) to the extent practicable and where a significant reduction in current and future risk to groundwater will result; and

- Maintain a stable or decreasing plume of COCs in groundwater beneath the Site.

Comments and Directive on Shell's Proposed RAOs

The Regional Board has the following comments on each RAOs:

- The Regional Board disagrees that the proposed COCs are limited to TPH-related compounds. During the Site investigation, chlorinated VOCs were detected on Site. Shell is required to include all compounds detected on site as COCs and develop RAOs and SSCGs to address all COCs. Also, as indicated by the UCLA Expert Panel's Interim Report, "It is possible that cleaning of machinery and other operations on-site resulted in release of these CVOCs on-site. This cannot be ruled out." (See UCLA Expert Panel Interim Report at p. 13.)

- The Regional Board agrees with the RAO of preventing human exposure and also agrees that the NCP sets forth a risk management range of 10^{-6} to 10^{-4}. The Regional Board agrees that such a range is appropriate for construction and utility maintenance workers. However, the Regional Board notes that the Report properly proposes to use a target incremental cancer risk of 10^{-6} and a non-cancer hazard quotient of 1 as the point of departure. The Department of Toxic Substances Control's (DTSC) Vapor Intrusion Mitigation Advisory (October 2011) sets forth the point of departure for risk management decisions for cancer risk at 10^{-6}. A target cancer risk of 10^{-6} or less is considered protective of on-site residents by Cal/EPA and should be used to support an unrestricted land use scenario.

- The Regional Board agrees that an RAO for methane should be to prevent fire and explosions. The RAO should also focus on eliminating methane to the extent technically and economically feasible.

- The Regional Board generally agrees with the RAO with respect to LNAPL. However, the RAO should be reworded to say "remove or treat to the extent technically and economically feasible," rather than "to the extent practicable," to mirror the language in Resolution 92-49.

- The Regional Board does not fully agree with the RAO for groundwater. Maintaining a stable plume in groundwater is important, but the RAO should be to reduce the plume to the extent technically and economically feasible to achieve, at a minimum, the water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply. Maintenance of plume stability may not restore groundwater to its designated beneficial uses.

Directive: Revise the proposed RAOs in accordance with the comments above.

Summary of Shell's Proposed SSCGs

The intent of the proposed SSCGs is to achieve the proposed RAOs described above. The methodology for developing the SSCGs involved evaluating and mitigating risks to human health and safety, and reducing continued hydrocarbon loading to the groundwater beneath the Site. Shell's methodology, organized by medium, is as follows:

***Soil*:**
The Report proposes numerical SSCGs for TPH in soil. These SSCGs were developed using a risk assessment methodology that is similar to the methodology used for HHSREs for analyzing potential risks from indoor vapor intrusion in the Site investigation. Key elements of the HHSREs are:

- The proposed SSCGs to address residential exposures are chemical-specific numerical values assuming a target incremental cancer risk of 10^{-6} and a non-cancer hazard quotient of 1. These proposed numerical values are to be applied to individual chemicals and soils not covered by hardscape and are calculated for both surface soils (0-2 feet below ground surface (bgs)) and sub-surface soils (>2-10 feet bgs). The former is based on exposure for 350 days per year, while the latter is based on 4 exposure days per year to reflect a less frequent exposure to deeper soil. The proposed SSCGs are not based on cumulative risk assessments. There are no SSCGs proposed for areas below hardscape.

- The proposed SSCGs for construction and utility maintenance workers are chemical-specific numerical values assuming a target incremental cancer risk of 10^{-5} and a hazard quotient of 1. These criteria are proposed to be applied to soils from 0-10 feet bgs.

***Soil Vapor*:**
Shell evaluated the vapor intrusion exposure pathway to develop SSCGs for soil vapor for VOCs and methane based on a residential exposure scenario. The Report concluded that numeric SSCGs for residential exposure of soil vapor are not warranted due to a "multiple lines-of-evidence" analysis of the vapor intrusion pathway as follows:

- Indoor air and outdoor air concentrations detected at the properties are indistinguishable from background and within the typical ranges reported in literature.

- Vapor intrusion is not affecting indoor air quality at the Site for COCs based on multiple-linear regression analysis in which indoor air concentrations were found to be significantly correlated with garage air and outdoor air concentrations but shows poor correlation with sub-slab vapor concentrations.

- Variability in indoor air concentrations is attributed to the presence of indoor sources of VOCs. These sources include outdoor air, indoor product use, residential building materials, dry cleaned clothing, and sources within attached garages.

- An empirical vapor intrusion attenuation factor cannot be calculated for the Site on the basis of the observed similarity of indoor and background air concentrations, and the lack of significant correlation between sub-slab soil vapor and indoor air concentrations.

Based on the multiple lines-of-evidence analysis described above, the Report proposes that a vapor intrusion assessment will be made on a property-specific basis to assess whether the sub-slab data result in indoor air concentrations above background, rather than a numeric SSCG for soil vapor.

***Indoor Air (Methane)*:**
The Report considers fire and explosion risks from methane. The proposed SSCGs are consistent with DTSC guidance for school sites that state methane levels of greater than 5000 parts per million by volume (ppmv) and soil vapor pressure greater than 13.9 inches water shall be evaluated for engineering controls.

***Groundwater*:**
The proposed SSCGs for groundwater are as follows:

- Remove LNAPL to the extent practicable;
- Maintain a stable or decreasing plume beneath the Site through a monitoring program to be presented in the RAP;
- Return shallow zone and Gage aquifer groundwater quality to background levels for petroleum hydrocarbons through natural biodegradation, and arsenic through maintaining an oxidizing chemical environment over time; and
- No documented or expected future use of site groundwater is anticipated.

<u>Comments and Directives on Shell's Proposed SSCGs</u>

The proposed SSCGs are generally derived from human health risk assessments that focus on reducing risks associated with COCs to a level that is acceptable for residential land use. However, the CAO also requires the proposed SSCGs to comply with Resolution 92-49, the Basin Plan, other regulations and policies, and be based on unrestricted residential land use. Shell is therefore required to address the following comments in its revised Report.

***Soil*:**
The proposed SSCGs for soils for many of the COCs, including but not limited to TPH and benzene, exceed background levels. The Report does not contain an analysis of the cleanup levels that are economically and technically feasible for the COCs. To comply with Resolution 92-49, the SSCGs must range between background and the level that is technically and economically feasible. The SSCGs must also be protective of groundwater and be based on unrestricted residential land use. The SSCGs also do not comport with the Regional Board's

Interim Site Assessment and Cleanup Guidebook, May 1996, and do not consider criteria such as waste concentrations, depth to the water table, the nature of the chemicals, soil conditions and texture, and attenuation trends, and human health protection levels set forth in *USEPA Regional Screening Levels (Formerly Preliminary Remediation Goals)*. The Report derives SSCGs based on contaminant fate and transport and human health risk criteria. This methodology does not completely comport with CCR, title 23, section 2550.4, which requires that cleanup levels must be protective of groundwater quality. The proposed SSCGs would allow significant quantities of wastes to remain beneath the Site, which may not be protective of groundwater and support unrestricted residential land uses. Further, in some areas of the Site, these wastes may persist and continue to generate soil vapor.

The Report also uses methodologies and assumptions that may not comport with the CAO, as described below:

- The Regional Board disagrees that the proposed COCs are limited to TPH-related compounds. During the Site investigation, chlorinated VOCs were detected on Site. Shell is required to include all compounds detected on site as COCs and develop RAOs and SSCGs to address all COCs. Also, as indicated by the UCLA Expert Panel's Interim Report, "It is possible that cleaning of machinery and other operations on-site resulted in release of these CVOCs on-site. This cannot be ruled out." (See UCLA Expert Panel Interim Report at p. 13.)

- The OEHHA Memorandum and UCLA Expert Panel Interim Report identify several issues regarding the risk calculations. A key issue concerns segregating the shallow soil exposure scenario into two layers: 0-2 feet bgs and 2-10 feet bgs. The fraction-specific soil SSCGs for TPH ranges (Appendix A Page 17-20) for soil between 2 and 10 feet bgs are quite high. The Report assumes specific exposure conditions of 4 days per year exposure frequency to subsurface soils between 2 and 10 feet bgs.

- The proposed chemical-specific SSCGs are based on the average concentrations or the 95[%] Upper Confidence Limit (95UCL) chemical concentrations calculated for each property, rather than using maximum concentrations in soil. Although the use of the 95UCL was approved by the Regional Board for Human Health Screening Evaluations, 95UCL may not be appropriate for SSCGs.

- The proposed SSCGs are based on chemical-specific risks and do not consider cumulative risks to receptors that may exceed 10^{-6}.

- The proposed SSCGs need to address all areas of the Site. The proposed SSCGs do not address areas below hardscape. The Regional Board does not typically distinguish SSCGs based on hardscape and softscape because such an approach is not likely to be protective of unrestricted residential land use or groundwater protection.

- Fruits and vegetables grown in the yards of the homes at the Site may uptake COCs, but that exposure scenario has not been considered in developing SSCGs.

The proposed SSCGs for TPH in soil do not support unrestricted residential land use for several reasons, including, but not limited to:

- Using the proposed SSCGs, land use restrictions (also known as deed restrictions or environmental covenants) may be necessary to inform and protect existing and future residents from exposure to certain COCs. The proposed SSCGs in soil cannot exceed human health values for dermal contact at shallow depths unless land use restrictions to control exposure are implemented. Any land use restrictions would be required to be recorded by the existing property owner.

- The proposed SSCGs for TPH would continue to pose a nuisance as defined in California Water Code section 13050(m) because the properties would be subject to continuing land use restrictions.

Directive: Revise the Report to: (1) include an evaluation of compliance with Resolution 92-49, including determining cleanup levels that are technically and economically feasible; (2) provide SSCGs that are inclusive of both hardscape and softscape areas of the Site; (3) provide the rationale for using average concentrations or propose another methodology; and (4) address the comments regarding supporting unrestricted residential land uses.

***Soil Vapor*:**
The Report does not propose SSCGs for soil vapor COCs because the Report states that vapor intrusion is not affecting indoor air quality based on an analysis of approximately 300 indoor air tests. A multiple lines-of-evidence approach was used to reach this conclusion. However, the Regional Board notes that soil vapor can be generated from COCs sorbed to the soil column and can continue to be generated into the future. Overall, the proposed SSCGs would leave a significant mass of hydrocarbons in the subsurface. Such hydrocarbons may continue to degrade and generate VOCs that may pose future risks to humans. The proposed SSCGs do not appear to consider the persistence and permanence of potential adverse effects. The Regional Board notes that the Report proposes that a vapor intrusion assessment will be made on a property-specific basis to assess whether the sub-slab data result in indoor air concentrations above background, rather than a numeric site-specific cleanup for soil vapor. In addition, the concrete in the soils below grade may contribute to soil vapors and needs to be evaluated. The Regional Board has received, and is evaluating, a separate report from Shell regarding the slabs. Given that the amount of hydrocarbons in the subsurface varies throughout the Site, a property-specific evaluation is appropriate.

The Report specifies screening levels for VOCs in sub-slab vapors that are 1% of the CHHSLS for indoor air. This implies that indoor air concentrations resulting from vapor intrusion are expected to be no more than 1% of the sub-slab concentrations (i.e., the attenuation factor is assumed to be 0.01 or less). Regional Board staff review of the statistical analysis of sub-slab soil vapor and indoor air data for vapor intrusion evaluation suggests that some VOCs detected in indoor air may be there in part from the intrusion of sub-slab vapors. (See attached Regional Board Staff Memorandum). Also, as indicated by the UCLA Expert Panel's Interim Report,

"any determination that there is a relationship between sub-slab soil vapor and indoor air will have a direct and profound impact on all risk estimates and cleanup calculations." (See attached UCLA Expert Panel Interim Report at p. 5.)

Directive: Shell is required to address the following: (1) Propose numeric SSCGs for VOCs in soil vapor that are equivalent to sub-slab screening levels or develop a site-specific attenuation factor (AF) to support development of a site-specific sub-slab vapor cleanup goal using indoor air and sub-slab data for VOCs; (2) develop SSCGs for soil vapor based on potential vapor intrusion concerns in individual homes; and (3) determine when concentrations of TPH may present a nuisance and detectable odor in accordance with the San Francisco Bay Regional Water Quality Control Board's Environmental Screening Levels (ESL) document.

***Indoor Air (Methane)*:**
The Regional Board agrees that the proposed SSCGs for methane may be suitable for risk management screening levels. The SSCGs are also consistent with DTSC guidance and have been approved by the Los Angeles County Fire Department for Site investigation screening levels. However, the proposed SSCGs only consider methane above ground or in vaults. Methane in soil vapor also represents a safety risk as it may contribute to elevated levels that can accumulate in structures, which pose a potential safety risk.

Directive: Shell is directed to develop SSCGs for methane in soil vapor for residential exposure scenarios.

***Groundwater*:**
The groundwater beneath the Site is impacted by petroleum hydrocarbons, including LNAPL free phase product. The Report does propose removal of LNAPL to the extent practicable. However, pursuant to Resolution 92-49, LNAPL should be removed "to the extent technically and economically feasible."

The Report does not propose numeric SSCGs for groundwater. Rather, the Report proposes to achieve background concentrations in groundwater through monitoring and natural biodegradation. The proposed SSCGs for soil do not consider the effects of continuing migration of waste into groundwater in excess of Basin Plan water quality objectives nor the permanence of the potential adverse effects. To comply with Resolution 92-49, cleanup levels less stringent than background conditions must not result in exceedance of water quality objectives set forth in the Basin Plan. Groundwater beneath the site is impacted with various chemicals that exceed their respective MCLs, including benzene, naphthalene, tetrachloroethene (PCE), trichloroethene (TCE), and tert-butyl alcohol (TBA). Although the proposed SSCGs to achieve background conditions appear appropriate, the period of time to reach these goals through monitoring and natural attenuation has not been analyzed. The attenuation rate for the COCs at the Site may be so long as to render these methods unsuitable for meeting the proposed SSCGs within a reasonable time frame and eliminate the potential impact to underlying aquifers.

Directive: Shell is required to: (1) propose removal of LNAPL "to the extent technically and economically feasible" in accordance with Resolution 92-49; and (2) propose SSCGs for

groundwater to achieve, at a minimum, applicable Basin Plan water quality objectives within a reasonable time frame and that take into account continuing migration of waste into groundwater.

Directive to Revise the Report

Shell is required to revise the Report and the SSCGs, as appropriate, in accordance with the specific directives and other comments provided in this letter. Shell is also directed to address all comments in the attached OEHHA Memorandum, UCLA Expert Panel Interim Report, and Regional Board Staff Memorandum. Shell must submit the revised Report by **October 21, 2013**. Shell is further directed to meet with Regional Board staff no later than **September 18, 2013** to discuss Shell's approach to revising the Report and proposed SSCGs. Revisions are necessary to take into consideration the requirements of Resolution 92-49, the Basin Plan, and regulations and policies referred to in these comments; to address the comments contained in the attached OEHHA Memorandum, UCLA Expert Panel Interim Report, and Regional Board Staff Memorandum; and to assure that SSCGs are sufficient to be protective of unrestricted residential land uses.

The due date for the revised report constitutes an amendment to Cleanup and Abatement Order No. R4-2011-0046, originally dated March 11, 2011. All other aspects of Order No. R4-2011-0046, and amendments thereto, remain in full force and effect. Pursuant to section 13350 of the California Water Code, failure to comply with the requirements of Order No. R4-2011-0046 by the specified due date, including dates in this amendment, may result in civil liability administratively imposed by the Regional Board in an amount of up to five thousand dollars ($5000) for each day of noncompliance.

Please note that the Regional Board requires Shell to include a perjury statement in all reports submitted under the CAO. The perjury statement shall be signed by a senior authorized Shell Oil Products US representative (and not by a consultant). The statement shall be in the following format:

"I, [NAME], do hereby declare, under penalty of perjury under the laws of the State of California, that I am [JOB TITLE] for Shell Oil Company, that I am authorized to attest to the veracity of the information contained in [NAME AND DATE OF REPORT], that the information contained in the reports described herein is true and correct, and that this declaration was executed at [PLACE], [STATE], on DATE]."

If you have any questions, please contact the project manager, Dr. Teklewold Ayalew, at (213) 576-6739 (tayalew@waterboards.ca.gov), or Ms. Thizar Tintut-Williams, Site Cleanup Unit III Chief, at (213) 576-6723 (twilliams@waterboards.ca.gov).

Sincerely,

Samuel Unger

Samuel Unger, PE
Executive Officer

Attachments: (1) OEHHA Memorandum, dated July 22, 2013
(2) Regional Board Staff Memorandum, dated August 14, 2013
(3) UCLA Expert Panel Interim Report, dated July 24, 2013

cc: See Mailing List (next page)

Mailing List

Janice Hahn, Honorable Congresswoman, US House of Representatives, California's 44th District
Ted Lieu, Senator, California Senate District 28
Isadore Hall, III, Assembly Member, 64th Assembly District
Mark Ridley-Thomas, Supervisor, Second District County of Los Angeles
Jim Dear, Mayor, City of Carson
Sheri Repp-Loadsman, City of Carson
Ky Truong, City of Carson
Sam Ghaly, City of Carson
Michael Lauffer, State Water Resources Control Board
Frances McChesney, State Water Resources Control Board
Robert Egel, State Water Resources Control Board
Robert Romero, Department of Toxic Substances Control
James Carlisle, Office of Environmental Health Hazard Assessment
Bill Jones, Los Angeles County Fire Department
Barry Nugent, Los Angeles County Fire Department
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Matthew Rodriquez
Secretary for Environmental Protection

Edmund G. Brown Jr.
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MEMORANDUM

TO: Teklewold Ayalew, Ph.D., P.G.
Engineering Geologist
Regional Water Quality Control Board
320 West 4th Street, Suite 200
Los Angeles, CA 90013

FROM: James C. Carlisle, D.V.M., M.Sc. J.C.
Staff Toxicologist
Air, Community, and Environmental Research Branch

DATE: July 22, 2013

SUBJECT: SITE-SPECIFIC CLEAN-UP GOAL REPORT FOR KAST PROPERTIES, CARSON, CA SWRCB#R4-09-17 OEHHA #880212-01

Document reviewed

- Site-Specific Clean-Up Goal Report for Former Kast Properties, Carson, California, dated February 22, 2013 by Geosyntec Consultants

Scope of review

- OEHHA's review is focused solely on risk-based and background-based SSCGs; therefore the comments herein refer only those issues. OEHHA recognizes that there are other considerations besides health risks in determining the final remedial goals.
- OEHHA's review excluded the ground water section.

Exposure pathways and exposure assessment

1. The appropriate exposure frequency and duration for the construction worker are site-specific and should be based on the most likely construction scenarios.
2. Proposed gastrointestinal and dermal absorption fractions should be referenced.
3. Residents are only considered to be exposed to deeper soils 4 days per year, based on a tree planting scenario. Page 23 states that soils from 0-10 feet were evaluated to address the scenario that deep soils contact would occur during a major renovation project such as pool installation or underground utility work. Since the site is fully developed, this scenario is considered unlikely. Nonetheless, this is a commonly evaluated scenario and its omission may be questioned, regardless of how unlikely it is. If renovation involving excavation were to occur, then residents could be exposed to deeper soils that are

redistributed to the surface, and this exposure would likely be greater than four days per year. During our teleconference, OEHHA was advised that there is no room to place excavated soil on these lots, and that any excavated soil would have to be hauled away.

4. Please explain the differences between the VF equation in Section 3.1.2.1and Equation 4-8 in the EPA Soil Screening Guidance on which it is based.
5. Construction and maintenance workers are assumed to be exposed to vapors from soil and soil vapor. These pathways may also be complete for onsite residents, who would have a greater exposure, resulting in lower SSCGs.

Background assessment

6. In order to fully evaluate background arsenic and PAHs, reviewers need to see site-wide arsenic & PAH data.
7. Page 27 states that the Site-Specific Clean-Up Goals (SSCGs) will be compared to the 95 percent upper confidence limit (UCL_{95}) for each property.
    a. OEHHA agrees that this is appropriate for risk-based SSCGs.
    b. However, OEHHA does not agree that this is appropriate for background-based SSCGs if the Southern California UTL (the upper confidence limit on the 95th percentile) is used, for the following reason:
        i. A person exposed to general Southern California soil arsenic would be exposed mostly to soils with less than 12 mg/kg arsenic, with less than 5% of samples equal to or greater than 12 mg/kg.
        ii. However, a person exposed to soils on a property with a UCL_{95} soil arsenic concentration of 12 mg/kg would be exposed to soils with arsenic concentrations above and below 12 mg/kg. This person's exposure would exceed the general Southern California background exposure.
    c. An upper-end statistic like a UTL of a maximum would be a more reasonable basis for comparison.

Exposure point concentrations

8. The site-wide average and UCL_{95} concentrations of the compounds of concern are not useful metrics for assessing exposure to the residents on the 285 individual lots. This site-wide approach could mask localized problem areas: the UCL on the mean for the entire site could be below risk-based thresholds despite risk and hazard estimates for some individual properties exceeding risk-based thresholds.
9. OEHHA supports assessment of exposure and risk over the area to which individuals are likely to be exposed. Each resident is exposed primarily to the soil on his or her individual lot and to the air in and around and his or her house. That means assessing exposure for each parcel separately.
10. Parcel-specific risks may be calculated based on the UCL_{95} for that parcel; however, if there are insufficient samples from a given parcel to calculate a UCL, the exposure and risk calculations should be based on the maximum detected concentration in a particular medium on that parcel.

11. The statement (page 29) that soil vapor samples collected at depth are not considered in the residential receptor analysis needs further explanation.

SSCGs

12. OEHHA calculated risks and hazards corresponding to selected SSCGs using standard exposure equations for workers and residents. The resulting risk and hazard estimates were 1×10^{-6} and the resulting hazard estimates were 1 or less.
13. SSCGs must be evaluated in the context of how they will be used. OEHHA supports the summation of chemical-specific risks and hazards to estimate cumulative risks and hazards (as proposed on page 27).
14. No SSCGS are provided for VOCs in soil gas.

Vapor intrusion analysis

15. Table B-1 gives concentrations of various VOCs used in the regression analysis. For non-detects, the minimum analytical reporting limit was used in the analysis. These values differ from the detection limits cited in the individual property reports. Please explain the use of the minimum analytical reporting limits.
16. As more paired indoor/sub-slab data are generated, the regression analysis should be expanded to include these data. Since co-variation could limit the effect of removing one variable on r^2, OEHHA suggests single regression in addition to the multiple regression method used.
17. Paired indoor/sub-slab data for various VOCs can be used to estimate site-specific attenuation factors (SSAFs). If supported by adequate data, these SSAFs may provide an alternative to the generic assumed AF of 0.01.

Communication issues

18. The separation of soil vapor and indoor air into separate sections seems unnecessary and results in redundancy.
19. Table A9 presents risk-based clean-up goals; Table 12 presents background-based clean-up goals. A table of final clean-up goals with a column showing whether they were risk-based or background-based would improve transparency.
20. The first three sentences in the second full paragraph on page 24 deal with COCs. The next three sentences discuss sampling strategies, and do not belong in the same paragraph.
21. The statement that metals that are below CHHSLs are not considered site-related defies logic. Site-related chemicals can be present at concentrations less than CHHSLs.
22. The second full paragraph on page 26 deals with background metals except for the last sentence. The latter does not belong in that paragraph and its presence there could be confusing.
23. In the same paragraph, the phrase "will be used", implying that the work will be done in the future, is confusing, since it appears that this selection is complete.

24. Table 7 is titled "Site-specific cleanup goals for soil", but these do not appear to be final clean-up goals since some of them are below background.
25. In the first sentence in section 7, "prevent" should probably be "limit".
26. In the following paragraph, "impacts" should probably be "vapors" (3x).

Conclusions

- Please reconsider whether residents could be exposed to soils in the 2-10 foot depth horizon more than 4 days per year. This could be following major renovation projects such as pool installation or underground utility work involving redistribution of soils and/or in the course of gardening, planting, etc.
- A Table showing final SSCGs and whether each is health-based or background-based would improve transparency.
- OEHHA questions the appropriateness of comparing background-based SSCGs to the 95 percent upper confidence limit (UCL_{95}) for each property. In order to fully evaluate background arsenic and PAHs, reviewers need to see site-wide arsenic & PAH data.
- Please consider evaluating the outdoor vapor inhalation pathway for residents or explain the exclusion of this pathway.
- OEHHA supports assessing exposure and risk over the area to which individuals are likely to be exposed. This is typically the UCL_{95} for each property, but if there are not enough samples from a given parcel to calculate a UCL, the exposure and risk calculations should be based on the maximum detected concentration in a particular medium on that parcel.
- OEHHA supports the summation of chemical-specific risks and hazards to estimate cumulative risks and hazards. The implication of cumulative risks and/or hazards that exceed target levels needs to be considered.
- The communication issues noted above should be addressed by providing additional information and/or correcting the text as indicated.

Memo peer reviewed by:

H.H.

Hristo Hristov, M.D., Ph.D.
Staff Toxicologist

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

Date: August 14, 2013

Subject: Comments on Statistical Analysis for Vapor Intrusion Evaluation at Kast Property Performed by Geosyntech Consultants

From: C.P. Lai, Ph.D., P.E., Water Resources Control Engineer
Los Angeles Regional Water Quality Control Board

C.P.

This memorandum contains comments on the Statistical Analysis for Vapor Intrusion Evaluation at Kast Property (Site) performed by Geosyntech Consultants dated February 22, 2013.

1. To assess the vapor intrusion pathway at the former Kast property, the spatial distribution of concentrations of sub-slab soil vapor, indoor air, and outdoor air respectively for benzene, ethylbenzene, naphthalene and toluene were analyzed by staff using 2012 data and presented in Figure 1 through Figure 4. It can be seen from these Figures that at some of the parcels the concentrations of sub-slab soil vapor are higher than those of indoor air and outdoor air as shown in Table 1 as well. The maximum measured concentrations of petroleum hydrocarbons vary from 1200 to 15 in different petroleum compounds at sub-slab layer, 91 to 4.4 at indoor layer, and then 22 to 1.6 at outdoor layer. Similarly for mean measured concentrations of petroleum hydrocarbons at different layers, they vary from 13.08 to 2.48 at sub-slab layer, 8.44 to 0.53 at indoor layer, and then 3.36 to 0.22 at outdoor layer. It is obvious that high concentrations of these compounds disperse and transport from sub-slab soil to indoor air, and then outdoor air. These physical pathways demonstrate that the indoor air concentrations above indoor screening levels at some of the parcels appear to be from the sub-slab soil vapor, which is the result of vapor intrusion.

2. The concentrations of sub-slab and indoor air vary both spatially and temporally as indicated above. As such, the linear regression analysis used by Geosyntech to evaluate the direct relationship between indoor air concentrations and sub-slab soil vapor concentrations would be insignificant. As shown in the statistical results obtained by Geosyntech using dataset in 2012, it indicated that there is no statistically significant relationship between the sub-slab soil vapor and indoor air concentrations for petroleum hydrocarbons. As mentioned above, staff does not completely agree with this conclusion because of the inconsistency with spatial distribution of field data as discussed in item 1 above.

3. Staff also found that there exists a significant relationship between vapor attenuation factor and sub-slab soil vapor concentration for petroleum hydrocarbon compounds (PHCs). Vapor attenuation factor is defined as the ratio of the indoor air concentration to the subsurface vapor concentration, which is a measurement of the overall dilution that occurs as vapors migrate from a subsurface source into a

building. These relationships in log-log scale are presented in Figure 5 through Figure 8.The probability distributions of vapor attenuation factor for these PHCs are also shown in Figure 9 through Figure 12. It can be seen that when vapor attenuation factor screening level is set to be 0.01 to 0.5, the indoor air concentrations have strong relationship with sub-slab soil vapor concentrations for PHCs at some of the parcels. In addition, the relationships in log-normal scale are presented in Figure 13 through Figure 16. It can be seen that a constant-valued attenuation factor (the horizontal portion of the line in Figure 13 through 16) is observed at high sub-slab soil concentrations. At smaller sub-slab soil concentrations, the background contribution to indoor air concentrations becomes larger than the subsurface contribution, which manifests as a plateau in indoor air concentrations and imposes an upward bias in the attenuation factor. These analyses demonstrate that attenuation factors representing vapor intrusion are observed when indoor air concentrations are greater than background indoor air levels (i.e. not contributed by sub-slab concentrations) and/or when sub-slab soil concentrations are high.

In summary, these results including the spatial distribution of concentrations and the relationships between attenuation factor and sub-slab concentration support the line of evidence for vapor intrusion in the Kast Property.

References:

1."Site-specific Cleanup Goal Report for Former Kast Property", prepared by Geosyntech Consultants, February 22, 2013.

2."EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings" Office of Solid Waste and Emergency Response U.S. Environmental Protection Agency Washington, DC, EPA 530-R-10-002, March 16, 2012.

3." Guidance For Addressing Petroleum Vapor Intrusion At Leaking Underground Storage Tank Sites", U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response Office of Underground Storage Tanks, Washington, D.C., EPA 510-R-13-xxx, April, 2013.

Figure 1 Spatial distribution of Benzene concentrations for sub-slab soil vapor, indoor air and outdoor air respectively using 2012 data

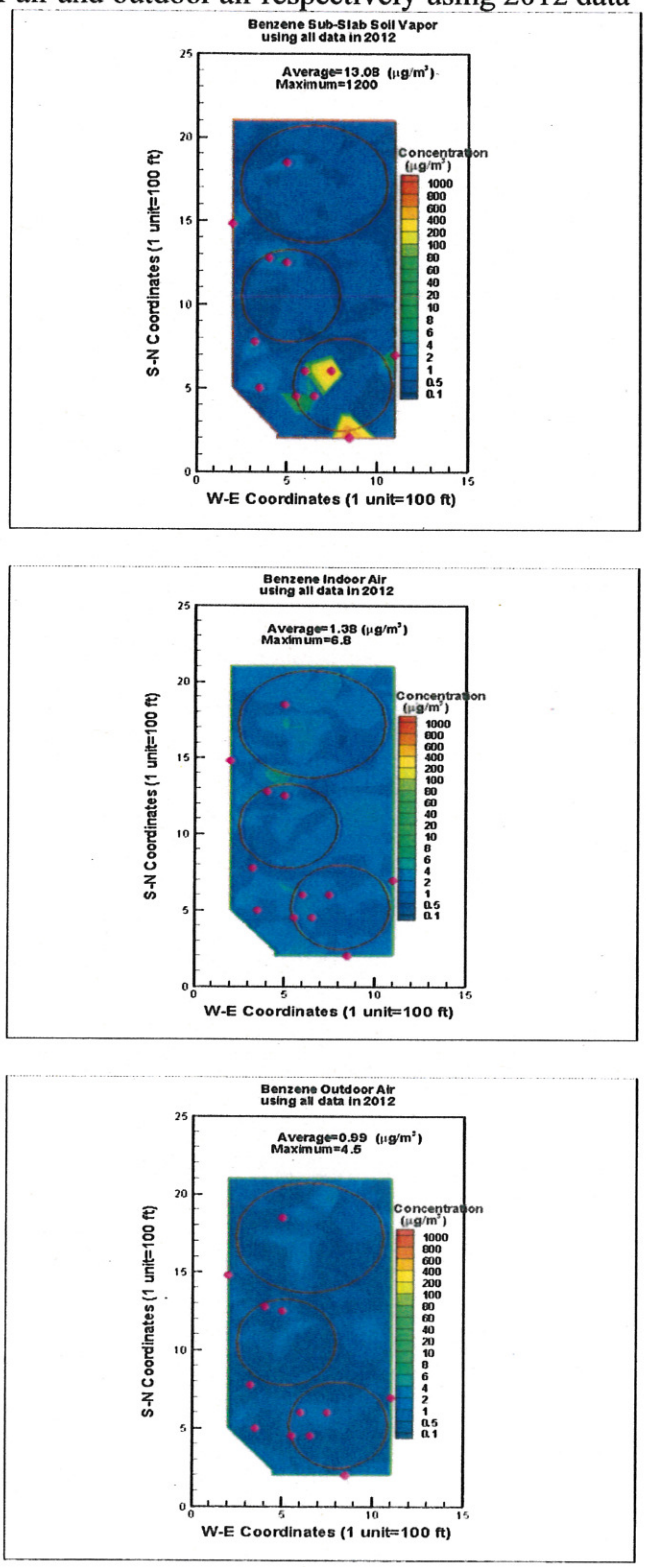


Figure 2 Spatial distribution of Ethylbenzene concentrations for sub-slab soil vapor, indoor air and outdoor air respectively using 2012 data

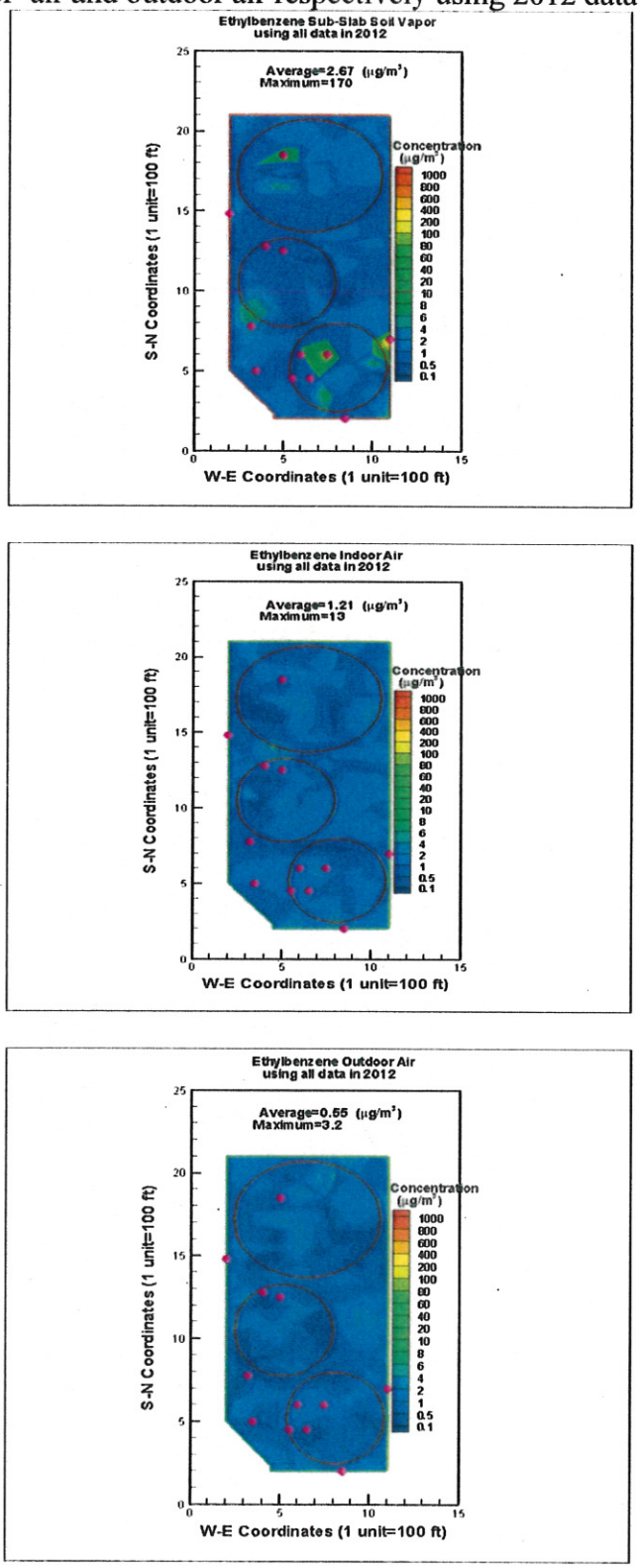
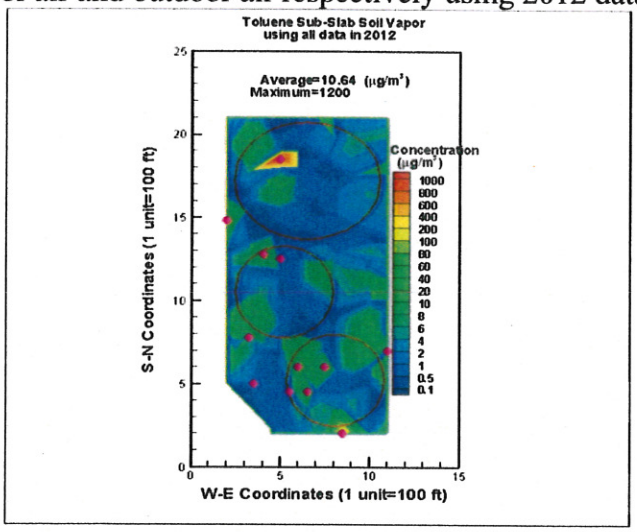
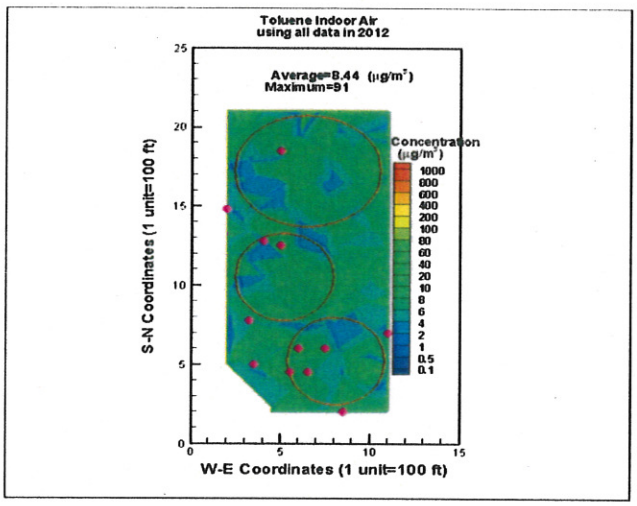


Figure 3 Spatial distribution of Toluene concentrations for sub-slab soil vapor, indoor air and outdoor air respectively using 2012 data





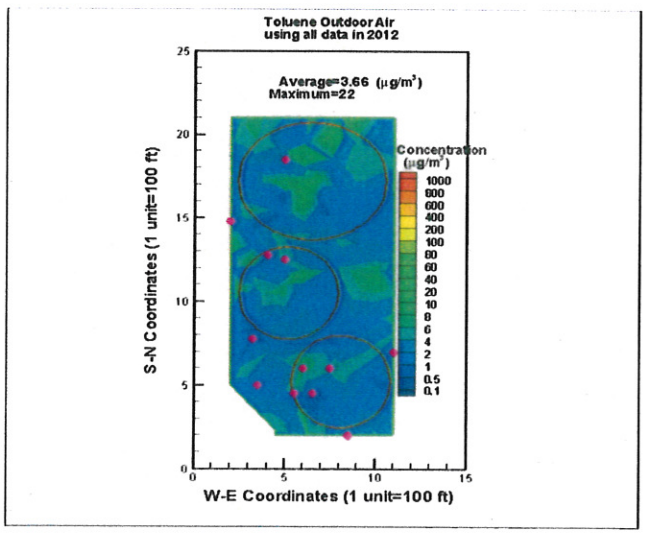
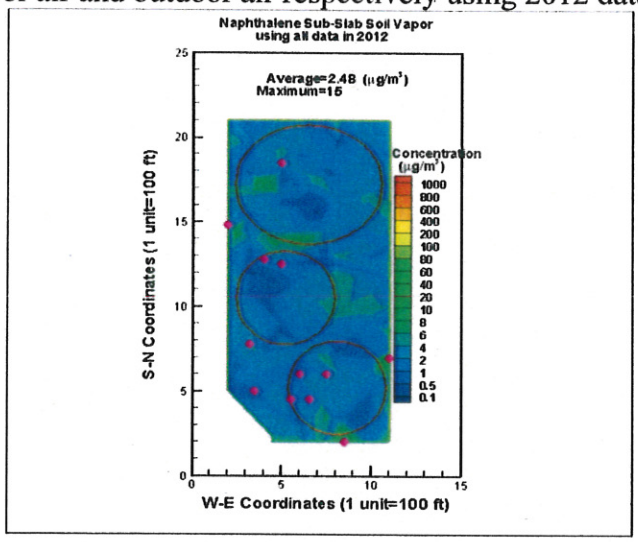
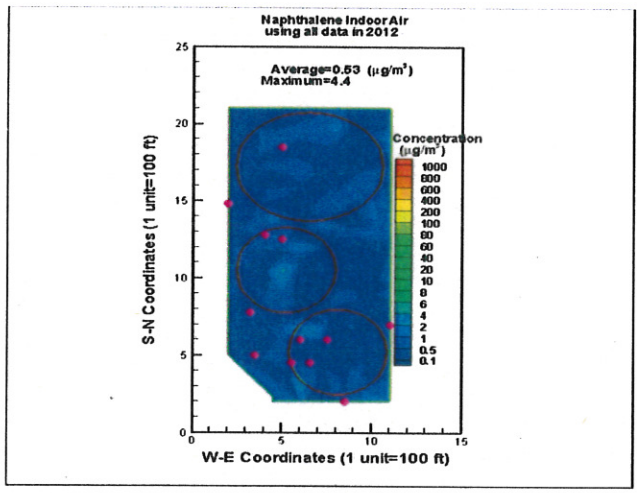


Figure 4 Spatial distribution of Naphthalene concentrations for sub-slab soil vapor, indoor air and outdoor air respectively using 2012 data





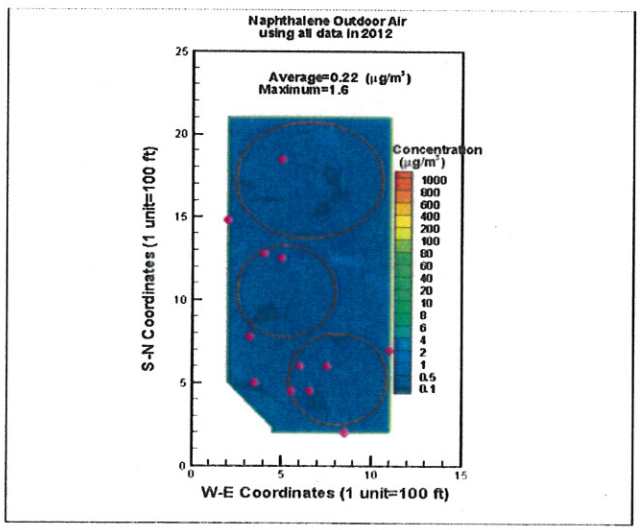


Table 1 Mean and maximum concentrations of petroleum hydrocarbon compounds in different spatial layers based on measured data at the Site in 2012

Benzene			
	Sub-Slab Soil Vapor	Indoor Air	Outdoor Air
Average	13.08	1.38	0.99
Maximum	1200	6.8	4.5
Exylebenzene			
	Sub-Slab Soil Vapor	Indoor Air	Outdoor Air
Average	2.67	1.21	0.55
Maximum	170	13	3.2
Toluene			
	Sub-Slab Soil Vapor	Indoor Air	Outdoor Air
Average	10.64	8.44	3.36
Maximum	1200	91	22
Naphthalene			
	Sub-Slab Soil Vapor	Indoor Air	Outdoor Air
Average	2.48	0.53	0.22
Maximum	15	4.4	1.6

Note: concentrations are reported in $\mu g/m^3$

Figure 5 Vapor attenuation factor vs. sub-slab soil vapor in log-log scale for Benzene

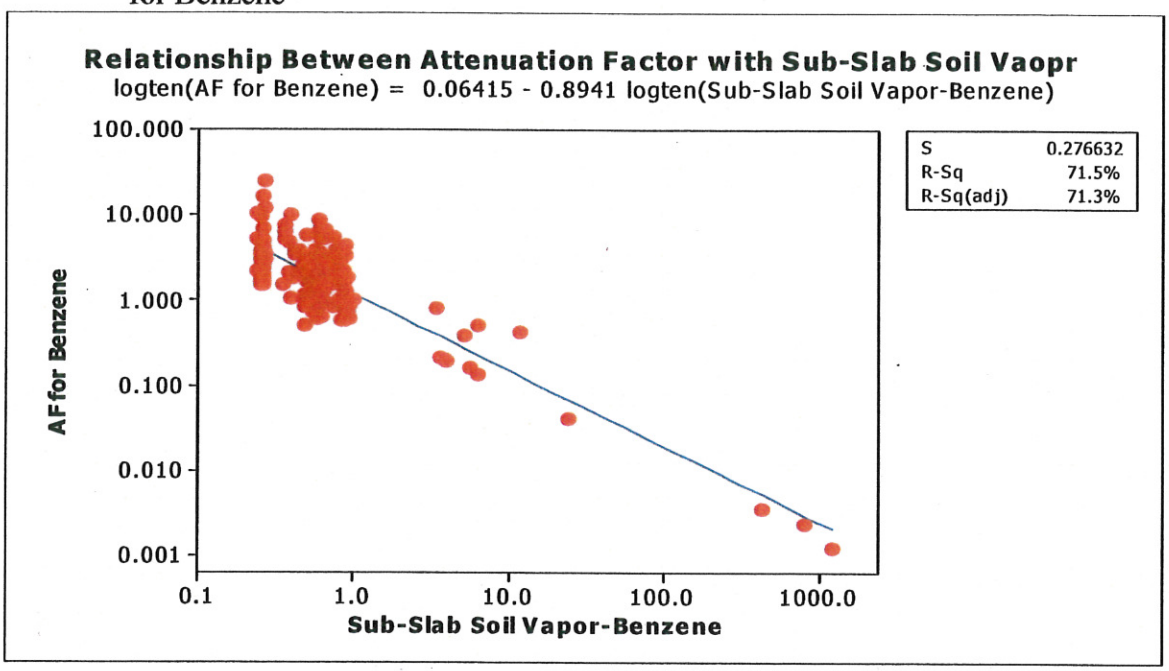


Figure 6 Vapor attenuation factor vs. sub-slab soil vapor in log-log scale for Ethylbenzene

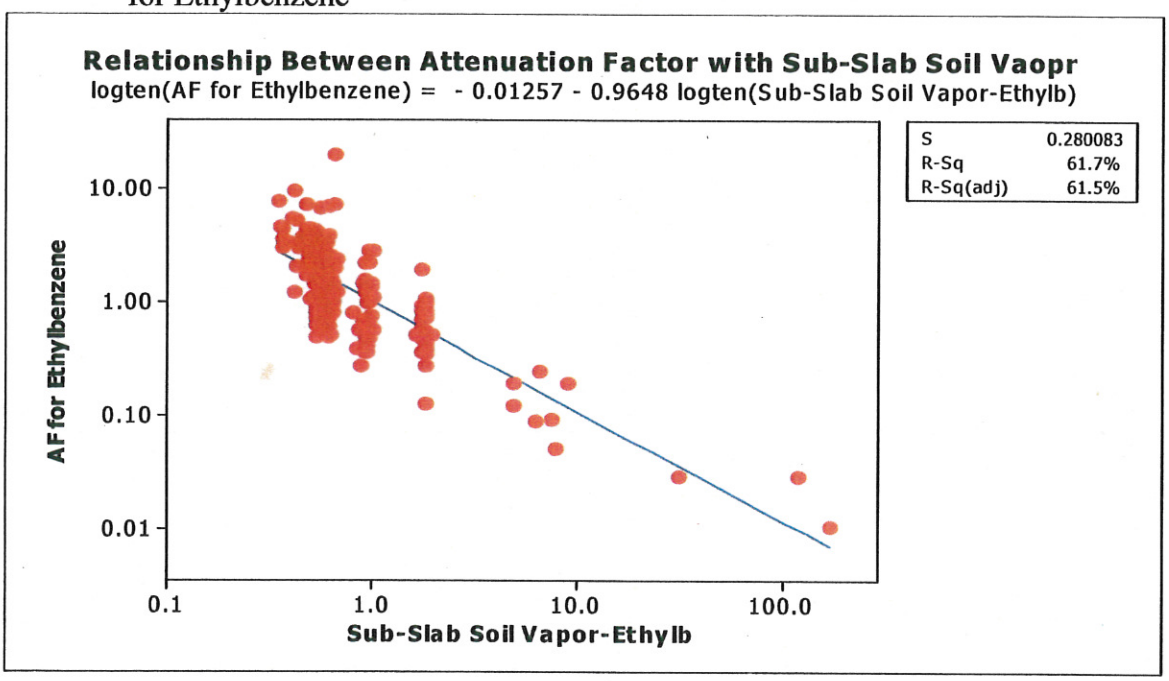


Figure 7 Vapor attenuation factor vs. sub-slab soil vapor in log-log scale for Naphthalene

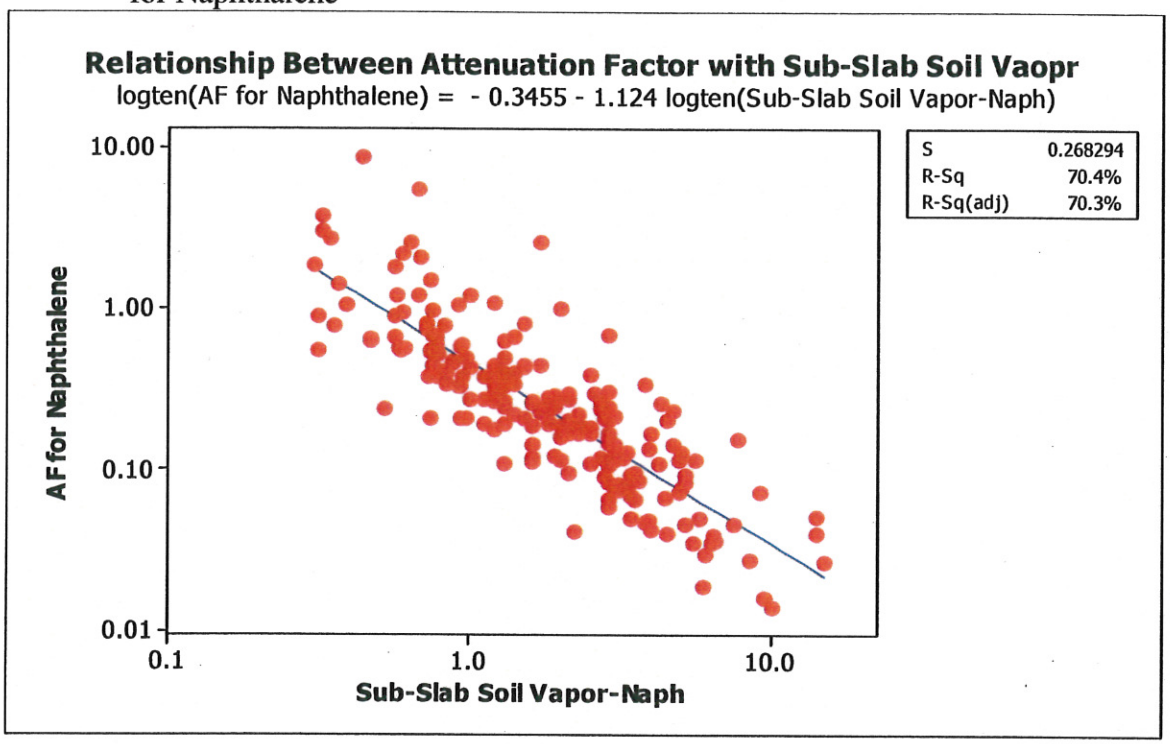


Figure 8 Vapor attenuation factor vs. sub-slab soil vapor in log-log scale for Toluene

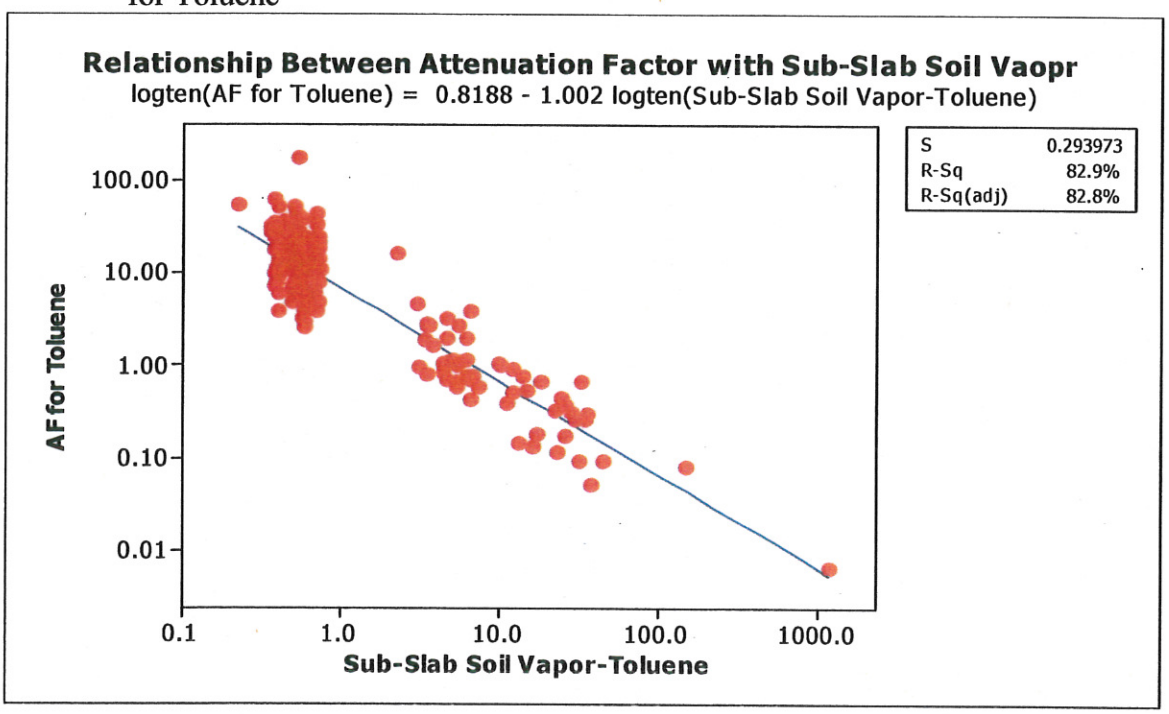


Figure 9 Percentile distribution of vapor attenuation factor for Benzene

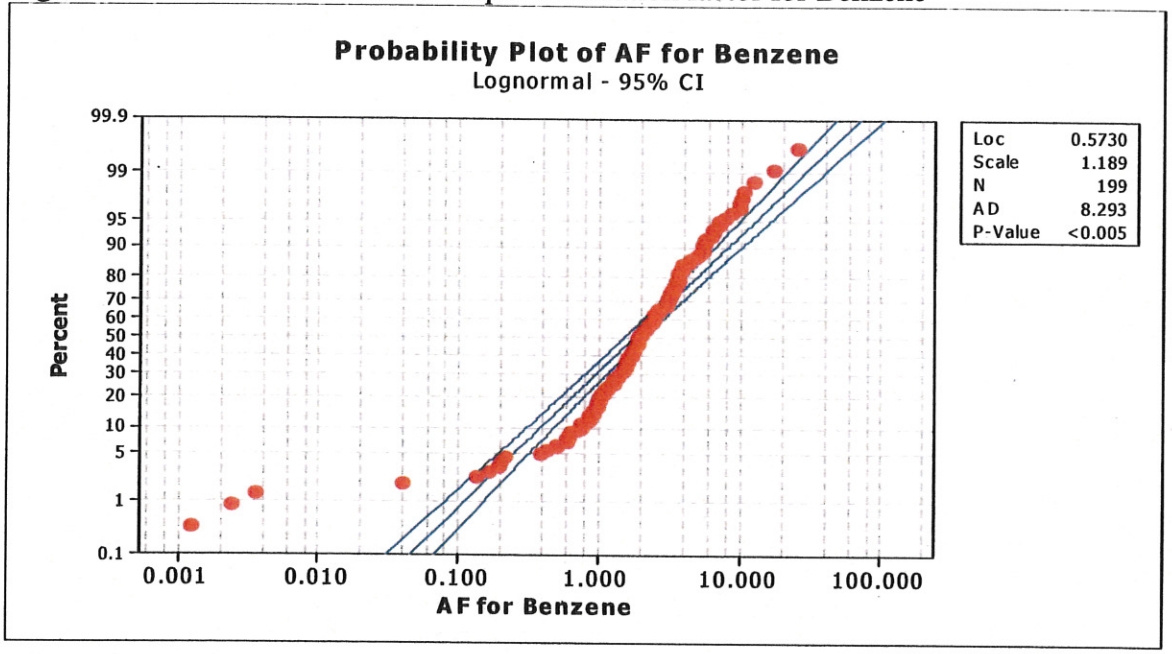


Figure 10 Percentile distribution of vapor attenuation factor for Ethylbenzene

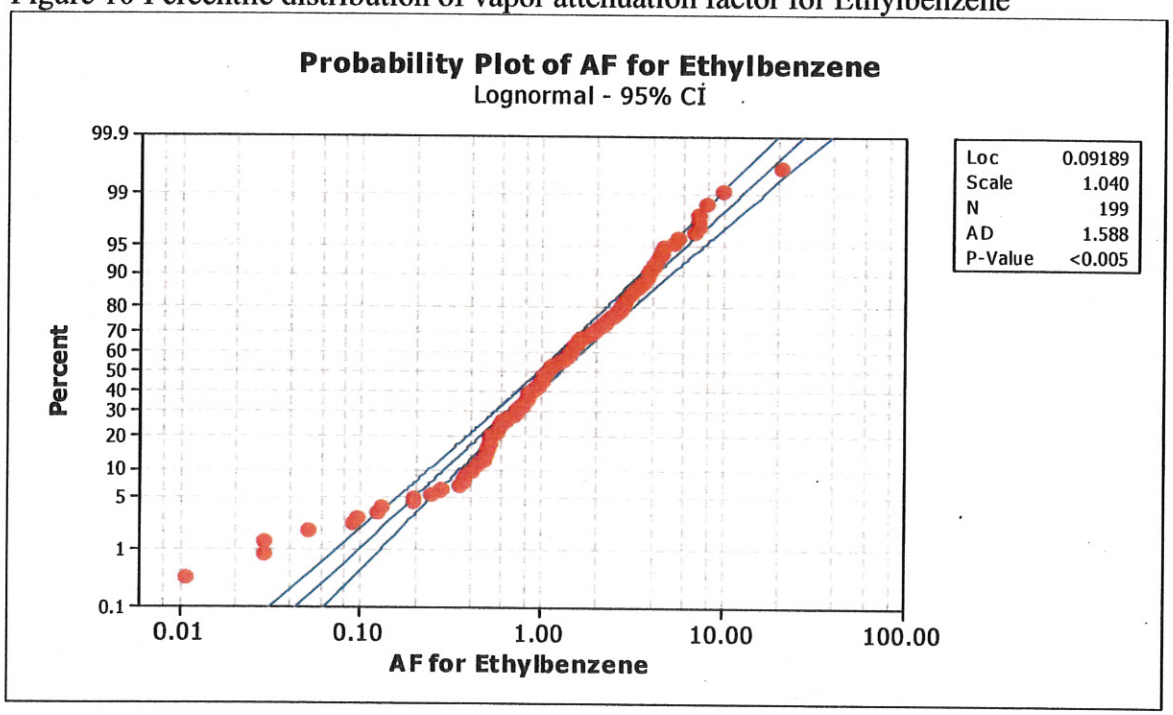


Figure 11 Percentile distribution of vapor attenuation factor for Naphthalene

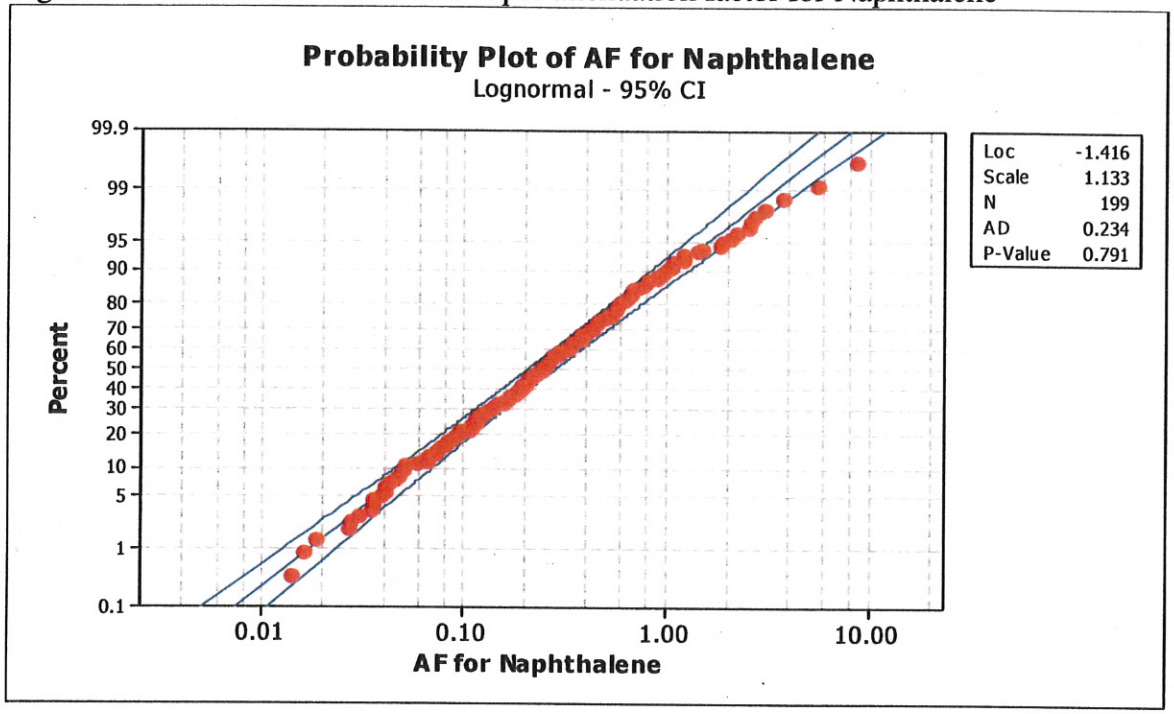


Figure 12 Percentile distribution of vapor attenuation factor for Toluene

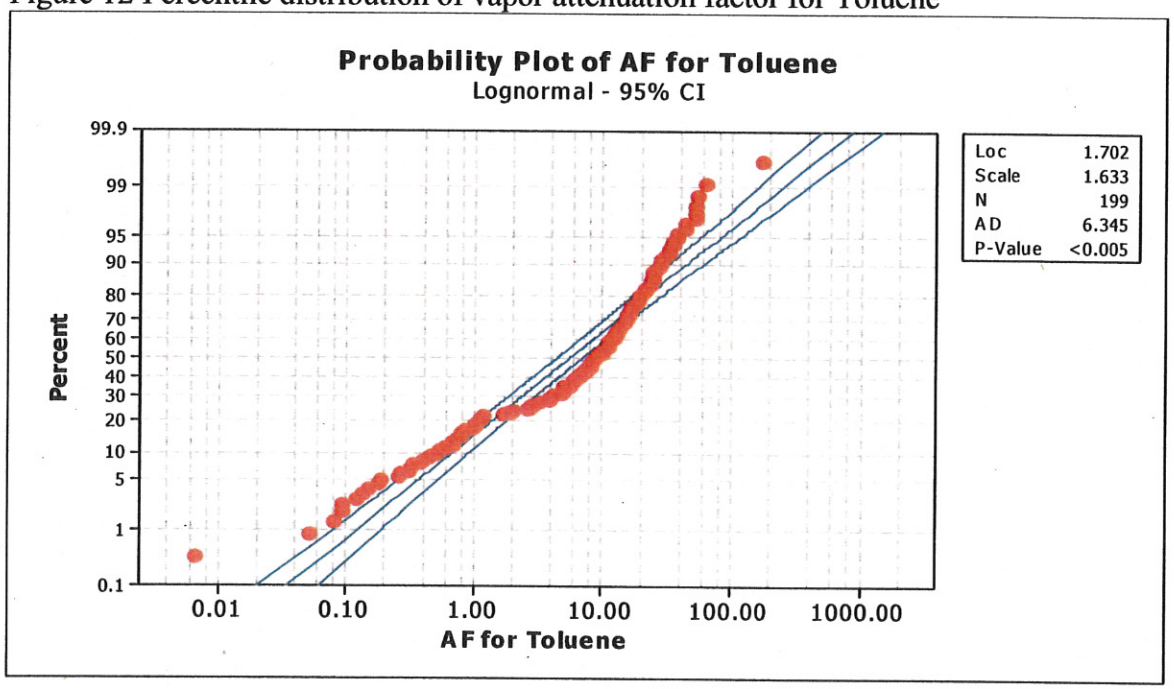


Figure 15 Vapor attenuation factor vs. sub-slab soil vapor in log-normal scale for Naphthalene

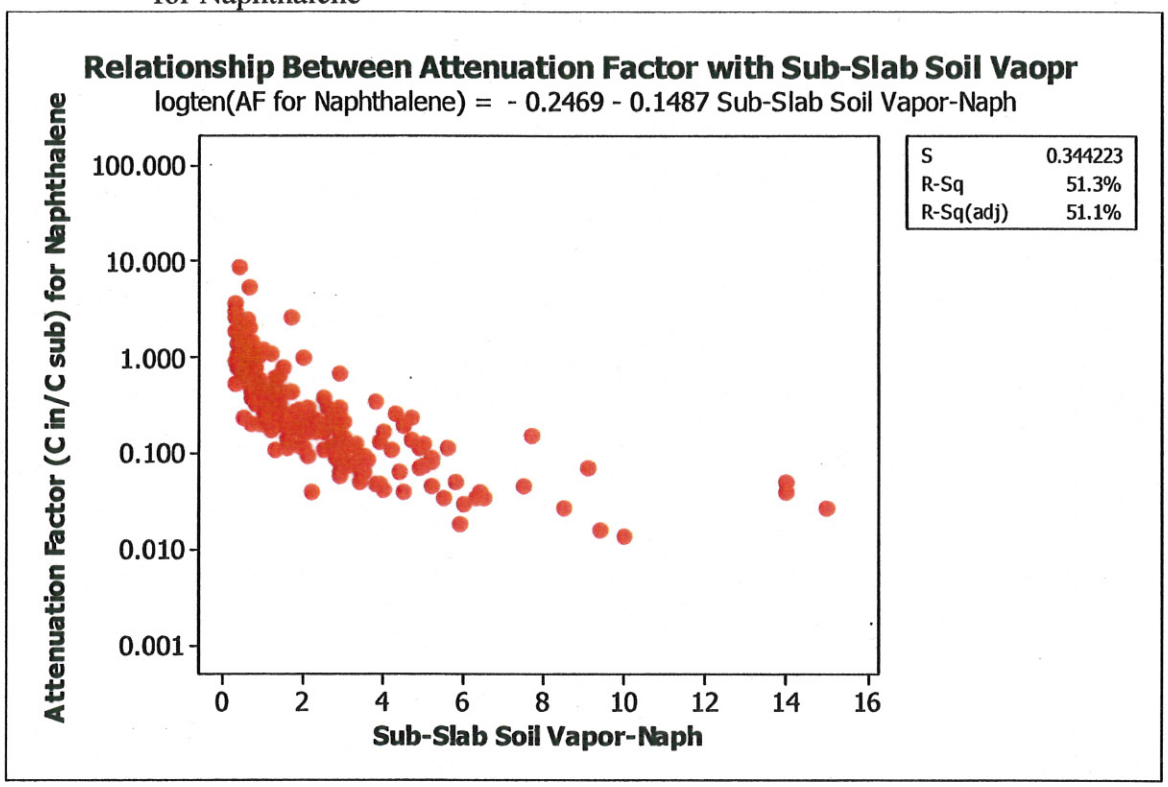
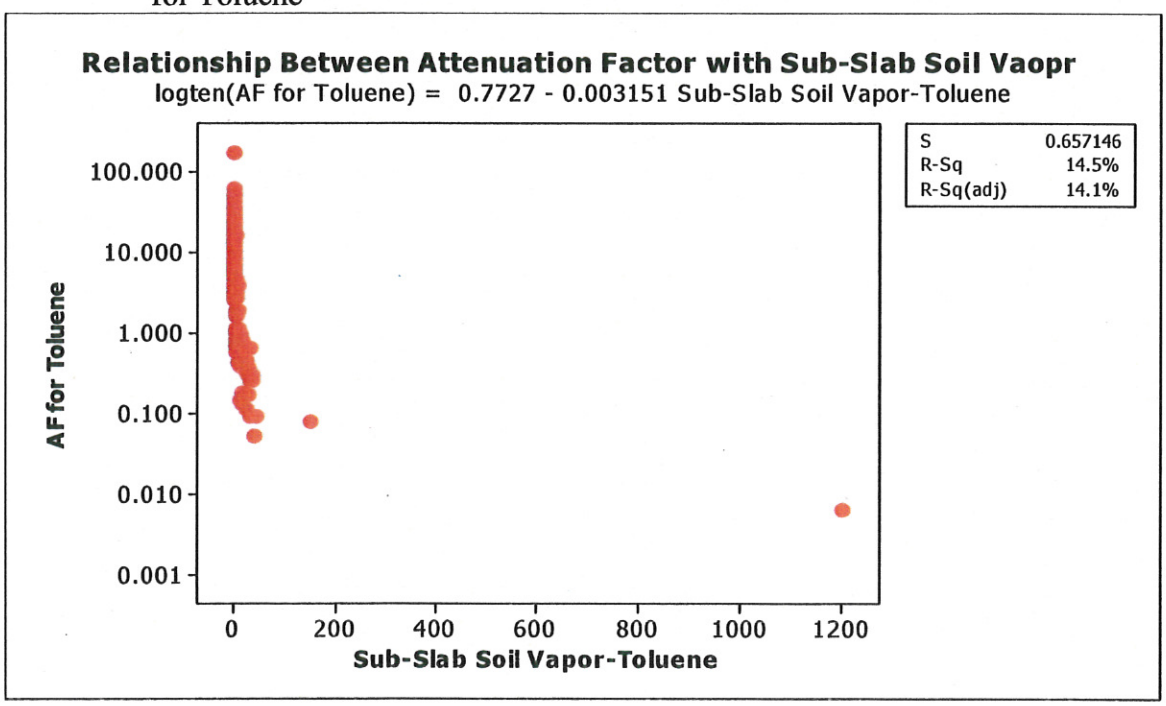


Figure 16 Vapor attenuation factor vs. sub-slab soil vapor in log-normal scale for Toluene



Expert Panel Interim Review of the Site-Specific Cleanup Goal Report and Human Health Screening Risk Evaluation

July 24, 2013

1. Introduction

This report contains the Expert Panel's interim review of the 2013 Site-Specific Cleanup Goal Report and Human Health Screening Risk Evaluation (2009, amended 2010 and 2011) as requested by the Regional Water Quality Control Board.

The Expert Panel's charge it to provide its recommendation for the Regional Board to consider in determining whether remedial actions and cleanup goals proposed by the responsible parties named in the Cleanup Order are consistent with applicable legal authorities, including State Water Resources Control Board (State Water Board) Resolution No. 92-49 ("Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304) (Resolution 92-49). Resolution 92-49 governs the Regional Board in requiring responsible parties to remediate the site to levels that will result in meeting all water quality standards and are "consistent with the maximum benefit to the people of the state."

The Expert Panel has reviewed several aspects of the Site-Specific Cleanup Goal Report (SSCG) and Human Health Screening Risk Evaluation (HHSRE). First, the panel evaluated the transparency, consistency, objectivity and the use of appropriate sensitivity analysis within and across the reports. Second, the panel identified areas of potentially important uncertainty in the reported knowledge of sources, transport and exposure to chemical of potential concern.

This interim report begins by lying out technical review criteria/principles. Section 3 then contains background information relevant to how the Expert Panel applied these technical criteria/principles in their review of the SSCG and HHSRE. Section 4 introduces concerns that arise when applying these principles to the SSCG and HHSRE. Section 5 contains other concerns/questions that arise from insufficient evidence. Finally, Section 6 summarizes and applies State Water Board Resolution 92-49 to this interim review.

2. Technical Review Criteria

This interim review of the human health risk assessment and cleanup goals work for the Former Kast Property (herein after referred to as Kast) has been analyzed based upon these principles:

- **Transparency**- A regulator and/or informed reader should be able to clearly identify and follow the logic and underlying assumptions (including those made under the banner of "best professional judgment") utilized in (i) the derivation of cleanup goals and (ii) overall risks for the site as a whole and at an individual homeowner level.

- **Consistency**- Methodological approaches for the risk assessment work should be based on a combination of (i) guidance and procedures published by the relevant regulatory agencies/authorities and as needed (ii) peer-reviewed scientific literature. If possible, methodological disparities (e.g., selection of chemicals of concern) should be minimized; however, if these differences occur a scientific and/or regulatory rationale should be provided.

- **Objectivity** (evidence based)- There should be a relevant and reasonably complete database that is useable for quantitative risk assessment. If there are significant data gaps for (i) media specific data sets (e.g., soil, air, water, biota), (ii) exposure assessment parameters (e.g., frequency, duration, behavioral patterns), and (iii) key toxicological parameters (e.g., slope factors, reference doses, toxic equivalency factors) then clear explanation and justification for bridging assumptions should be provided.

- **Sensitivity**- "How do we know what's important?" As applied to risk assessment, sensitivity analysis is "any systematic, common sense technique used to understand how risk estimates and, in particular risk-based decisions, are dependent on variability and uncertainty in the factors contributing to risk" (USEPA, 2001).
    - It is extremely useful for regulators and readers to understand the major "drivers" of the risk estimates, i.e., those parameters, factors, and assumptions that are significantly impacting the calculated risk.

3. Background Relevant to Application of the Technical Review Principles

The SSCG has these stated objectives:

- Evaluate impacts to shallow soils 0-10 feet below ground surface.
- Consider listed guidelines and Polices in the development of cleanup goals.
- Address groundwater cleanup goals.
- Develop site-specific cleanup levels for residential land use and for construction/utility worker exposures.

The SSCG utilizes over 550 Phase II Interim and Follow-up Reports that contain property-specific investigations and these include a *Human Health Screening Risk Evaluation (HHSRE)*. The HHSREs (various dates 2009/2010/2011) provided an initial evaluation, residential property by property, of calculated potential risks and

is tantamount, in many respects, to a baseline human health risk assessment. The HHSRE was designed to assist in interim response planning.

However, it is not clear whether 1) the HHSREs are now considered to constituent the "full" human health risk assessment, as the Expert Panel is hearing from Regional Board staff, or 2) whether a "full" human health risk assessment is scheduled for release in the future, as is stated in the SSCG report: "A full Human Health Risk Assessment (HHRA) incorporating the SSCGs proposed in this report will be conducted to further evaluate potential health risks once the site characterization work is complete. The HHRA will be used to guide final response action for impacted media at the Site and will likely be included in the Remediation Action Plan" (Site-Specific Cleanup Goal Report, Feb, 2013, page ES-1). The Expert Panel has concerns with either scenario 1) or 2).

Concerns with Either Scenario:

1) The HHSRE does not follow the guidelines of a standard human health risk assessment.

2) Alternatively, the utility of developing this document after the execution and release of the SSCG is potentially problematic for key decision makers at the Water Board. Typically, a human risk assessment should inform cleanup goals rather than be released after the cleanup goals are determined.

Other Issues:

- There are mathematical and methodological connections between calculating a cleanup level and a screening risk assessment; hence, there are links between the SSCG and the HHSREs. While the stated purposes of the two are "different," there is substantial methodological overlap.
    - There should be transparency, consistency, objectivity (same/similar data sets) and sensitivity (mathematical connection between the two calculated outcomes.
        - (i) Cleanup level based on a target risk (SSCG) and;
        - (ii) Property-specific risk based on an underlying media-specific screening level.

    - Both the SSCG and HHSREs utilize the same core calculation equation(s), it is simply a matter of variable rearrangement.
        - The basic media –specific data sets are similar (the SSCG has a somewhat fuller set simply because it is a more recent report);
        - Core exposure factors are the same as the residential scenarios;
        - Core toxicology parameters, e.g., reference doses, slope factors would be the same unless there was a published regulatory revision.

    - SSCG uses a 'target risk' level to back calculate scenario and media-specific cleanup levels, e.g., a residential scenario, assuming (a) standard exposure factors/parameters, (b) media-specific data sets for chosen

chemicals of concern (COCs) and (c) standard chemical-specific toxicity factors

- HHSREs uses (a) media-specific data combined plus a COC selection process (all detects are included) in combination with (b) exposure factors and (c) toxicity parameters in order to calculate media-specific (e.g., soil, indoor air and sub-slab soil vapor) "cumulative risk index" for both carcinogenic and non-carcinogenic COCs, as well as a separate total petroleum hydrocarbon screen.

- While there is an acknowledged risk range that is utilized for carcinogens (10^{-6} – 10^{-4}) and non-carcinogens (hazard index <1.0) the point of departure is conservative, i.e., carcinogens 10^{-6}.
  - Risk range and points of departure are the same for both the SSCG and the HHSRE.

- Both documents correctly state (and this requires emphasis) that risk estimates generated should not be interpreted as the expected rates of disease in the exposed population but rather as estimates of potential risk, based on current knowledge and a number of assumptions.
  - There are a variety of uncertainty factors integrated within the toxicity factors that are meant to err on the side of public health protection in order to avoid underestimation of risk.
  - Risk assessment is best used as a ruler to compare one source with another and to prioritize concerns.

- Risk estimates are best used to prioritize different options and scenarios for decision makers. The risk estimates do not inform either an individual or a defined population whether a defined disease endpoint (e.g., cancer) is going to be actually developed.
  - Consistency and transparency of methodological approaches are essential for regulators.
  - Changes in certain key inputs have a cascade effect on the risk estimates (or risk indices) as the variables are connected

    Sensitivity analysis is a useful tool for revealing which variable in the risk model contribute most to the variation in estimates of risk.

    According to USEPA (2001), "This variation in risk could represent variability, uncertainty, or both, depending on the type of risk model and characterization of input variables."

4. General and Specific Analysis

- **Sub-slab soil vapor and residential air quality.**
  The most consequential decision is whether to accept, reject, or request modifications to the Geosyntec analysis of the relationship, (or lack thereof), between chemical-specific sub-slab soil vapor concentrations and residential indoor air monitoring.
  - Any determination that there is a relationship between sub-slab soil vapor and indoor air will have a direct and profound impact on all risk estimates and cleanup calculations, i.e., there will be a definite increase in risk estimates and a concomitant lowering (more stringent) of chemical-specific cleanup levels as pathway additivity will clearly change the calculations.

    Concern:
    The statistical analysis done to determine whether there is sub-slab to indoor air VOC (volatile organic compound) transfer, although impressive in the volume of data used, is flawed because it ignores spatial and temporal factors. It would be much more valuable if it was done for each individual home, rather than for the aggregate; mixing data from various time periods can also distort the results.

    However, a review of the sub-slab concentrations compared to the indoor air concentrations for each of the VOCs indicates that: (1) the 10-12 homes with elevated levels of a given VOC in the sub-slab soil vapors do not have elevated levels of that VOC in indoor air; (2) the few homes with elevated levels of a given VOC in indoor air have low levels of the same VOC in sub-slab vapors; (3) higher levels of indoor benzene or toluene concentrations correlate well with high levels of garage benzene or toluene concentrations, suggesting that this is the more likely source of benzene or toluene in these homes. The only apparent exceptions (from a preliminary analysis) were high levels of PCE in sub-slab soil vapor and indoors for 24436 Panama Ave, 24617 Marbella Ave and 24737 Marbella Ave.

    In light of the assertions by Everett and Associates that the input data in the statistical analysis is incomplete (as depicted in Everett's letter in Page 9), it may be necessary to review the results with a higher level of scrutiny.

- **Consistency in chemical of concern selection between the SSCG and HHSRE.**
  The absolute number of potential chemicals of concern (COCs) retained matters as the more carcinogens that are retained, mathematically the more it will drive back calculated cleanup levels as carcinogens are considered to be additive.
  - It matters if there are 10 versus 30 carcinogenic and/or non-carcinogenic compound selected.

    Concern:
    DTSC guidance typically advises that compounds retained if there is a "hit"

regardless of whether there are otherwise numerous non-detects for the same compound. This procedure was followed for the HHSRE; however, a different process was utilized in the SSCG.

The SSCG excluded certain detects based on overall frequency of detection. In risk assessment practice there is a screening argument that is often made for dropping compounds based on level of non-detects versus a single detect.

In terms of **transparency** the different COC selection methodology across reports should be highlighted AND the impact of this decision further characterized (**sensitivity**).

Consistency of methodology is critical for regulators and decision-makers.

- The calculated media-specific SSCG values would mathematically change (become more stringent) if the COC process used in the HHSRE was utilized.

- **Calculation of SSCG without considering additivity of risk and hazards.**
  HHRA Note 4 (Page 12) states "Risk must be summed across all carcinogenic chemicals and exposure pathways (including vapor intrusion to indoor air evaluated separately from comparison to RSLs). Similarly, hazard quotients must be summed across all chemicals and exposure pathways (including vapor intrusion to indoor air evaluated separately from comparison to RSLs) for threshold (non-carcinogenic) effects to provide a hazard index. ... If the summed hazard index for the site is greater than one, then the hazard index may be recalculated for chemicals which have the same toxic manifestation or which affect the same target organ."

  Concern:
  The number of both carcinogenic and non-carcinogenic chemicals is greater than 10 for both site-wide and residential-specific COCs. While the SSCG uses 10^{-6} as the target risk and 1.0 for threshold hazard index, as the number of COCs becomes >10, the mathematical impact results in an overall risk greater than 10^{-5} and hazard risk well over 1. The SSCG does take additivity partially into account by multiply any target or threshold by 0.1 but again there are more than 10 COCs. Most states including California typically use 10^{-5} as a carcinogenic target. While cumulative and/or individual risks can be at the 10^{-4} level this is not typical and may not be agreeable to either regulators or Water Board decision makers.

- **SSCGs for soils.**
  The analysis provide for the development of SSCGs for soils in general follows reasonable methods and assumptions. Yet several issues deserve attention.

  Concerns/Issues:

One important point is the SSCGs were developed for each COC independently, but there may be several COCs at any one location that exceed the SSCGs, and even though they may all be remediated to the SSCGs, when added up them may still exceed the one in a million or HQ =1 target levels; adequate measures need to be in place to avoid this situation. The 0-2 ft bgs levels (EF = 350 days/yr) seem adequate for protecting residents, including children, to exposure of site soils. There is a bit more concern with the 2-10 ft bgs (EF = 4 days/yr) levels which are two orders of magnitude higher in general, due to the low exposure frequency (EF) expected. While it is valid to assume a very low exposure frequency, these higher levels in soils may under certain circumstances be a source of sub-slab soil vapors that could slowly leak into the subsurface soils (0-2 ft below gruond surface or bgs) and under exceptional circumstances into homes. It may also be a concern for construction workers, although this has been addressed (Table 8). In fact, the difference between the subsurface levels (0-2 ft bgs) for residents and the 0-10 ft bgs SSCGs of VOCs for construction workers is so small, that it makes sense to use the SSCGs for VOCs from the subsurface levels throughout the entire first ten feet bgs.

It has been suggested that the 95 UCL be used as the criterion to use for each property. The PRPs should realize that a greater number of soils samples will be needed to determine a 95 UCL, given the large variability in COC concentrations in a given property. In addition, when there are some clear hot spots above the 95 UCL, a more thorough investigation is warranted to make sure that a site with high levels of contamination in some small hot spots is not classified as not requiring remediation because the hot spot is combined with data from cleaner soils.

In addition, given the tolerance in SSCGs (e.g. not requiring cleanup to TPH = 100 mg/kg), it may make sense to request that the PRPs set up a trust fund that would be available in the future (next 20-25 yers) for (1) long term monitoring of COCs in indoor air and sub-slab soil vapors (once a year in key locations which have tested high in the past, plus a few random additional locations); (2) providing adequate protection to construction workers and nearby residents in the case that excavation below 2 ft bgs is needed for an extended period (e.g. 5 days or more); (3) engineering controls for methane in sub-surface as needed.

- **Sensitivity.**
  As the COC selection results in 26 different carcinogens (12 Site COCs) and 34 non-carcinogens (15 Site COCs) the SSCG can be calculated based on the target risk or acceptable hazard quotient divided by the number of COC that make up that risk/hazard.

  Concern/Issue:

The sensitivity (impact) of this change should and can be easily shown for Board decision makers.

- **Consistency and objectivity of screening levels.**
  Screening levels developed in the HHSRE (Human Health Screening Evaluation Work Plan; Geosyntec 2009) are stated (pg 3) to be "consistent with" Cal-EPA-OEHHA and USEPA RSL." Geosyntech writes that COC screening was conducted using risk-based screening levels (RBSLs) that were calculated assuming potential residential exposures to COC in soil and soil vapor as part of the HHSRE process and presented in the approved HHSRE Work Plan (Geosyntec 2009) and that the screening criteria is 1/10 of the RBSLs regardless whether of Cancer (C) or Non Cancer (NC). Geosyntech also describes the background screen for both metals and carcinogenic PAHs (known as "cPAH").
    - **Objectivity**- It is unclear at this stage of the review whether the DTSC list of cPAHs was analyzed versus the shorter OEHHA cPAH list, i.e., DTSC includes several PAHs as "carcinogenic" that are not typically considered as cPAHs by USEPA or OEHHA.

Concerns:

1. Cal-EPA January 2005 (Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, page 6) indicates that standard "Superfund" algorithms are used for unrestricted land use scenario. HHRA Note 3 (version August 2012 updated May 2013, see Summary page 1) indicates that the EPA RSLs are appropriate risk based screening levels unless the analyte is listed on one of the accompanying tables then the RSL on the table should be used.
    a. EPA RSL equations were not used as mutagenic effects were not included in the RBSL calculations (determined using verification calculations and the provided spreadsheets). While HHRA Note 3 (Page 4) indicates that in 2008 the RSLs did include this effect, it is unclear whether Cal-EPA fully implements the uncertainty factors as the corresponding equations have not be referenced in the Cal-EPA documents review to date. This would impact the PAH RBSLs which are calculated using Cal-EPA toxicity values.
    b. PEF Calculation: In the HHSRE (Table 3), the F(x) is specific for Los Angeles so the resulting PEF is 1.2E+11 m^3/kg. However, in SSCG Report, Appendix A, page 5, the F(x) is noted to be the default from USEPA 2002 (Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites) but the mean wind speed is specific for Los Angeles, so the change results in a PEF of 2.8E+9 m^3/kg. This is two orders of magnitude more conservative, so this may have been a requested change, as USEPA 2002 does not specify that the default be used. USEPA 1996 (Soil Screening Guidance: Technical Background Document) actually provides the Los Angeles specific number for F(x) per Cowherd 1985, as recommend in USEPA 2002. (Note the 2009

HHSRE Work Plan did include the Los Angeles F(x) but all later versions of the PEF calculation did not).

While the inhalation dose from particulates is typically very small relative to the incidental ingestion making this variance insignificant (in of itself), it does demonstrate that RBSLs were modified between the HHSRE and the ones used in the SSCG Report. This would indicate that Geosyntec could have made other updates, especially in the case of toxicity updates or guidance updates between 2009 and 2013. The 2010 HHSRE addendum does demonstrate updates due to toxicity, in this case cPAH.

c. Does not appear that for analytes listed on the HHRA Note 3 Table 1 that the table's soil screening values were used but instead the corresponding Cal-EPA toxicity values from the on-line screening calculator with the exception of the cPAH which used the corresponding TEQ of the Cal-EPA 2010 BaP toxicity value. <u>This is appropriate</u> but as there were no modifications to the exposure parameters or to the equations with the exception of that discussed above in 1a (mutagenic effects) and 1b (PEF which is insignificant), it is unclear why the residential soil RBSLs from USEPA RSLs and the Cal-EPA HHRA Note 3 Table 1 were calculated versus using the published screening concentrations.

2. HHRA Note 4 (Page 3) dated June 2011 supports the above concerns with the following statement: "As discussed in HHRA Note 3, for the majority of the 706 listed chemicals with RSLs, HERO recommends use of the soil and tap water values listed in the Spring 2010 U.S. EPA RSL table. However some values listed in the U.S. EPA RSL table differ significantly (greater than four-fold) than values calculated using Cal/EPA toxicity criteria and risk assessment procedures. HERO has prepared a reference table for soil and tap water RSLs which indicate contaminants for which: 1) the 2004 EPA Region 9 PRG should be used; 2) the 2004 EPA Region 9 'Cal-modified' PRG should be used; or 3) the Cal/EPA California Human Health Screening Level (CHHSL) should be used."

3. HHRA Note 4 (Page 9) also indicated that RBSLs used should be annotated as they "do not consider physical limitations such as soil saturation and some RSLs exceed the "ceiling limit" concentration of $1x10^{+5}$ mg/kg. Soil RSLs that exceed Csat are denoted as "s." Soil RSLs exceeding $1x10^{+5}$ mg/kg are denoted as "m", meaning that the chemical represents more than 10% by weight of the soil sample. At such concentrations, the assumptions for soil contact used to derive the RSLs may no longer be valid. Cases in which the chemicals are present at concentrations exceeding $1x10^{+5}$ mg/kg or Csat need to be identified and addressed in the risk assessment." <u>This was not done.</u>

4. HHRA Note 4 (Page 12) "In general, HERO recommends that all detected compounds be selected as COPCs and be included in the quantitative risk evaluation. ... Potential chemical breakdown products must also be considered, and the rationale should not be based on a "bright line" approach (e.g. preliminary cancer risk <1E-07, preliminary HQ<0.1). As detailed above, inorganics which are determined to be present at concentrations consistent with background will still need to be included in the total risk and hazard evaluation."

5. RBSLs do not appear to have been updated from the HHSRE (Geosyntec 2009, Table 10) using the more recent Cal-EPA guidance, though small input parameters are indicated (see 1b) to have been different. Earlier Cal-EPA (2005) guidance set the default sub-slab soil vapor to indoor air attenuation factor as 0.01 mg/m^3 to mg/m^3; whereas current guidance Cal-EPA [2011b, Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance)] recommends the attenuation factor of 0.05 mg/m^3 to mg/ m^3. Reviewing the COC selection for Soil Vapor and multiply the screening concentration by 0.2 for the correction, an additional four COC would be selected (styrene and vinyl acetate from non-sub-slab samples and 1,2-dichlorobenzene and cis-1,2-dichloroethene from sub-slab samples). Additionally bromomethane, already selected from sub-slab samples would be selected in the non-sub-slab samples. One would assume only styrene would be classified as a Site COC.

While the vapor intrusion pathway used for the derivation of the RBSL for soil vapor, these SSCGs for soil vapor were calculated for the Utility Worker scenario for all COCs. If the vapor intrusion into the residential structure is believed to be an incomplete pathway (as per Appendix B of the SSCG Report), the RBSLs for soil vapor could be calculated using an industrial air RSL and the soil vapor attenuation for trench/utility workers in order to possibly reduce the number of soil vapor SSCGs.

- **Definition of surface soil.**
  HHRA Note 4 (Page 10) states "For evaluation of future residential land use scenarios, soil samples from the 0 to 10 foot (ft) below ground surface (bgs) interval should be collected. While recommended soil sampling depths may vary based on site-specific conditions; in general, discrete soil samples should be collected from both surface (0 to 0.5 ft bgs) and subsurface soil."

  Concerns: While the data collection appears to have following this sampling the depth of surface soil was extended to 2 feet. This is considered reasonable given the potential for gardening as referenced in the text. However the data were not presented by depth in any of the documents reviewed, especially in the SSCG document.

- **Multiple SSCGs for subsurface soil.**
  SSCGs were calculated for both residential and construction/utility worker exposure to subsurface soils (Tables 7 and 8, respectively). However, the SSCGs for construction and utility maintenance worker exposures ... will be applied to soils from 0-10 feet bgs" (page 48).

  Concerns: Due to the exposure calculation using the child exposure factors in the residential exposure scenario, the SSCGs for the subsurface soils are more conservative for the residential subsurface exposure than the construction/utility worker. Why then was the worker-based SSCGs selected for the subsurface soils?

- **Use of cPAH**: HHRA Note 4 (Page 13).
  In some cases, benzo(a)pyrene (BaP)-equivalent concentrations are calculated and used in screening-level risk evaluations to assess risk from carcinogenic PAHs. ... If the BaP-equivalent concentration is calculated, the OEHHA potency equivalency factors (PEFs) should be used (OEHHA 2002). See Table 1."

  Concern: Document references use of cPAH, especially for background characterization, but the data tables do not show that the cPAH were calculated and background concentration was used only for BaP. Since the maximum BaP concentration was greater than background cPAH, the point becomes moot but should be considered as it makes the argument weak.

- **Lead.**
  Use of the Adult Lead Model (ALM) for the intermittent exposures to subsurface soils is inaccurate due to the lack of steady state scenario.

  Concern: Lead SSCG is not accurate for subsurface soil. USEPA (1994, 2003a, 2003b) recommends a minimum frequency of one day per week and duration of three consecutive months. For most of the construction/utility worker populations, this assumption is not met within the neighborhood or Site. Given the half-life of lead in blood is 30 days, the lead levels in the blood will not reach steady state but will probably be at least partly flushed from the blood prior to the next exposure. The current biokinetic models are not appropriate to evaluate non-steady-state exposures to lead and may underestimate the peak blood concentrations following short-term transient exposure.

  USEPA's 2003b guidance *ASSESSING INTERMITTENT OR VARIABLE EXPOSURES AT LEAD SITES* addresses how "to use the IEUBK model and ALM to assess a wider variety of exposure scenarios, including exposure from more than one location, varying intensities of exposure, track-in of soil from another location, and intermittent air exposures." Given the subsurface

exposure is described by Geosyntec as the potential of the resident (child and adult) to come in contact with subsurface soil 4 times per year, the USEPA guidance would recommend using the time-weighted average to evaluate the child exposure. USEPA guidance (2003b) considers three (3) months "to be the minimum exposure to produce a quasi-steady-state PbB concentration. The reliability of the models for predicting PbB concentrations for exposure durations shorter than 3 months has not been assessed." This document for the ALM recommends using the shortest averaging time of the exposure, for example the exposure could be per week or 90 days.

While the utility worker exposure is not over the full exposure period, the weighted media concentration will not be annualized across the year, even though the models will assume the exposure occurs over a year. The TRW recommends not annualizing the weighted concentrations even though some of the lead burden accumulated during the exposure season will be eliminated during the intervening months between seasonal exposures. However, neither the IEUBK nor the ALM can simulate this loss of lead, so model predictions correspond to a full year of exposure to a constant exposure level regardless of the actual exposure period. The seasonal exposure can occur successively over years or for only one year. Since the model cannot predict the wash out period (no exposure), the resulting risk assessment is probably over-estimating the resulting risk.

- **Recap of the technical review.**
  An interim review of the Kast risk assessment has been performed. Knowledgeable and sophisticated practitioners have obviously performed the work. Spot check of risk spreadsheets demonstrates no calculation errors. The complexity and numerosity of the risk assessment reports is formidable almost to a fault. If the point of the entire risk assessment exercise is to provide a clear road map for regulators, Water Board decision makers and the public stakeholders then there are critical issues that should be more clearly addressed. Critical stakeholders should be able to more clearly follow a transparent, consistent and objective analysis that includes an analysis of the sensitivity of key assumptions and technical decisions.

5. Important Unknowns: Needed Additional Information

- **GW Plume delineation.**
  The extent of the plumes (different plumes for different COCs) is not explicitly determined in the information provided. In addition, the plume delineation analysis should establish the rate of migration of the various COCs, to better understand the risk to neighboring properties and wells. A gradient is provided, as well as soil types (sands) for the aquifers, but there should be some evaluation of adsorption (retardation), biodegradation and other processes that will support the assertion that the plumes are stable and will eventually be

decreasing, not just a statistical analysis (MAROS) of benzene (one COC). At present not all locations indicate stable or decreasing; some are increasing and many had "no trend" which means there is insufficient information to state they are stable or decreasing. Stable could be the norm for decades given the levels of TPH and the presence of LNAPLs. While in most cases the concentrations are not very high, there are a few locations where the concentrations of some COCs is many times above the MCL. The proposed SSCG of maintaining a stable or decreasing plume would require more monitoring. Given the significant amount of TPH in the overlying soils (Figure 10B in Plume Delineation Report indicates a very thick zone contaminated with petroleum derived compounds, at depth (8-40 ft bgs)), it is likely that the petroleum derived COC plumes will last for decades, with a significant monitoring cost to the PRPs. These can also be a continuous source of soil vapors to the sub-slab region. While there is not sufficient evidence to indicate that there is much migration of COC vapors from sub-slab to indoor air (see below), it will remain a concern that needs to be monitored for decades.

- **CVOCs sources.**
  There are CVOCs (chlorinated VOCs, alledgedly from off-site activities) at relatively high concentrations in MW-01, which is not downgradient of Turco. May be from former OTC. However, many CVOCs found in sub-slab soil samples at concentrations that appear to be too high for volatilization from groundwater 53 feet below (Bellflower aquifer). Figures 15A & B, 16 A & B (Plume Delineation Report) provide some sense of PCE & TCE contamination at shallow depths, which is difficult to explain as a result of GW transport from Turco or OTC. If these vapors are in equilibrium (or near equilibrium) with the soils in the shallow area, the concentrations in the soils are significant. As indicated by the SSCG report, one would not expect transport from off-site to on-site to be significant due to adsorption, dilution, biodegradation and other fate and transport processes. It is possible that cleaning of machinery and other operations on-site resulted in release of these CVOCs on-site. This cannot be ruled out.

  Lack of maps for CVOCs hinder ability to better understand their distribution and thus sources and risks. There is an emphasis on only considering petroleum-based COCs, even though data is available for many other COCs. Most of the CVOC data is only presented in tables and not considered in some of the analyses, which is not helpful for determining risk, regardless of PRP. They are considered as part of the SSCGs, and must be considered in the remedial action plan.

6. Cleanup Goals and the "Maximal benefit" Criteria

State Water Board Resolution 92-49 governs the Regional Board in requiring responsible parties to remediate the site to levels that will result in meeting all

water quality standards and are "consistent with maximum benefit to the people of the state." The current SSCG remains consistent with this so long as it seeks to enable unrestricted land use of the parcels and is consistent with, and preserves, the previous level of residential land use and the value derived there from subject to it being economically and technically feasible. Whether it achieves these standards depends, in part, upon addressing the concerns raised above in the technical review of the SSCG and HHSRE.

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