

# Office of Environmental Health Hazard Assessment



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## MEMORANDUM

**TO:** Kevin Graves, Chief,  
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**FROM:** David M. Siegel, Ph.D., Chief,  
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**DATE:** February 7, 2012

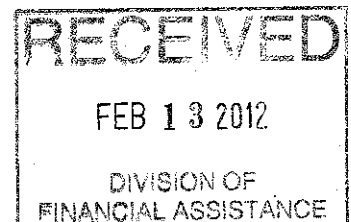
**SUBJECT:** Comment Letter: Proposed Low-Threat UST Closure Policy

The Office of Environmental Health Hazard Assessment (OEHHA) is providing comments on the proposed Low-Threat UST Closure Policy supporting documents, Technical Justification for Direct Contact and Outdoor Air Exposure Media-Specific Criteria, 11/4/11, and Technical Justification for Vapor Intrusion Media-Specific Criteria, 11-22-11. OEHHA staff prepared these comments in response to a request by you to review the documents and offer comments and suggestions on the technical justifications supporting the policy.

If you have any questions, please contact me at (916) 322-5624 or at [David.Siegel@oehha.ca.gov](mailto:David.Siegel@oehha.ca.gov).

Attachment

Cc: Lauren Zeise, Ph.D.  
Acting Deputy Director for Scientific Affairs



California Environmental Protection Agency

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption.

**Office of Environmental Health Hazard Assessment Comments on the  
Technical Justification for Direct Contact and Outdoor Air Exposure Media-  
Specific Criteria, 11/4/11,  
Technical Justification for Vapor Intrusion Media-Specific Criteria, 11-22-11,  
and the  
Proposed Low-Threat UST Closure Policy, 11-12-11**

The Office of Environmental Health Hazard Assessment (OEHHA) staff have reviewed two technical justification documents, Direct Contact and Outdoor Air Exposure Media-Specific Criteria and Vapor Intrusion Media-Specific Criteria, being used to support the proposed Low-Threat UST Closure Policy of the State Water Resources Control Board. OEHHA also performed a quick review of the policy as it relates to the technical documents.

OEHHA staff found that these documents adequately support the proposed policy. The comments below identify possible errors or problems with the documents. Addressing the issues identified may further strengthen these documents.

OEHHA supports the proposed policy.

**Comments on the "Technical Justification for Direct Contact and Outdoor Air Exposure Media-Specific Criteria, 11/4/11"**

This version of the technical document is clear and concise. It contains reasonable explanations for the methodology and parameters used to calculate the soil screening levels. There were a few minor problems noted below, but these did not impact the final screening levels reported in Table 8.

The specific comments follow:

1. Page 4, Section 3.3 Depths to Which the Screening Levels Apply. While the text states that two sets of screening levels were developed, in fact, some of the screening levels for 5 to 10 feet below ground surface (bgs) were calculated incorrectly because the appropriate formula for the Volatilization Factor (VF) was not used to calculate subsurface conditions. The correct formula to calculate VF for this condition is:

$$VF_{zamb} = \frac{H\rho_s}{[\theta_{ws} + \kappa_s\rho_s + H\theta_{as}] \times \left[ 1 + \frac{U_{air} \times \delta_{air} \times L_s}{D_{eff} \times W} \right]} \times 10^3$$

This comes from a paper by Connor *et al.* (1996), from Figure 2, Equation CM-3: Subsurface Soil Volatilization Factor ( $VF_{samb}$ ).

Use of this formula does not change the final screening levels but does change some of the values in Table 9. The values become significantly larger for naphthalene Commercial/Industrial Volatilization to outdoor air (5 to 10 feet bgs) and for PAH Residential and Commercial/Industrial Volatilization to outdoor air (5 to 10 feet bgs).

2. Pages 12 and 13, in Tables 2 and 3. The equations for "*Incidental ingestions of soil*" and "*Dermal contact with soil*" do not have the body weight (BW) term in the numerator. This appears to be a typographical error since the calculated results are correct.
3. Table 6. The variable for thickness of impacted soil is identified as "D." In the equation in Table 5, "Mass-balance considered" the variable is identified as "d." One or the other should be used to avoid confusion.
4. Table 7. The benzene Henry's law constant is 0.23. In the "*Technical Justification for Vapor Intrusion Media-Specific Criteria*" the Henry's law constant is given as 0.25. For consistency within the policy, one or the other should be the same.

### **Comments on the "Technical Justification for Vapor Intrusion Media-Specific Criteria, 11-22-11"**

#### **Review Limitations**

The proposed technical justification is based on a modeling study and analysis of field data. Part of the policy is based on personal communication and presentations. Some of the articles used are not published yet, while others are not peer-reviewed. OEHHA did not have the opportunity to review all articles, nor to verify the modeling and the field data as shown in databases. Accordingly, this review is based on the assumption that the modeling was performed correctly, and the analysis of the field data is adequate to the purpose of the reviewed document. Under these conditions, the provided "Technical Justification for Vapor Intrusion Media-Specific Criteria" document was reviewed for consistency with the suggested criteria only.

The specific comments follow:

1. Page 1. There is a statement, "*For petroleum-related volatile organic compounds (VOCs), current risk-based screening levels (such as the California Human Health Screening Levels [CHHSLs]) for evaluating risk from vapor intrusion at underground storage tank (UST) sites are extremely conservative. This conservatism is caused*

*by not considering biodegradation in site screening which generally drives further unnecessary site evaluation."*

The adverb extremely as in "extremely conservative" can, in this case, be considered an inappropriate use of the term. It is correct that soil-gas CHHSLs do not take biodegradation into account. However, CHHSLs were developed to cover all possible scenarios at contaminated sites for screening purposes and biodegradation may not take place in all situations for all chemicals. Therefore, CHHSLs need to be health protective and were developed as such. For this purpose they should not be seen as extremely conservative and should not be referred to as such in this document. For the same reason, the phrase "which generally drives further unnecessary site evaluations" is overly broad and would not be appropriate for situations where biodegradation does not occur.

2. Page 5. It is stated, "*Low concentration sources are therefore composed primarily of the more soluble (aromatic) VOC LNAPL constituents, benzene, toluene, ethylbenzene, xylenes, and naphthalene... Note: weathered LNAPL is analogous to low-concentration sources in cases where the LNAPL is depleted of VOCs.*"

Suggested note text modification: "...weathered LNAPL is analogous to low-concentration sources in cases where the LNAPL is depleted of aliphatic VOCs."

3. Page 8. "*Figure 19 from API (2009) is a plot of the hydrocarbon (TPH-gasoline) attenuation factor in the unsaturated zone versus source vapor concentration for a range of source/building foundation separation distances assuming a representative biodegradation rate and two soil types...*"

Suggested text modification: "Figure 19 from API (2009) is a plot of the hydrocarbon (TPH-gasoline) attenuation factors in the unsaturated zone versus a range of source vapor concentrations for a source/building foundation separation distance of 3 m assuming a representative biodegradation rate and two soil types..." In addition, the log scale in that figure for the attenuation factor is incorrect. This log scale shows a two-orders-of-magnitude change between the values, but the minor tic marks on the scale are set for a one-order-of-magnitude change. While this may not affect the actual results or their interpretation, it does raise some question on the value of the citation.

5. Page 10. "*The cited databases are publically available.*" They are not shown in the Reference list. If publicly available, they should be shown in the Reference list.
6. Page 12. In the figure from Lahvis (2011), the inserted graphics should probably show benzene concentrations in µg/L.
7. Page 18, Section 4. The text omits the requirement of no LNAPL in soil, namely TPH < 100 mg/kg under scenarios 1, 2, and 3. These scenarios as described and further discussed should demonstrate the complete set of criteria.

8. Page 30. The text states, "*The model results from Abreu et al. (2009) (see Figure 3 below) show O<sub>2</sub> concentrations in excess of ~17% (0.8 \* 21%) for a hydrocarbon (benzene) vapor source concentration of 1 mg/L (1,000 ug/L) (see plots in middle of the figure).*" If the oxygen attenuation factor is 0.9 as shown in Figure 3, perhaps the text should read ~19% (0.9 \* 21%).
9. Page 32. It is stated "2 m (5 ft)". Two meters is much closer to 6.5 ft.
10. The newer DTSC, 2011 guidance document for evaluation of vapor intrusion provides a number of requirements, e.g., for the soil gas to have reached steady-state conditions. However, comparison of the requirements shown in that guidance to the criteria shown in the reviewed UST policy is beyond the scope of this review. We suggest that they be compared to ensure there is consistency.

### **Comments on the "Low-Threat UST Closure Policy, 11-10-11"**

1. Appendix 4, Soil Gas Sampling-with Bioattenuation Zone. "1. *There is a maximum of five vertical feet of soil vapor measurement and the foundation of an existing building...*" Maximum should probably read **minimum** to be consistent with the provided theoretical basis for this scenario.
2. Appendix 4, Soil Gas Sampling-with Bioattenuation Zone. "2. *TPH (TPHg + TPHd) is less than 100 ppm...*" This requirement is supposed to guarantee no LNAPL in soil. However, page 4 of the technical document refers to indirect evidence of LNAPL in case of vapor readings of >10 ppm after historic diesel release. Therefore, the requirement of less than 100 ppm may not be sufficient.
3. While the policy implies that the sites considered under this policy have been investigated and characterized, it does not state it explicitly. It would be useful to state in the preamble of the policy that sites considered under this policy must first be fully investigated and characterized.

### **References cited by OEHHA**

Connor, JA, CJ Newell, MW Malander, 1996. "Parameter Estimation Guidelines for Risk-Based Corrective Action Modeling," National Groundwater Association, Proceedings of the Petroleum Hydrocarbons and Organic Chemicals in Groundwater Conference, Houston, Texas, November 1996.

DTSC, 2011. Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air, Final, Department of Toxic Substances Control, California Environmental Protection Agency, October 2011.