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STATE WATER RESOURCES CONTROL BOARD

FOR THE STATE OF CALIFORNIA

In the Matter of the Petition of EQUILON ENTERPRISES LLC dba SHELL OIL PRODUCTS US and SHELL OIL COMPANY Cleanup and Abatement Order R4-2011-0046 California Regional Water Quality Control Board, Los Angeles Region California Water Code § 13304	Case No. **PETITION FOR REVIEW AND REQUEST FOR HEARING**

Equilon Enterprises LLC dba Shell Oil Products US and Shell Oil Company (collectively "Shell") hereby file this Petition for Review ("Petition"), along with the supporting Declarations of Douglas J. Weimer and exhibits (attached hereto and referred to hereafter as "Weimer Decl.") and David Marx. Shell also requests that an order be issued staying certain requirements in the subject Directive and that a hearing regarding this Petition be granted. *See* Water Code § 13320, 23 Cal. Code Reg. § 2053. Notwithstanding the technical issues raised in this protective Petition, which are the subject of ongoing discussions between Shell and the California Regional Water Quality Control Board, Los Angeles Region (the "Regional Board"), Shell intends to submit the Remedial Action Plan and the Human Health Risk Assessment Report, along with drafts of preliminary environmental documents, to the Regional Board by the March 10, 2014 deadline.

Shell alleges as follows:

1. Shell's mailing address is 20945 South Wilmington Avenue, Carson, California 90810. (Weimer Decl., ¶ 2.) Shell requests that copies of all communications relating to this Petition should be sent to Mr. Weimer at the foregoing address with copies sent to the above-captioned counsel.

2. Since 2008, Shell has been conducting an environmental investigation of the former Kast Property located southeast of the intersection of Marbella Avenue and E. 244th Street in Carson, California ("Site"). (Weimer Decl., ¶ 3.) On March 11, 2011, the Regional Board issued Cleanup and Abatement Order No. R4-2011-0046 (the "CAO") which, *inter alia*, directed Shell to "submit site-specific cleanup goals for residential (i.e., unrestricted) land use" that "shall include detailed technical rationale and assumptions underlying each goal." (Exh. 1, p. 13.)[1] On February 22, 2013, Shell timely submitted its initial Site-Specific Cleanup Goal Report ("Initial SSCG Report"). On August 21, 2013, the Regional Board issued a response to the Initial SSCG Report and directed Shell to revise the Site-Specific Cleanup Goals ("SSCGs") for the Site in accordance with certain comments and directives. On October 21, 2013, Shell timely submitted a Revised Site-Specific Cleanup Goal Report ("Revised SSCG Report") that addressed and incorporated the Regional Board's comments and directives.[2]

3. On January 23, 2014, the Regional Board issued its Review of Revised Site-Specific Cleanup Goal Report and Directive to Submit the Remedial Action Plan, Human Health Risk Analysis, and Environmental Analysis for Cleanup of the Carousel Tract Pursuant to California Water Code Section 13304 ("Directive").[3] In the Directive, the Regional Board

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[1] All exhibits referenced herein are attached to the Weimer Declaration.

[2] Copies of Shell's Initial SSCG Report, the Regional Board's August 21, 2013 response, and Shell's Revised SSCG Report are submitted as Exhibits 2 to 4, respectively. The text, tables and figures for the Initial and Revised SSCG Reports are attached to the Weimer Declaration, and copies of the full reports (with the appendices) are included on CDs that are included with the hard copy of the Petition.

[3] A copy of the Regional Board's Directive is submitted as Exhibit 5.

approved the SSCGs proposed in the Revised SSCG Report with certain modifications, and required Shell to submit a Remedial Action Plan for the Site ("RAP") by March 10, 2014, along with a Human Health Risk Assessment Report ("HHRA Report"), and "draft environmental documents consistent with the California Environmental Quality Act (CEQA) analyzing the potential environmental impacts associated with remediation alternatives considered in the RAP." (Exh. 5, p. 9.)

4. Shell submits this Petition for Review to request review by the State Water Resources Control Board ("State Board") of certain requirements in the Regional Board's Directive. Shell is diligently working to prepare and finalize the RAP, HHRA Report, and a draft CEQA Initial Study and proposed Notice of Preparation ("NOP"), and intends to submit these documents by March 10, 2014, the date specified in the Directive. However, Shell believes that certain requirements and statements in the Directive lack evidentiary, legal and/or technical support and should be revised as described below. Shell therefore files this protective Petition in order to protect its rights and requests that the Petition be held in abeyance while Shell and the Regional Board discuss these issues. If Shell and the Regional Board are unable to resolve the issues raised herein, Shell will request that the State Board proceed with its review of Shell's Petition and the relevant requirements in the Regional Board's Directive.

5. This Petition for Review is made on the following grounds:

a. *First*, in its Directive, the Regional Board erroneously states that the remedial action objective ("RAO") for methane in the Revised SSCG Report provides that methane will not exceed two percent of the lower explosive limit ("LEL") and "will be removed to less than two percent of the LEL and to the greatest extent technologically and economically feasible." (Exh. 5, pp. 2-3.) This is inaccurate. The actual RAO for methane proposed in the Revised SSCG Report is to "[p]revent fire/explosion risks in indoor air and/or enclosed spaces" due to methane accumulation caused by degradation of petroleum hydrocarbons in the soil, and to "[e]liminate methane in the subsurface to the extent technologically and economically feasible." (Exh. 4, p. 34.) Shell assumes that the language on pages 2 and 3 is a clerical error. However, to avoid any confusion regarding the RAO for methane, the relevant language in the

Directive should be rescinded and revised to reflect the actual RAO for methane contained in the Revised SSCG Report. The Directive also states that "[t]he SSCG for methane should be the more stringent of the lower explosive limit or the level that is technically and economically feasible." (Exh. 5, p. 6.) This statement misapplies State Water Board Resolution No. 92-49 and 23 Code of Regulations § 2550.4, which authorize the establishment of a cleanup goal that is greater than background and that is technologically and economically achievable. Thus, the SSCG for methane should be Shell's stated RAO or the level that is technicologically and economically feasible to achieve, and not whichever is "the more stringent" of the two.

b. *Second*, while the Regional Board has approved the application of depth-based soil cleanup levels, the Regional Board selected intervals of 0-5 feet below ground surface ("bgs") for increased exposures and 5-10 feet bgs for less frequent exposures. (Exh. 5, p. 4.) In selecting these intervals, the Regional Board concluded that "institutional controls are already in place throughout Los Angeles County" because the Los Angeles County Building Code requires that residents obtain an excavation permit before excavating below five feet. (*Id.*) Shell agrees with this principle, but the actual ordinance applicable to the Site, the City of Carson Building Code § 8105, requires that residents obtain a permit for excavations deeper than 3 feet bgs. In addition, guidance from the Environmental Protection Agency ("US EPA") regarding exposure assumptions and soil cleanup depths, and comments by the independent Expert Panel that is advising the Regional Board, all support the use of depth intervals for risk-based soil cleanup goals of 0-2 feet bgs and greater than 2-10 feet bgs. Given this, and in order to align the depth intervals with the applicable ordinance, Shell requests that the risk-based soil cleanup goals in the Directive be revised to incorporate and reflect depth intervals of 0-3 feet bgs and 3-10 feet bgs, which is more conservative than what US EPA guidance and Expert Panel comments support.

c. *Third*, in its Directive, the Regional Board directs Shell to "develop odor-based screening levels for indoor air based on 50 percent odor-recognition thresholds as published in the ATSDR Toxicological Profiles. For soil gas, follow the ESL for odor and other nuisance to calculate a ceiling level for residential land use." (Exh. 5, p. 4, fn. 3.) In fact, Shell

proposed screening values for soil gas in the Revised SSCG Report that followed the ESL, but the Regional Board reduced the TPH nuisance value by half without any explanation. Shell believes the Regional Board's revised screening value is not supported and, in fact, contradicts the Regional Board's express direction in footnote 3 of the Directive to "follow the ESL." Accordingly, Shell requests that the TPH nuisance screening value in the Directive be rescinded and revised to include the value submitted by Shell, which is consistent with the Regional Board's direction in footnote 3 of the Directive.

d. *Fourth,* the Regional Board revised the soil cleanup levels based on leaching to groundwater proposed by Shell in its Revised SSCG Report, but in so doing it relied on improper assumptions and an inapplicable regulation, and its methodology generated erroneous values, especially with respect to the revised value for total petroleum hydrocarbons as motor oil ("TPH motor oil"). In particular, the Regional Board failed to apply a dilution attenuation factor when it derived its soil cleanup levels based on leaching to groundwater. (Exh. 5, p. 5.) Accordingly, Shell requests that the leaching to groundwater soil cleanup levels in the Directive be rescinded and replaced with those proposed in the Revised SSCG Report.

d. *Fifth*, while the Revised SSCG Report proposed an attenuation factor of 0.001 to apply to sub-slab soil vapor concentrations based on analysis of actual Site data, the Regional Board directs Shell to use an attenuation factor of 0.002 to calculate SSCGs for soil vapor that it bases on default numbers it states are recommended in recent agency guidance documents. (Exh. 5, pp. 5-6.) However, these default attenuation factor values are provided to calculate soil vapor cleanup values in the absence of Site data, and in this instance, the Regional Board has correctly described the Site data collected by Shell as "reliable, comprehensive, and high-quality." (Exh. 3, p. 2.) Given the existence of such a robust and comprehensive data set for the Site, the use of default values is not warranted. The requirement in the Directive to use an attenuation factor of 0.002 should therefore be rescinded and revised to approve the attenuation factor proposed by Shell based on Site data, which is 0.001.

e. *Sixth*, while the Regional Board appears to agree that chlorinated hydrocarbons detected at the Site are not related to Shell's historical use of the Site for storage of

crude oil and bunker oil, and therefore most such compounds are not Site-related Chemicals of Concern ("COCs"), the Regional Board states in the Directive that tetrachloroethylene ("PCE") and trichloroethylene ("TCE") in soil and soil vapor cannot be excluded from the list of COCs for the Site. (Exh. 5, p. 7.) In making this determination, the Regional Board concedes the existence of off-Site sources for these compounds, and it does not point to any evidence that Shell in fact used PCE or TCE at the Site (and Shell has been unable to find any such evidence). Instead, the only "evidence" the Regional Board identifies is the inclusion of chlorinated solvents in a description for large industrial processes in the EPA's Toxic Release Inventory for the Petroleum Industry. (*Id.*) Shell does not believe this general agency inventory is a proper or sufficient basis for inclusion of PCE and TCE in the list of COCs for this specific Site, especially in light of the documented off-site sources for these compounds and the absence of evidence that such compounds were used during Shell's ownership of the Site. For these reasons, Shell requests that the inclusion of PCE and TCE as Site-related COCs be rescinded and the Directive be revised to include only petroleum-related hydrocarbons as Site-related COCs. In addition, to the extent that the Directive requires Shell to include other chlorinated compounds, such as trihalomethanes ("THMs"), as Site-related COCs—despite the absence of evidence connecting the presence of these compounds with Shell's historical use of the Site and the fact that such chemicals are recognized to result from the use of municipal water in and around the home—Shell further requests that the State Board confirm that such compounds should not be listed as Site-related COCs.

f. *Seventh*, the Directive includes a requirement that Shell submit by March 10, 2014 "draft environmental documents consistent with the California Environmental Quality Act (CEQA) analyzing the potential environmental impacts associated with remediation alternatives considered in the RAP." (Exh. 5, p. 9.) This requirement is vague and could be construed to require submission of a Draft Environmental Impact Report along with the RAP, which would not comply with the sequencing of environmental review actions required by CEQA and its implementing regulations. Preparation of the Draft Environmental Impact Report by March 10, 2014 would also be infeasible. It also fails to recognize that the Regional Board is

the lead agency for both the RAP and CEQA process, not Shell. Shell is supporting the Regional Board's environmental review process by, *e.g.*, paying for an experienced and qualified contractor to assist the Regional Board in complying with CEQA, and preparing to submit preliminary environmental documents with the RAP and HHRA Report, including a draft Initial Study, a draft Notice of Preparation, and a draft timeline for the environmental review process. Shell will continue to support the Regional Board's environmental review process as the agency and the CEQA consultant move forward. For all of the above reasons, however, the above-quoted requirement in the Directive is erroneous, infeasible and improper and should be clarified or rescinded.

6. This Petition is filed pursuant to Section 13320, which authorizes any aggrieved person to petition the State Board to review any action (or failure to act) by a regional board. *See* Water Code § 13223 (actions of the regional board shall include actions by its executive officer pursuant to powers and duties delegated to him by the regional board). Shell is an aggrieved party in this instance because the requirements and statements in the Directive that are the subject of this Petition are vague and/or lack evidentiary, legal and/or technical support, or are otherwise erroneous, and should be revised as described below.

7. Shell respectfully requests that the State Board grant the relief set forth in the Request for Relief. Shell herewith submits a Request for Stay and asks the State Board to order that the challenged portions of the Directive be stayed pending review of this Petition.

8. Shell requests a hearing regarding this Petition. The arguments that Shell wishes to make at the hearing are summarized in this Petition, as is the testimony and evidence that Shell would introduce at the hearing, which also are contained in the administrative record for this matter. Shell reserves its right to supplement the testimony and evidence both prior to, and at, the hearing on this Petition.

9. Shell's Statement of Points and Authorities in support of the issues raised by this Petition commences below. Shell previously raised the issues discussed herein with the Regional Board. (Weimer Decl., ¶ 26.)

10. Shell reserves the right to modify and supplement this Petition, and also requests an opportunity to present additional evidence, including any evidence that comes to light following the filing of this Petition. *See* 23 Cal. Code Regs. § 2050.6.

11. Copies of this Petition and Shell's Request for Stay are being sent on this day by personal delivery to the Regional Board to the attention of Mr. Samuel Unger, Executive Officer.

STATEMENT OF POINTS AND AUTHORITIES

I. BACKGROUND

Shell's Investigation of the Site

12. The Site is an approximately 44-acre residential housing tract located southeast of Marbella Avenue and E. 244th Street in Carson, California. (Weimer Decl., ¶ 3.) Historical records have established the following background regarding the Site. In 1923, Shell Company of California, a corporation, purchased the Site for use as an oil storage facility at a time when the surrounding area was largely undeveloped. (*Id.*, ¶ 8.) It then constructed three large reservoirs on the property, which were lined with concrete and surrounded by 15-foot high levees. (*Id.*) The reservoirs were covered by frame roofs on wood posts. (*Id.*) The reservoirs were primarily used to store crude oil. (*Id.*)

13. Active use of the reservoirs generally ceased by the early 1960s. (*Id.*, ¶ 9.) In 1965, after removing most of the oil from the concrete reservoirs, Shell Oil Company sold the property to Richard Barclay of Barclay Hollander Curci and Lomita Development Company (the "Developers"). (*Id.*) Shell is informed and believes that Barclay Hollander Curci became Barclay Hollander Corporation, which is now an affiliate of Dole Food Company, Inc. (*Id.*) The Developers bought the property from Shell with knowledge of the property's former use and agreed to perform the site-clearing work, including removal of the remaining liquids, demolition of the reservoirs, and permitting and grading. (*Id.*) The Developers secured a zoning change for the property, decommissioned the reservoirs, graded the property, and constructed and sold the 285 homes which now form the residential tract in Carson, California known as the Carousel neighborhood. (*Id.*) However, to date, the Developers have not participated in the environmental investigation or agreed to participate in any future cleanup. (*Id.*)

14. In 2008, Turco Products, Inc. ("Turco"), which was investigating contamination (primarily chlorinated compound impacts) at its facility adjacent to the northwest portion of the Site, performed step-out sampling which revealed petroleum hydrocarbon contamination at the Site. (*Id.*, ¶ 10.) The Department of Toxic Substances Control ("DTSC") notified the Regional Board regarding the petroleum contamination, which in turn notified Shell. (*Id.*) Based on

review of historical aerial maps of the area, the former oil storage reservoirs were identified as a potential source of contamination at the Site. (*Id.*)

15. Following notification from the Regional Board, Shell began an extensive and thorough investigation of the soil, soil vapor, groundwater, and indoor and outdoor air at and beneath the Site and adjacent areas, including both public and residential areas. (*Id.*, ¶ 11.) The sampling protocol proposed by Shell and approved by the Regional Board for the 285 residences at the Site requires the collection and analysis of the following samples: (1) soil at multiple locations and depths in the front- and backyards at each residence where exposed; (2) sub-slab soil vapor at three locations from beneath the slab of each resident at the Site where feasible; and (3) the indoor and outdoor air at the residence on two occasions at least 90 days apart. (*Id.*) In addition, an indoor air methane screening program is utilized early in the process to assess whether methane is an issue in any of the residences. (*Id.*) The results of the tests are submitted to the Regional Board, posted on the State Board's publicly accessible Geotracker website, and also are forwarded to the Carousel residents or their designated legal representatives. (*Id.*)

16. The testing program is ongoing as access is granted by the residents. (*Id.*, ¶ 12.) As of January 17, 2014, Shell has collected samples at 94% of the homes in the Carousel neighborhood, and has completed all required testing at 78% of the homes. (*Id.*) Shell has been conducting outreach to schedule the remaining houses and complete all residential testing. (*Id.*)

17. Shell has also conducted an extensive testing program in the public rights-of-way (*e.g.*, below the streets and sidewalks) in the Carousel neighborhood and surrounding communities that has included soil, soil vapor and groundwater sampling, and methane monitoring in utility vaults, stormwater drains and the like. (*Id.*, ¶ 13.) Shell continues to regularly conduct groundwater and sub-surface soil vapor sampling, and conduct methane monitoring on an ongoing basis. (*Id.*) All sampling results are submitted to the Regional Board and posted to the Geotracker website. (*Id.*)

18. The Regional Board has described Shell's investigation of the Site as "thorough" and "extensive" and stated that Shell's site investigation has "provided reliable, comprehensive, and high-quality data." (Exh. 3, p. 2.) As of December 31, 2013, Shell had collected 11,031 soil

samples, 2,695 soil vapor samples, and over 2,457 indoor and outdoor air samples, and the testing program is ongoing. (Weimer Decl., ¶ 14.)

The Results of the Sampling at the Site

19. While Shell is continuing to seek access to the remaining residences to complete its investigation of the Site, the investigation is nearly completed. (Weimer Decl., ¶ 15.) Based on the data obtained thus far (all of which has been submitted to the Regional Board and posted on the State Board's Geotracker website), the results can be summarized as follows.

20. *First*, the Regional Board and the Los Angeles County Department of Public Health have concluded that, while environmental impacts exist at the Site related to Shell's former use of the Site and the subsequent development of the Site by the Developers, the environmental conditions at the Site do not pose an imminent threat to the health and safety of the Carousel residents. (*Id.*, ¶ 16.) Shell has performed regular methane monitoring using field instruments at 69 locations in the public rights-of-way such as utility vaults, stormwater drains and similar locations, and methane has never been detected at levels of concern. (*Id.*) The Los Angeles County Fire Department has also performed methane monitoring in the public areas of the Site and has not detected methane at levels of concern. (*Id.*)

21. Methane has not been detected in laboratory analysis of any of the more than 1,400 indoor air samples that have been collected from Carousel residences. (*Id.*, ¶ 17.) The residential methane screening program, which is conducted prior to indoor air sampling, has detected only isolated instances of elevated methane due to natural gas leaks from utility lines or appliances, and in those instances Shell has advised the residents to repair those leaks. (*Id.*) Subsequent testing, when performed, has not revealed any methane hazards. (*Id.*) In the single instance where elevated methane related to petroleum hydrocarbon degradation was detected in the sub-slab soil gas beneath a garage, Shell installed a methane mitigation system according to an engineering design and work plan approved by the Regional Board and Los Angeles County Department of Public Works Environmental Programs Division. (*Id.*) Multiple rounds of follow-up testing have not shown any methane hazard at that home. (*Id.*)

22. While elevated levels of methane presumably related to anaerobic biodegradation of petroleum hydrocarbons have been detected at depth, the lack of oxygen and any significant vapor pressure at depth mitigates any risk related to explosion or fire. (*Id.*, ¶ 18.) Site data indicate that methane generated by degradation of petroleum hydrocarbons at depth under anaerobic conditions is naturally controlled through biodegradation as it migrates through aerobic surface soil. (*Id.*)

23. *Second*, analysis of the indoor air, outdoor air and sub-slab soil vapor samples collected from the residences at the Site generally have shown indoor air concentrations to be consistent with background values and to be correlated with garage and outdoor air. (*Id.*, ¶ 19.) As the Regional Board has recognized, this data does not indicate that vapor intrusion is an issue at the Site. (*Id.*)

24. *Third*, there are widespread but uneven soil impacts at the Site that appear to be related to the grading of the Site. (*Id.*, ¶ 20.) The spatial distribution of the soil impacts is somewhat stochastic and does not appear as a plume. (*Id.*)

25. *Fourth*, the groundwater beneath the Site is impacted by a plume that is stable with downgradient concentrations quickly dropping to levels below analytical reporting limits. (*Id.*, ¶ 21.) There exist multiple documented upgradient impacts that likely contribute to the groundwater conditions beneath the Site. (*Id.*) Petroleum hydrocarbons in the form of light non-aqueous phase liquid ("LNAPL") have been detected in two monitoring wells located in the western portion of the Site, and LNAPL removal from these wells is performed on a regular basis. (*Id.*) The groundwater at the Site is not used for municipal supply. (*Id.*) Carousel residents obtain their drinking water from municipal supply provided by California Water Service Company, which has confirmed that the Site's water supply meets quality standards for drinking water. (*Id.*)

Shell's Actions in Response to the CAO

26. On March 11, 2011, the Regional Board issued the CAO for the Site. (Exh. 1.) The CAO directed Shell to (1) complete delineation of on- and off-Site impacts in soil, soil vapor and groundwater related to Shell's historical use of the Site; (2) continue groundwater monitoring

and reporting; (3) develop and conduct a pilot testing work plan to evaluate remedial options for the Site; and (4) conduct an assessment of any potential environmental impacts of residual concrete slabs that were left at the Site by the developers, and evaluate whether removal of the concrete is necessary and feasible. (Exh. 1, pp. 9-11.) Shell has completed (or, in the case of the residential sampling, nearly completed) the above actions and has submitted reports to the Regional Board that include analysis of the data. (Weimer Decl., ¶ 22.) The pilot test work conducted by Shell included pilot testing of different excavation methods, soil vapor extraction, bioventing, and chemical oxidation technologies. (*Id.*) Shell continues to perform quarterly groundwater monitoring. (*Id.*)

27. Per the Directive, the RAP required by the CAO and the HHRA Report are due on March 10, 2014. (Exh. 1, pp. 11-12; Exh. 5, p. 9.)

The Regional Board's Directive

28. The CAO also required Shell to prepare and "submit site-specific cleanup goals for residential (i.e., unrestricted) land use" that "shall include detailed technical rationale and assumptions underlying each goal." (Exh. 1, p. 13.) On February 22, 2013, Shell timely submitted its Initial SSCG Report. (Exh. 2.) On August 21, 2013, the Regional Board issued a response to the Initial SSCG Report and directed Shell to revise the SSCGs for the Site in accordance with certain comments and directives. (Exh. 3.) On October 21, 2013, Shell timely submitted a Revised SSCG Report that addressed and incorporated the Regional Board's comments and directives. (Exh. 4.)

29. On January 23, 2014, the Regional Board issued its Directive, which is the subject of this Petition. (Exh. 5.) In the Directive, the Regional Board approved the SSCGs proposed in the Revised SSCG Report with certain modifications, and required Shell to submit the RAP, HHRA Report, and "draft environmental documents consistent with the California Environmental Quality Act (CEQA) analyzing the potential environmental impacts associated with remediation alternatives considered in the RAP." (Exh. 5, p. 9.)

30. Shell is in the process of preparing the RAP, HHRA Report and certain draft environmental documents. Notwithstanding the issues raised in this Petition, Shell intends to

submit the RAP and the HHRA Report, along with drafts of preliminary environmental documents, to the Regional Board by the March 10, 2014 deadline specified in the Directive. (Weimer Decl., ¶ 25.)

31. However, the Directive contains certain requirements and statements that are vague and/or lack evidentiary, legal and/or technical support or are otherwise erroneous, and should be revised as described below. To protect its rights in this regard, Shell files this protective Petition and seeks State Board review of these specific requirements and statements in the event it is not able to resolve these issues with the Regional Board.

II. THE CHALLENGED SECTIONS OF THE DIRECTIVE SHOULD BE RESCINDED AND REVISED

A. The Statement in the Directive Regarding the RAO for Methane Is Inaccurate

32. In the Directive, the Regional Board acknowledges that Shell's "Revised Report addressed many of the comments in the Regional Board August 21, 2013 letter." (Exh. 5, p. 2.) However, the Regional Board then erroneously states that the Revised SSCG Report "revised the proposed remedial action objective (RAO) for methane such that methane will not exceed two percent of the lower explosive limit and will be removed to less than two percent of the lower explosive limit and to the greatest extent technologically and economically feasible." (*Id.*, pp. 2-3.) This is not an accurate statement. The actual RAO proposed for methane states as follows:

> Prevent fire/explosion risks in indoor air and/or enclosed spaces (e.g., utility vaults) due to the accumulation of methane generated from the anaerobic biodegradation of petroleum hydrocarbons in soils. Eliminate methane in the subsurface to the extent technologically and economically feasible.

(Exh. 4, p. 34.)

33. Thus, the proposed RAO does not require the removal of methane to less than two percent of the LEL, but instead prioritizes the prevention of fire and explosion risks in homes and enclosed spaces, and also proposes to eliminate subsurface methane to the extent technologically and economically feasible. Elsewhere in the Directive, the Regional Board characterizes the

RAO for methane proposed in the Revised SSCG Report differently. (*See* Exh. 5, p. 6 ("In the Revised Report, the revised RAOs proposes prevention of fire/explosion risks in indoor air and/or enclosed spaces due to generation of methane by eliminating methane to the extent technologically and economically feasible.").)[4] Thus, it appears that the statement regarding the RAO for methane on page 2 of the Directive is a clerical error. However, to avoid any confusion, Shell requests that this language be rescinded and revised to properly reflect the RAO proposed in the Revised SSCG Report and quoted above.

34. The Directive also states that "[t]he SSCG for methane should be the more stringent of the lower explosive limit or the level that is technically and economically feasible." (Exh. 5, p. 6.) This statement misapplies State Water Board Resolution No. 92-49 and 23 Code of Regulations § 2550.4, which authorize the establishment of a cleanup goal that is greater than background and that is technologically and economically achievable. Thus, the SSCG for methane should be Shell's stated RAO or the level that is technicologically and economically feasible to achieve, and not whichever is "the more stringent" of the two.

B. The Risk Exposure Assumptions in the Directive Rely on an Inapplicable Municipal Code and Disregard Applicable US EPA Guidance

35. The Revised SSCG Report proposed risk-based soil cleanup levels for 0-2 feet bgs based on more frequent typical residential exposures, and a second set of values for 2-10 feet bgs based on the very low likelihood of residents contacting soils at such depths. (Exh. 4, pp. 42, 44.) In its Directive, the Regional Board approved the application of depth-based exposure scenarios in setting risk-based soil cleanup levels, but it selected depths of 0-5 feet bgs and 5-10

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[4] Notably, the SSCGs for methane in the Revised SSCG Report propose certain responses based on the detection of specified methane levels (which are the same responses that the Regional Board approved in the Data Evaluation and Decision Matrix for the Site for deciding when interim measures are necessary). (Exh. 4, p. 58.) These SSCGs provide that when methane is detected between two and ten percent of the LEL and soil vapor pressure is above 2.8 in water, the response is to perform follow-up sampling and evaluate engineering controls. (*Id.*) Thus, the proposed SSCGs, which are consistent with DTSC's guidance for addressing methane at school sites, do not require the removal of methane to less than two percent of the LEL. The Directive states that the Regional Board will review the response actions contained in the RAP. (Exh. 5, p. 6.)

feet bgs. (Exh. 5, p. 4.) The Regional Board based these intervals on its conclusion that "institutional controls are already in place throughout Los Angeles County" because the Los Angeles County Building Code requires that residents obtain an excavation permit before excavating below five feet. (*Id.*)

36. Shell agrees that local permitting ordinances serve as an institutional control that help minimize residential contact with soils at depths where excavation to such depths trigger the need for obtaining an excavation and/or grading permits. However, the specific ordinance applicable to the Site requires that any excavation at the Site may only be conducted after obtaining a grading permit unless the excavation "(a) is less than three (3) feet in depth below natural grade, or (b) does not create a cut slope greater than three (3) feet in height and steeper than one and one-half (1-1/2) horizontal to one (1) vertical." City of Carson Building Code § 8105 (amending Los Angeles Cty. Building Code § 7003.1). Thus, application of the approach used in the Directive and the specific permitting ordinance applicable to the Site results in depth intervals for risk-based soil cleanup levels of 0-3 feet bgs and 3-10 bgs. Shell requests that this portion of the Directive be rescinded and revised to reflect these depth intervals.

37. The use of these risk-based soil depth intervals is consistent with comments from the independent advisory Expert Panel, which stated in a memorandum dated January 14, 2014 that "[w]e agree that the 0-2 feet interval is appropriate for the typical residential exposure and expect, given the established nature of the neighborhood, the assumption that the resident is exposed 4 times per year to soils at depths greater than 2 feet *to be highly conservative*." (Exh. 5, Memo. from UCLA Expert Panel, Gary Krieger, to Los Angeles Regional Water Quality Control Board, dated January 14, 2014, p. 2 (emphasis added).)

38. In reaching this conclusion, the Expert Panel cited US EPA guidance including *Soil Screening Guidance: User's Guide*, Second Edition, Office of Solid Waste and Emergency Response (July 1996), and *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, Office of Solid Waste and Emergency Response (December 2002). The 1996 US EPA guidance states that "the decision to sample soils below 2 centimeters depends on the likelihood of deeper soils being disturbed and brought to the surface (e.g., from gardening,

landscaping or construction activities." (USEPA, 1996, p. 12.) In the 2002 supplemental guidance, the US EPA states that "residential activities (e.g., gardening) or commercial/industrial (e.g., outdoor maintenance or landscaping) or construction activities that may disturb soils to a depth of up to two feet, potentially exposing receptors to contaminants in a subsurface soil via direct contact pathways such as ingestion and dermal absorption." (USEPA, 2002, pp. 2-8.) The Expert Panel also cited *Superfund Lead-Contaminated Residential Sites Handbook*, Office of Emergency and Remedial Response (August 2003), which recommends for remediation that "it is strongly recommended that a minimum of twelve (12) inches of clean soil be used to establish an adequate barrier from contaminated soil in a residential yard for the protection of human health. ... With the exception of gardening the typical activities of children and adults in residential properties do not extend below a 12-inch depth." (USEPA, 2003, p. 37.) Moreover, "[t]wenty-four (24) inches of clean soil cover is generally considered to be adequate for gardening areas . . . ." (*Id.*)

39. Given the depths set forth in these guidance documents, and the Expert Panel memorandum supporting the proposal in the Directive to use risk-based soil depth intervals of 0-2 feet bgs and 2-10 feet bgs, the Regional Board's reference to the precautionary principle to support the depth intervals included in the Directive is inapposite here. The precautionary principle provides that in the face of uncertainty or a lack of scientific consensus, regulatory controls should incorporate a margin of safety. (Stewart, R.B., "Environmental Regulatory Decision Making Under Uncertainty," *Research in Law and Economics*, 20: 76 (2002).) Here, the US EPA guidance documents state that 1 foot of clean soil provides "an adequate barrier" for adults and children, and, in areas where gardening may take place, 2 feet of cover is adequate. Moreover, these guidance documents and the SSCGs for the site are conservative and already build in a margin of safety. The Regional Board has not provided any basis or evidence to support a conclusion that there is a lack of scientific consensus regarding the US EPA's guidelines. Absent such uncertainty or scientific consensus, the precautionary principle does not operate, and there should not be a requirement to apply more stringent cleanup levels to soil depths (such as 4 and 5 feet), with which residents are highly unlikely to ever come into contact,

according to agency guidance. This conclusion is further bolstered by consideration of the permitting rules in the City of Carson Building Code, which, applying the Regional Board's principle, act as an institutional control for excavations greater than 3 feet bgs.

40. Thus, while Shell continues to believe that depth intervals of 0-2 feet bgs and greater than 2-10 feet bgs as proposed in the Revised SSCG Report are sufficient to protect residents against any potential risks from long term exposure to soil, Shell requests that the relevant portion of the Directive be rescinded and revised to require depth intervals for risk-based soil cleanup goals of 0-3 feet bgs and greater than 3-10 feet bgs to align with the applicable permitting ordinance.

C. The Regional Board's Reduction of the TPH Nuisance Value for Soil Vapor Is Arbitrary and Contradicts Its Own Direction

41. In the Revised SSCG Report, Shell developed screening levels for soil vapor based on the ESL to address potential odor and other nuisance concerns. (*See* San Francisco Bay Regional Water Quality Control Board (SFRWQCB), May 2013 ("SFRWQCB, 2013").) In its Directive, the Regional Board cut the TPH nuisance value by 50% without explanation or justification. (Exh. 5, Table 2 (listing TPH nuisance value of 50 ug/m3 instead of the SFRWQCB ESL value for nuisance of 100 ug/m3).) The Regional Board's revision of this value is not supported by reference to guidance and, in fact, its revision contradicts its own direction to Shell elsewhere in the Directive to "follow the ESL for odor and other nuisance to calculate a ceiling for residential land use" when calculating screening levels for soil gas. (Exh. 5, p. 4, fn. 3.) Shell believes the Regional Board's TPH nuisance value in Table 2 of the Directive is not supported. Accordingly, Shell requests that the odor-based screening values in the Directive be rescinded and revised to include the values included in the Revised SSCG Report, which are consistent with the Regional Board's direction in footnote 3.

D. *The Soil Cleanup Levels Based on Leaching to Groundwater in the Directive Are Erroneous and Should Be Revised to Incorporate Use of an Attenuation Factor*

42. In its Revised SSCG Report, Shell calculated a second set of soil cleanup goals for the top 10 feet of soil based on the potential for Site-related COCs to leach to groundwater as a result of infiltration of rainwater in exposed areas of the Site. (Exh. 4, pp. 46-49, Table 6-2.) The methodology used in the Revised SSCG Report accounted for three transport components: (1) leaching between soil and soil moisture, (2) attenuation due to distance above the groundwater, and (3) a dilution-attenuation factor ("DAF") that accounts for the infiltration rate of leachate through Site soils and mixing with groundwater flow. Consideration of the leaching and DAF in the calculation of soil cleanup goals is consistent with guidance documents that Shell was directed to apply in the development of Site cleanup goals. (Exh. 1, pp. 11-12; *see also* USEPA Regional Screening Levels Users Guide, November 2013 ("USEPA, 2013"); USEPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December 2002 ("USEPA, 2002"); SFRWQCB, 2013; and Commonwealth of Massachusetts Department of Environmental Protection, Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of the MADEP VPH/EPH Approach, Policy #WSC-02-411 Background/Support Documentation for the Development of Publication Guidelines & Rule of Thumb, October 2002 ("Commonwealth of Massachussetts DEP, 2002").) Additionally, the 1996 California Regional Water Quality Control Board's *Interim Site Assessment & Cleanup Guidebook* (LARWQCB, 1996) ("LARWQCB Guidebook") includes the following three transport components for the calculation of soil screening levels: (1) leaching between soil and soil moisture, (2) attenuation due to distance above the groundwater, and (3) attenuation due to soil type. The attenuation factors for soil types in the LARWQCB Guidebook account for varying infiltration rates of leachate for different soil types.

43. In the Revised SSCG Report, the leaching step was modeled using the LARWQCB Guidebook for organic chemicals and the US EPA Regional Screening Methodology for metals. (Exh. 4, p. 47.) The leachate-groundwater mixing step was modeled

using the Soil Attenuation Model developed by J. A. Connor, et al. (*Id.*, pp. 47-48.) The cleanup values were then calculated using regulatory groundwater quality standards and the application of a DAF, as recommended in the Soil Attenuation Model. (*Id.*, p. 48.)

44. In its Directive, the Regional Board rejected the application of a DAF based on the fact that groundwater beneath the Site is already impacted. (Exh. 5, p. 5 and Memo. from Yue Rong, Ph.D., and Weixong Tong, Ph.D., PG, CHG to Samuel Unger, P.E., Executive Officer, dated December 10, 2013 ("Staff Memo").) Instead, the Regional Board proposed soil SSCGs for the leaching pathway that neglect to apply the DAF, and then divided the values presented in the Revised SSCG Report by a factor of 6.24. (Exh. 5, Table 1.) By incorporating this modification, the Regional Board has neglected to account for the effect of infiltration rate on the calculations. It is inappropriate to neglect this component of the conceptual model in calculating soil cleanup goals. To the contrary, the infiltration rate is included in the LARWQCB Guidebook as well as other guidance documents that describe methodologies to calculate soil cleanup goals for the leaching pathway and that the Regional Board has directed Shell to consider in the development of cleanup goals, such as USEPA, 2013; USEPA, 2002; SFRWQCB, 2013; and Commonwealth of Massachusetts DEP, 2002. (*See* Exh. 1, pp. 11-12).

45. Additionally, the Regional Board erroneously applied a modification factor of 6.24 for the soil SSCG for TPH motor oil. (Exh. 5, Table 1.) The SSCG for TPH motor oil in the Revised SSCG Report was based on the residual saturation concentration. (*See* Exh. 4, Table 9.2.) The DAF was not used in the calculation of this cleanup goal and consequently it is inappropriate to include the modification proposed by the Regional Board.

46. Further, the statement by Regional Board staff that the use of a DAF "is against the State Anti-degradation Policy" is mistaken. (Exh. 5, Staff Memo, p. 2.) This policy, which is documented in State Water Board Resolution No. 68-16, was passed to regulate "the granting of permits and licenses for unappropriated waters and the disposal of wastes into the waters of the State." Section 1 of Resolution 68-16 states:

> Whenever the existing quality of water *is better than* the quality established in policies as of the date on which such policies

> become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.

(Emphasis added.) Section 2 of Resolution No. 68-16 states:

> Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge *to existing high quality waters* will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

(Emphasis added.)

47. Resolution No. 68-16 does not apply in this case for two reasons. *First*, nothing in the Revised SSCG Report proposes a *new* activity that would result in discharges to existing high quality waters, or requests the issuance of waste discharge permits. Instead, the Revised SSCG Report proposes cleanup levels for *existing* historical impacts.

48. *Second*, it is highly unlikely that the water quality levels for the relevant constituents beneath the Site were *better* than the water quality levels set in the Basin Plan at the time the Basin Plan was adopted in 1994. By 1994, the environmental conditions at the Site had existed for at least twenty-five years and included impacts from upgradient sources including the Turco facility and the former Fletcher Oil Refinery. Thus, it is highly likely that the groundwater was already impacted in 1994. Indeed, groundwater sampling data indicates that the groundwater plume is stable or decreasing, which suggests that impacts have been present in the groundwater for a substantial period of time. Given this, Resolution No. 68-16—which, again, is aimed at

preserving better-than-established water quality levels—is inapplicable here. As one court explained:

> When undertaking an antidegradation analysis, the Regional Board must compare the baseline water quality . . . to the water quality objectives. If the baseline water quality is equal to or less than the objectives, the objectives set forth the water quality that must be maintained or achieved. *In that case the antidegradation policy is not triggered.* However, if the baseline water quality is better than the water quality objectives, the baseline water quality must be maintained in the absence of findings required by the antidegradation policy.

Asociacion de Gente Unida por el Agua v. Cent. Valley Reg'l Water Quality Control Bd., 210 Cal.App.4th 1255, 1270 (2012) (emphasis added).

49. For the reasons stated above, Shell requests that the soil cleanup levels in the Directive based on leaching to groundwater be rescinded and revised to conform with the values proposed in the Revised SSCG Report.

E. The Regional Board's Doubling of the Soil Vapor Attenuation Factor Proposed in the Revised SSCG Report Is Erroneous and Unsupported

50. In the Revised SSCG Report, Shell analyzed soil vapor and indoor air data for the Site and calculated an attenuation factor for soil vapor of 0.001. (Exh. 4, App. B, pp. B-17 and B-18.) In its Directive, the Regional Board does not criticize Shell's analysis or methodology, but nevertheless directs Shell to use an attenuation factor of 0.002 to calculate SSCGs for soil vapor that the Regional Board based on default numbers it states are recommended in DTSC and US EPA agency guidance documents. (Exh. 5, pp. 5-6.) However, the *default* attenuation factor values in these guidance documents are intended to be used for preliminary screening evaluations. (DTSC Vapor Intrusion Guidance Document, October 2011, p. 16.) Here, extensive Site data have already been collected and analyzed, and the Regional Board has described this data set as "reliable, comprehensive, and high-quality." (Exh. 3, p. 2.) Given this, the Regional

Board's reliance on, and use of, default values is unnecessary and misplaced, and the requirement in the Directive to use an attenuation factor of 0.002 should be rescinded and revised to incorporate the attenuation factor of 0.001 presented in the Revised SSCG Report.

F. The Directive's Inclusion of PCE and TCE as Site-Related COCs Lacks Evidentiary Support and Should Be Rescinded

51. In the Revised SSCG Report, Shell explained that although chlorinated compounds have been detected at the Site, they are not considered Site-related COCs because no historical evidence exists that chlorinated solvents were used at the Site, and because off-Site sources for these compounds exist. (Exh. 4, pp. 10-13.) This includes PCE and TCE, as well as THMs such as bromomethane, chloroform and others.[5]

52. While the Regional Board has previously stated that Shell is not responsible for addressing compounds that are not associated with its historical use of the Site, the Regional Board states in the Directive that PCE and TCE in soil and soil vapor cannot be excluded from the list of COCs for the Site. (Exh. 5, p. 7.) In making this determination, the Regional Board concedes the existence of off-site sources for these compounds (which are well documented and described in detail in the Revised SSCG Report, *see* Exh. 4, pp. 11-12), and it does not point to any evidence that Shell in fact used PCE or TCE at the Site (and Shell has been unable to find any such evidence). Instead, the only "evidence" the Regional Board identifies is the inclusion of chlorinated solvents in a description for large industrial processes in the EPA's Toxic Release Inventory for the Petroleum Industry. Such a generalized industry "inventory" is not a proper or sufficient basis for inclusion of PCE and TCE in the list of COCs for this specific Site, especially in light of the absence of evidence that such compounds were used during Shell's ownership of the Site and the presence of documented off-Site sources for these compounds. It is well-

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[5] The presence of THMs at the Site are most likely connected to the use of municipal water supply to irrigate yards and landscaping or leaking water lines and other household water use. (Exh. 4, p. 13.) THMs are byproducts of water treatment by chlorine or chloramines and have been found in the domestic water supplied to the Carousel by California Water Service Company. (*Id.*) Other chlorinated compounds detected at the Site are associated with common household products. (*Id.*, p. 14.)

established that a party can only be required to address the effects of the discharge it caused. *In re HR Texton, Inc.*, WQ 94-2, 1994 WL 86342, at *3-4 (Cal.St.Wat.Res.Bd.) (substantial evidence must show both that the named party caused or permitted the discharge in question *and* that the discharge caused the contamination that is the subject of the order). Accordingly, Shell requests that the inclusion of PCE and TCE as Site-related COCs be rescinded and the Directive be revised to include only petroleum-related hydrocarbons as Site-related COCs.

53. Shell has previously explained why other chlorinated compounds, such as THMs, should not be included as Site-related COCs. To the extent that the Directive requires Shell to include other chlorinated compounds, including trihalomethanes THMs, as Site-related COCs despite the absence of evidence connecting the presence of these compounds with Shell's historical use of the Site, Shell further requests that the State Board confirm that such compounds should not be listed as Site-related COCs.

G. The Directive's Requirement that Shell Submit Draft Environmental Documents Consistent with CEQA Is Vague, Unrealistic and Inconsistent with the Mandated Order of Actions Under CEQA and Its Regulations

54. In the Directive, the Regional Board directs Shell to submit, with the RAP and the HHRA Report, "draft environmental documents consistent with the California Environmental Quality Act (CEQA) analyzing the potential environmental impacts associated with remediation alternatives considered in the RAP." (Exh. 5, p. 9.) For numerous reasons, Shell believes this requirement should be rescinded.

55. *First*, the requirement is vague in that it does not specify *which* "draft environmental documents" are required to be submitted on March 10, 2014 with the RAP and the HHRA Report. For this reason, Shell cannot know what specifically is required of it and what it must do to comply.

56. *Second*, to the extent this is meant to require the submission of the Draft Environmental Impact Report ("EIR") or a similar document, such a requirement would not comply with CEQA. A Draft EIR cannot be prepared until after the project has been defined and the lead agency has sent a Notice of Preparation to the State clearinghouse and each responsible

agency. 14 Cal. Code Regs. § 15082(a). The Notice of Preparation must include "sufficient information describing the project and the potential environmental effects to enable the responsible agencies to make a meaningful response." 14 Cal. Code Regs. § 15082(a)(1). While work on the draft EIR may begin immediately after the submission of the Notice of Preparation, the "lead agency shall not circulate a draft EIR for public review before the time period for responses to the notice of preparation has expired." 14 Cal.Code Regs. § 15082(a)(4). Here, the Notice of Preparation had to await the Board's approval of the SSCGs for the Site, which only occurred on January 23, 2014, as well as the development of the RAP, which is currently under way. Thus, the only "draft environmental documents" that could be submitted with the RAP and the HHRA Report on March 10, 2014 in compliance with CEQA would be a draft Initial Study and a draft Notice of Preparation. Anything further would not comply with CEQA's implementing regulations.

57. *Third*, in addition to being premature, any requirement to submit a Draft EIR by March 10, 2014 would also be infeasible. For a project of this complexity, the preparation of a Draft EIR, including the identification of a range or reasonable alternatives to the project which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project (*see* 14 Cal. Code Reg. § 15126.6), typically requires at least 12 weeks *after* the project has been defined. (Declaration of David Marx, ¶ 3.) Prior to the Regional Board's approval of the SSCGs for the Site on January 23, 2014, Shell lacked critical information that is directly relevant to the potential remedy for the Site. It is important to note here that the Regional Board did not approve the Initial SSCG Report and instead directed Shell to revise the SSCGs, and when the Regional Board ultimately approved SSCGs it directed Shell to include alternatives that had previously been screened out as part of the preliminary feasibility analysis that was included in the Revised SSCG Report. Thus, preparation of a Draft EIR was unquestionably premature prior to the approval of the SSCGs. Even assuming that the preparation of the Draft EIR could have commenced on the date the Regional Board approved the SSCGs, it would have been logistically infeasible to complete the preparation of the Draft EIR in six weeks. (*Id.*) Moreover, given that the RAP is currently being

prepared, Shell does not believe that it is feasible or legally permissible to begin to prepare the Draft EIR until the remedy has been proposed in the RAP; accordingly, it is even more infeasible that a Draft EIR could be submitted at the same time that the RAP is due.

58. *Fourth*, the requirement in the Directive for Shell to submit "draft environmental documents" is misplaced. Under CEQA, it is the Regional Board, as the lead agency, that is required to perform the environmental review, not Shell. *See* Public Res. Code § 21080.1 ("[t]he lead agency shall be responsible for determining whether an environmental impact report, a negative declaration, or a mitigated negative declaration shall be required for any project"); Public Res. Code § 21080.4 ("[i]f a lead agency determines that an environmental impact report is required for a project, the lead agency shall immediately send notice of that determination by certified mail or an equivalent procedure to each responsible agency, the Office of Planning and Research, and those public agencies having jurisdiction by law over natural resources affected by the project . . ."); 14 Cal. Code Regs. § 15082(a) ("the lead agency shall send . . . a notice of preparation"); 14 Cal. Code Regs. § 15082(a)(4) ("[t]he lead agency may begin work on the draft EIR"); *Planning and Conservation League v. Department of Water Resources*, 83 Cal.App.4th 892, 903 (2000) (under CEQA lead agency is responsible "for preparing the EIR and including it in any report of the project"). Nothing in the Water Code authorizes the Regional Board to shift the CEQA requirements onto Shell, and indeed such a delegation is proscribed. *Planning and Conservation League*, 83 Cal.App.4th at 907 ("So significant is the role of the lead agency that CEQA proscribes delegation"). Nevertheless, it is not unusual for a responsible party to support the agency's environmental review process, and Shell is doing this by, *e.g.*, paying for an experienced and qualified contractor to assist the Regional Board in complying with CEQA, and preparing to submit preliminary environmental documents with the RAP and HHRA Report, including a draft Initial Study, and a draft Notice of Preparation. Shell will continue to support the Regional Board's environmental review process as the agency and the CEQA consultant move forward.

REQUEST FOR RELIEF

For the reasons set forth above, Shell respectfully requests that the State Board grant Shell the following relief:

1. That the State Board grant Equilon's Request for Stay, filed concurrently herewith, and stay those requirements in the Regional Board's Directive that are the subject of this Petition pending the State Board's decision.

2. That the State Board hold a hearing on the CAO, and Shell be permitted to present evidence and testimony supporting the arguments contained herein.

3. That the challenged portions of the Directive be rescinded by the State Board and that the State Board direct the Regional Board to revise those portions as described above.

4. In the alternative, that the State Board grant Shell's Request for Stay and hold this Petition in abeyance pursuant to California Code of Regulations, Title 23 § 2020.5(d) to permit the Regional Board and Shell to engage in discussions in an attempt to informally resolve this matter.

5. Such other relief as the State Board may deem just and proper.

DATED: February 24, 2014

CALDWELL LESLIE & PROCTOR, PC
MICHAEL R. LESLIE
DAVID ZAFT

By _____
DAVID ZAFT
Attorneys for Petitioners EQUILON ENTERPRISES LLC dba SHELL OIL PRODUCTS US and SHELL OIL COMPANY

DECLARATION OF DOUGLAS J. WEIMER

I, Douglas J. Weimer, declare and state:

1. I am a Senior Principal Program Manager employed by Equilon Enterprises LLC dba Shell Oil Products US ("Equilon"). My duties include directing and managing environmental investigations and remediation projects. Based on my involvement in Equilon's activities relating to the former Kast Property, I have personal knowledge of the facts stated herein, or I have been informed of and believe such facts, and could and would testify competently thereto if called as a witness in this matter.

2. Equilon's mailing address is 20945 South Wilmington Avenue, Carson, California 90810.

3. Since 2008, Equilon, on behalf of Shell Oil Company, has been conducting an environmental investigation of the former Kast Property, which is approximately 44 acres in size and is located southeast of the intersection of Marbella Avenue and E. 244th Street in Carson, California ("Site"). (Equilon and Shell Oil Company are referred to collectively as "Shell.") On March 11, 2011, the California Regional Water Quality Control Board, Los Angeles Region (the "Regional Board") issued Cleanup and Abatement Order No. R4-2011-0046 (the "CAO"). A true and correct copy of the CAO is attached hereto as Exhibit 1. The CAO directed Shell to, *inter alia*, "submit site-specific cleanup goals for residential (i.e., unrestricted) land use" that "shall include detailed technical rationale and assumptions underlying each goal." (Exh. 1 (CAO), p. 13.)

4. On February 22, 2013, Shell timely submitted its initial Site-Specific Cleanup Goal Report ("Initial SSCG Report"). A true and correct copy of the Initial SSCG Report is submitted herewith as Exhibit 2.

5. On August 21, 2013, the Regional Board issued a response to the Initial SSCG Report and directed Shell to revise the Site-Specific Cleanup Goals ("SSCGs") for the Site in accordance with certain comments and directives. A true and correct copy of the Regional Board's August 21, 2013 response letter is attached hereot as Exhibit 3.

6. On October 21, 2013, Shell timely submitted a Revised Site-Specific Cleanup Goal Report ("Revised SSCG Report") that addressed and incorporated the Regional Board's comments and directives. A true and correct copy of the Revised SSCG Report is submitted herewith as Exhibit 4.

7. On January 23, 2014, the Regional Board issued its Review of Revised Site-Specific Cleanup Goal Report and Directive to Submit the Remedial Action Plan, Human Health Risk Analysis, and Environmental Analysis for Cleanup of the Carousel Tract Pursuant to California Water Code Section 13304 (the "Directive"), which is the subject of this Petition. A true and correct copy of the Directive is attached hereto as Exhibit 5.

Shell's Investigation of the Site

8. Historical records have established the following background regarding the Site. In 1923, Shell Company of California, a corporation, purchased the Site for use as an oil storage facility at a time when the surrounding area was largely undeveloped. It then constructed three large reservoirs on the property, which were lined with concrete and surrounded by 15-foot high levees. The reservoirs were covered by frame roofs on wood posts. The reservoirs were primarily used to store crude oil.

9. Active use of the reservoirs generally ceased by the early 1960s. In 1965, after removing most of the oil from the concrete reservoirs, Shell Oil Company sold the property to Richard Barclay of Barclay Hollander Curci and Lomita Development Company (the "Developers"). Shell is informed and believes that Barclay Hollander Curci became Barclay Hollander Corporation, which is now an affiliate of Dole Food Company, Inc. The Developers bought the property from Shell with knowledge of the property's former use and agreed to perform the site-clearing work, including removal of the remaining liquids, demolition of the reservoirs, and permitting and grading. The Developers secured a zoning change for the property, decommissioned the reservoirs, graded the property, and constructed and sold the 285 homes which now form a residential tract in Carson, California known as the Carousel neighborhood. However, to date, the Developers have not participated in the environmental investigation or agreed to participate in any future cleanup.

10. In 2008, Turco Products, Inc. ("Turco"), which was investigating contamination (primarily chlorinated compound impacts) at its facility adjacent to the northwest portion of the Site, performed step-out sampling which revealed petroleum hydrocarbon contamination at the Site. The Department of Toxic Substances Control ("DTSC") notified the Regional Board regarding the petroleum contamination, which in turn notified Shell. Based on review of historical aerial maps of the area, the former oil storage reservoirs were identified as a potential source of contamination at the Site.

11. Following notification from the Regional Board, Shell began an extensive and thorough investigation of the soil, soil vapor, groundwater, and indoor and outdoor air at and beneath the Site and adjacent areas, including both public and residential areas. The sampling protocol proposed by Shell and approved by the Regional Board for the 285 residences at the Site requires the collection and analysis of the following samples: (1) soil at multiple locations and depths in the front- and backyards at each residence where exposed; (2) sub-slab soil vapor at three locations from beneath the slabs of each residence at the Site where feasible; and (3) the indoor and outdoor air at the residence on two occasions at least 90 days apart. In addition, an indoor air methane screening program is utilized early in the process to assess whether methane is an issue in any of the residences. The results of the tests are submitted to the Regional Board, posted on the State Board's publicly accessible Geotracker website, and also are forwarded to the Carousel residents or their designated legal representatives.

12. The testing program is ongoing as access is granted by the residents. As of January 17, 2014, Shell has collected samples at 94% of the homes in the Carousel neighborhood, and has completed all required testing at 78% of the homes. Shell has been conducting outreach to schedule the remaining houses and complete all residential testing.

13. Shell has also conducted an extensive testing program in the public rights-of-way (*e.g.*, below the streets and sidewalks) in the Carousel neighborhood and surrounding communities that has included soil, soil vapor and groundwater sampling, and methane monitoring in utility vaults, stormwater drains and the like. Shell continues to regularly conduct groundwater and sub-surface soil vapor sampling, and conduct methane monitoring on an

ongoing basis. All sampling results are submitted to the Regional Board and posted to the Geotracker website.

14. The Regional Board has described Shell's investigation of the Site as "thorough" and "extensive" and stated that Shell's site investigation has "provided reliable, comprehensive, and high-quality data." (Exh. 3, p. 2.) As of December 31, 2013, Shell had collected 11,031 soil samples, 2,695 soil vapor samples, and over 2,457 indoor and outdoor air samples. The testing program is ongoing.

The Results of the Sampling at the Site

15. While Shell is continuing to seek access to the remaining residences to complete its investigation of the Site, the investigation is nearly completed. Based on the data obtained thus far (all of which has been submitted to the Regional Board and posted on the State Board's Geotracker website), the results can be summarized as follows.

16. *First*, the Regional Board and the Los Angeles County Department of Public Health have concluded that, while environmental impacts exist at the Site related to Shell's former use of the Site and the subsequent development of the Site by the Developers, the environmental conditions at the Site do not pose an imminent threat to the health and safety of the Carousel residents. Shell has performed regular methane monitoring using field instruments at 69 locations in the public rights-of-way such as utility vaults, stormwater drains and similar locations, and methane has never been detected at levels of concern. The Los Angeles County Fire Department has also performed methane monitoring in the public areas of the Site and has not detected methane at levels of concern.

17. Methane has not been detected in laboratory analysis of any of the more than 1,400 indoor air samples that have been collected from Carousel residences. The residential methane screening program, which is conducted prior to indoor air sampling, has detected only isolated instances of elevated methane due to natural gas leaks from utility lines or appliances, and in those instances Shell has advised the residents to repair those leaks. Subsequent testing, when performed, has not revealed any methane hazards. In the single instance where elevated methane related to petroleum hydrocarbon degradation was detected in the sub-slab soil gas

beneath a garage, Shell installed a methane mitigation system according to an engineering design and work plan approved by the Regional Board and Los Angeles County Department of Public Works Environmental Programs Division. Multiple rounds of follow-up testing have not shown any methane hazard at that home.

18. While elevated levels of methane presumably related to anaerobic biodegradation of petroleum hydrocarbons have been detected at depth, the lack of oxygen and any significant vapor pressure at depth mitigate any risk related to explosion or fire. Site data indicate that methane generated by degradation of petroleum hydrocarbons at depth under anaerobic conditions is naturally controlled through biodegradation as it migrates through aerobic surface soil.

19. *Second*, analysis of the indoor air, outdoor air and sub-slab soil vapor samples collected from the residences at the Site generally have shown indoor air concentrations to be consistent with background values and to be correlated with garage and outdoor air. As the Regional Board has recognized, this data does not indicate that vapor intrusion is an issue at the Site.

20. *Third*, there are widespread but uneven soil impacts at the Site that appear to be related to the grading of the Site. The spatial distribution of the soil impacts is somewhat stochastic and does not appear as a plume.

21. *Fourth*, the groundwater beneath the Site is impacted by a plume that is stable with downgradient concentrations quickly dropping to levels below analytical reporting limits. There exist multiple documented upgradient impacts that likely contribute to the groundwater conditions beneath the Site. Petroleum hydrocarbons in the form of light non-aqueous phase liquid ("LNAPL") has been detected in two monitoring wells located in the western portion of the Site, and LNAPL removal from these wells is performed on a regular basis. The groundwater at the Site is not used for municipal supply. Carousel residents obtain their drinking water from municipal supply provided by California Water Service Company, which has confirmed that the Site's water supply meets quality standards for drinking water.

Shell's Actions in Response to the CAO

22. On March 11, 2011, the Regional Board issued the CAO for the Site. (Exh. 1.) The CAO directed Shell to (1) complete delineation of on- and off-Site impacts in soil, soil vapor and groundwater related to Shell's historical use of the Site; (2) continue groundwater monitoring and reporting; (3) develop and conduct a pilot testing work plan to evaluate remedial options for the Site; and (4) conduct an assessment of any potential environmental impacts of residual concrete slabs that were left at the Site by the developers, and evaluate whether removal of the concrete is necessary and feasible. (Exh. 1, pp. 9-11.) Shell has completed (or, in the case of the residential sampling, nearly completed) the above actions and has submitted reports to the Regional Board that include analysis of the data. The pilot test work conducted by Shell included pilot testing of different excavation methods, soil vapor extraction, bioventing, and chemical oxidation technologies. Shell continues to perform quarterly groundwater monitoring.

23. Per the Directive, the RAP required by the CAO and the HHRA Report are due on March 10, 2014. (Exh. 1, pp. 11-12; Exh. 5, p. 9.)

The Regional Board's Directive

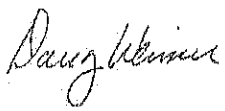
24. On January 23, 2014, the Regional Board issued the Directive, which is the subject of this Petition. (Exh. 5.) In the Directive, the Regional Board approved the SSCGs proposed in the Revised SSCG Report with certain modifications, and required Shell to submit the RAP, HHRA Report, and "draft environmental documents consistent with the California Environmental Quality Act (CEQA) analyzing the potential environmental impacts associated with remediation alternatives considered in the RAP." (Exh. 5, p. 9.)

25. Shell is in the process of preparing the RAP, HHRA Report and certain draft environmental documents. Notwithstanding the issues raised in this Petition, Shell intends to submit the RAP and the HHRA Report, along with drafts of preliminary environmental documents, to the Regional Board by the March 10, 2014 deadline specified in the Directive.

26. However, the Directive contains certain requirements and statements that are vague, arbitrary, erroneous, unsupported by the evidence and the relevant guidance, do not comply with the applicable laws and regulations and accepted guidance documents, and/or rely

on inapplicable laws and regulations. Shell previously raised these issues with the Regional Board, and Shell and the Regional Board have engaged in discussions to resolve these issues. However, to protect its rights in this regard, Shell files this protective Petition and seeks State Board review of these specific requirements and statements in the event it is not able to resolve these issues with the Regional Board.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that this Declaration was executed on February 24, 2014 in Los Angeles, California.



DOUGLAS J. WEIMER

DECLARATION OF DAVID MARX

I, David Marx, declare and state:

1. I am a Principle at Geosyntec Consultants. Based on my experience, I have personal knowledge of the facts stated herein, or I have been informed of and believe such facts, and could and would testify competently thereto if called as a witness in this matter.

2. I have over thirty years of experience in environmental resource management, permitting, and regulatory compliance for clients in the solid waste, natural gas, power, petroleum, transportation, and aerospace sectors. I have contributed to and performed environmental reviews pursuant to the California Environmental Quality Act ("CEQA") for over twenty years. I have been involved in over 200 environmental reviews, and have personally prepared and drafted, or assisted in the preparation and drafting of, various documents required under CEQA relating to numerous projects, including initial studies, notices of preparation, technical studies, negative declarations, mitigated negative declarations, Draft Environmental Impact Reports ("EIRs") and Final EIRs. Among other projects, I led the environmental analysis and preliminary design process for a major landfill expansion in southern California, two composting facilities and a 200-mile section of the California High Speed Rail project.

3. I am familiar with the environmental investigation at the former Kast Property. Based on my experience and my knowledge about the former Kast Property project and the remedies being considered, I believe that it would typically take 12 weeks or more to prepare a Draft EIR for a project of this size and complexity. Before the preparation of a Draft EIR could begin, the project would have to be adequately defined, and a Notice of Preparation must be filed with the State by the lead agency.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that this Declaration was executed on February 24, 2014 in San Diego, California.

DAVID MARX

PROOF OF SERVICE

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

At the time of service, I was over 18 years of age and **not a party to this action**. I am employed in the County of Los Angeles, State of California. My business address is 725 South Figueroa Street, 31st Floor, Los Angeles, California 90017-5524.

On February 24, 2014, I served true copies of the following document(s) described as **PETITION FOR REVIEW AND REQUEST FOR HEARING** on the interested parties in this action as follows:

State Water Resources Control Board
Office of Chief Counsel
Jeannette L. Bashaw, Legal Analyst
1001 "I" Street, 22nd Floor
Sacramento, CA 95814
Telephone: (916) 341-5155
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BY E-MAIL OR ELECTRONIC TRANSMISSION: I caused a copy of the document(s) to be sent from e-mail address odanaka@caldwell-leslie.com to the persons at the e-mail addresses listed in the Service List. I did not receive, within a reasonable time after the transmission, any electronic message or other indication that the transmission was unsuccessful.

BY OVERNIGHT DELIVERY: I enclosed said document(s) in an envelope or package provided by the overnight service carrier and addressed to the persons at the addresses listed in the Service List. I placed the envelope or package for collection and overnight delivery at an office or a regularly utilized drop box of the overnight service carrier or delivered such document(s) to a courier or driver authorized by the overnight service carrier to receive documents.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on February 24, 2014, at Los Angeles, California.

Margie Odanaka

PROOF OF SERVICE

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

At the time of service, I was over 18 years of age and **not a party to this action.** I am employed in the County of Los Angeles, State of California. My business address is Apex Attorney Services, 1055 West Seventh Street, Suite 250, Los Angeles, CA 90017.

On February 24, 2014, I served true copies of the following document(s) described as **PETITION FOR REVIEW AND REQUEST FOR HEARING** on the interested parties in this action as follows:

Samuel Unger
California Regional Water Quality Control
Board - Los Angeles Region
320 W. Fourth Street, Suite 200
Los Angeles, CA 90013
Tel.: (213) 576-6600
E-Mail: sunger@waterboards.ca.gov

BY PERSONAL SERVICE: I personally delivered the document(s) to the person being at the addresses listed in the Service List. (1) For a party represented by an attorney, delivery was made to the attorney or at the attorney's office by leaving the documents in an envelope or package clearly labeled to identify the attorney being served with a receptionist or an individual in charge of the office. (2) For a party, delivery was made to the party or by leaving the documents at the party's residence with some person not less than 18 years of age between the hours of eight in the morning and six in the evening.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on February 24, 2014, at Los Angeles, California.

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Attorneys for Petitioners EQUILON ENTERPRISES LLC dba SHELL OIL PRODUCTS US and SHELL OIL COMPANY

STATE WATER RESOURCES CONTROL BOARD

FOR THE STATE OF CALIFORNIA

In the Matter of the Petition of EQUILON ENTERPRISES LLC dba SHELL OIL PRODUCTS US and SHELL OIL COMPANY Cleanup and Abatement Order R4-2011-0046 California Regional Water Quality Control Board, Los Angeles Region California Water Code § 13304	Case No. **REQUEST FOR STAY**

I. INTRODUCTION

In accordance with Water Code section 13321(a) and section 2053 of Title 23 of the California Code of Regulations, Equilon Enterprises LLC dba Shell Oil Products US and Shell Oil Company (collectively "Shell") hereby request a stay of certain requirements in the January 23, 2014 directive entitled "Review of Revised Site-Specific Cleanup Goal Report and Directive to Submit the Remedial Action Plan, Human Health Risk Analysis, and Environmental Analysis for Cleanup of the Carousel Tract Pursuant to California Water Code Section 13304" ("Directive") issued by the California Regional Water Quality Control Board, Los Angeles Region (the "Regional Board"). A copy of the Directive is attached as Exhibit 5 to Shell's Petition for Review and Request for Hearing ("Petition") filed herewith.

Notwithstanding the technical issues raised in Shell's protective Petition regarding certain requirements and statements in the Directive, which are the subject of ongoing discussions between Shell and the Regional Board, Shell intends to submit the Remedial Action Plan ("RAP") and the Human Health Risk Assessment Report ("HHRA Report"), along with drafts of preliminary environmental documents, to the Regional Board by the March 10, 2014 deadline.

The grounds for stay are set forth below and in the Petition and supporting Declarations of Douglas J. Weimer and David Marx filed herewith and incorporated herein by reference. Because of the March 10, 2014 deadline contained in the Directive, Shell requests that the State Water Resources Control Board ("State Board") issue the requested stay and conduct a hearing on this matter as soon as possible.

II. A STAY OF THE EFFECT OF THE CHALLENGED PORTIONS OF DIRECTIVE IS WARRANTED IN THIS CASE

Under Section 2053 of the State Board's regulations (23 Cal. Code Regs. § 2053), a stay of the effect of an order shall be granted if the petitioner shows:

(1) substantial harm to petitioner or to the public interest if a stay is not granted;

(2) a lack of substantial harm to other interested parties and to the public if a stay is granted; and

(3) substantial questions of fact or law regarding the disputed action exist.

Here, the requirements for issuance of a stay are clearly met.

A. Shell Will Suffer Substantial Harm If a Stay Is Not Granted

Shell believes that certain requirements and statements in the Directive that are the subject of this Petition are the proper subject of review by the State Board and should be revised. Specifically:

- The Directive erroneously states that the remedial action objective ("RAO") for for methane proposed in the Revised Site Specific Cleanup Goals Report ("Revised SSCG Report") provides that methane will not exceed two percent of the lower explosive limit ("LEL") and "will be removed to less than two percent

of the LEL and to the greatest extent technologically and economically feasible." (Exh. 5, pp. 2-3.) This is inaccurate. The actual RAO for methane proposed in the Revised SSCG Report is to "[p]revent fire/explosion risks in indoor air and/or enclosed spaces" due to methane accumulation caused by degradation of petroleum hydrocarbons in the soil, and to "[e]liminate methane in the subsurface to the extent technologically and economically feasible." (Exh. 4, p. 34.)

- The Directive also states that "[t]he SSCG for methane should be the more stringent of the lower explosive limit or the level that is technically and economically feasible." (Exh. 5, p. 6.) This statement misapplies State Water Board Resolution No. 92-49 and 23 Code of Regulations § 2550.4, which authorize the establishment of a cleanup goal that is greater than background and that is technologically and economically achievable.

- While the Regional Board has approved the application of depth-based soil cleanup levels, it selected intervals of 0-5 feet below ground surface ("bgs") for increased exposures and 5-10 feet bgs for less frequent exposures. (Exh. 5, p. 4.) In selecting these intervals, the Regional Board concluded that "institutional controls are already in place throughout Los Angeles County" because the Los Angeles County Building Code requires that residents obtain an excavation permit before excavating below five feet. (*Id.*) Shell agrees with this principle, but the actual ordinance applicable to the Site, the City of Carson Building Code § 8105, requires that residents obtain a permit for excavations deeper than 3 feet bgs. In addition, guidance from the Environmental Protection Agency ("US EPA") regarding exposure assumptions and soil cleanup depths, and comments by the independent Expert Panel that is advising the Regional Board, all support the use of depth intervals for risk-based soil cleanup goals of 0-2 feet bgs and greater than 2-10 feet bgs. Given this, and in order to align the depth intervals with the applicable ordinance, Shell requests that the risk-based soil cleanup goals in the

Directive be revised to incorporate and reflect depth intervals of 0-3 feet bgs and 3-10 feet bgs, which is more conservative than what US EPA guidance and Expert Panel comments support.

- In its Directive, the Regional Board directeds Shell to "develop odor-based screening levels for indoor air based on 50 percent odor-recognition thresholds as published in the ATSDR Toxicological Profiles. For soil gas, follow the ESL for odor and other nuisance to calculate a ceiling level for residential land use." (Exh. 5, p. 4, fn. 3.) In fact, Shell proposed a TPH nuisance screening values for soil gas in the Revised SSCG Report that followed the ESL, but the Regional Board reduced the value by half without any explanation. Shell believes the Regional Board's revised screening value is not supported and, in fact, contradicts the Regional Board's express direction in footnote 3 of the Directive to "follow the ESL." Accordingly, Shell requests that the odor-based screening value in the Directive be rescinded and revised to include the value submitted by Shell, which is consistent with the Regional Board's direction in footnote 3 of the Directive.
- The Regional Board revised the soil cleanup levels based on leaching to groundwater proposed by Shell in its Revised SSCG Report, but in so doing it relied on improper assumptions and an inapplicable regulation, and its methodology generated erroneous values, especially with respect to the revised value for total petroleum hydrocarbons as motor oil ("TPH motor oil"). In particular, the Regional Board failed to apply a dilution attenuation factor when it derived its soil cleanup levels based on leaching to groundwater. (Exh. 5, p. 5.) Accordingly, Shell requests that the leaching to groundwater soil cleanup levels in the Directive be rescinded and replaced with those proposed in the Revised SSCG Report.
- The Revised SSCG Report proposed an attenuation factor of 0.001 to apply to sub-slab soil vapor concentrations based on analysis of actual Site data. However,

the Regional Board directed Shell to use an attenuation factor of 0.002 to calculate SSCGs for soil vapor that it based on default numbers it stated are recommended in recent agency guidance documents. (Exh. 5, pp. 5-6.) However, these default attenuation factor values are provided to calculate soil vapor cleanup values in the absence of Site data, and in this instance, a robust and comprehensive data set exists for the Site. Accordingly, the use of default values is not warranted. The requirement in the Directive to use an attenuation factor of 0.002 should therefore be rescinded and revised to approve the attenuation factor proposed by Shell based on Site data, which is 0.001.

- While the Regional Board appears to agree that chlorinated hydrocarbons detected at the Site are not related to Shell's historical use of the Site for storage of crude oil and bunker oil, and therefore most such compounds are not Site-related Chemicals of Concern ("COCs"), the Regional Board stated in the Directive that tetrachloroethylene ("PCE") and trichloroethylene ("TCE") in soil and soil vapor cannot be excluded from the list of COCs for the Site. (Exh. 5, p. 7.) In making this determination, the Regional Board conceded the existence of off-Site sources for these compounds and it did not point to any evidence that Shell in fact used PCE or TCE at the Site (and Shell has been unable to find any such evidence). Instead, the only "evidence" the Regional Board identified is the inclusion of chlorinated solvents in a description for large industrial processes in the EPA's Toxic Release Inventory for the Petroleum Industry. (*Id.*) Shell does not believe this general agency inventory is a proper or sufficient basis for inclusion of PCE and TCE in the list of COCs for this specific Site, especially in light of the documented off-site sources for these compounds and the absence of evidence that such compounds were used during Shell's ownership of the Site. For these reasons, Shell requests that the inclusion of PCE and TCE as Site-related COCs

be rescinded and the Directive be revised to include only petroleum-related hydrocarbons as Site-related COCs.

- In addition, to the extent that the Directive requires Shell to include other chlorinated compounds, such as trihalomethanes ("THMs"), as Site-related COCs——despite the absence of evidence connecting the presence of these compounds with Shell's historical use of the Site and the fact that such chemicals are recognized to result from the use of municipal water in and around the home—Shell further requests that the State Board confirm that such compounds should not be listed as Site-related COCs.

- Finally, the Directive includes a requirement that Shell submit "draft environmental documents consistent with the California Environmental Quality Act (CEQA) analyzing the potential environmental impacts associated with remediation alternatives considered in the RAP." (Exh. 5, p. 9.) This requirement is vague and could be construed to require submission of a Draft Environmental Impact Report along with the RAP, which would not comply with the sequencing of environmental review actions required by CEQA and its implementing regulations, and is not feasible to prepare given the March 10, 2014 deadline. It also fails to recognize that the Regional Board is the lead agency for both the RAP and CEQA process, not Shell. Shell is supporting the Regional Board's environmental review process by, *e.g.*, paying for an experienced and qualified contractor to assist the Regional Board in complying with CEQA, and preparing to submit preliminary environmental documents with the RAP and HHRA Report, including a draft Initial Study, a draft Notice of Preparation, and a draft timeline for the environmental review process. Shell will continue to support the Regional Board's environmental review process as the agency and the CEQA consultant move forward. The above-quoted requirement in the Directive is erroneous and improper and should be clarified or rescinded.

As noted above, Shell intends to submit the RAP, the HHRA Report and certain draft environmental documents by March 10, 2014, the deadline set forth in the Directive. However, given the above issues, certain statements, proposals and assumptions contained in these documents may not comply with the requirements and statements in the Directive discussed above and in the Petition. Absent a stay, Shell may face the threat of administrative sanctions, which include substantial daily penalties. Such substantial harm can be avoided through a stay while the State Board considers the merits of Shell's petition. Also, an immediate stay of the relevant portions of the Directive will allow Shell and the Regional Board to continue discussing, and hopefully resolve, these issues in connection with the Regional Board's review of the RAP and the HHRA Report, and through the course of the environmental review process.

B. The Public Will Not Be Substantially Harmed If a Stay is Granted

There is no known risk of substantial harm to the public or to water quality if the stay is granted. The request for a stay focuses only on certain requirements and statements in the Directive. Shell intends to submit the RAP, HHRA Report and draft environmental documents on March 10, 2014. Thus, review, approval and implementation of the proposed remedial strategy for the Site will not be slowed by a stay of the specific portions of the Directive that are challenged in the Petition.

C. The Petition Raises Substantial Questions of Law and Fact

Shell's Petition raises substantial questions of law and fact, including, *inter alia*: (1) whether it is proper under State Water Board Resolution No. 92-40 for the Regional Board to establish a cleanup goal for methane that is the more stringent of the LEL or the level that is technologically and economically feasible; (2) whether the precautionary principle should be invoked in reviewing and setting soil cleanup goals in the absence of a scientific dispute regarding exposure assumptions; (3) whether the Regional Board may require a regulated party to consider and apply specified guidance documents and, after cleanup goals or other values are developed pursuant to those guidance documents, set its own goals or values that deviate from the guidance without explanation or justification; (4) whether the Regional Board can direct the regulated party to include compounds as Site-related COCs in the absence of evidence showing

that the compounds were ever used by the Regulated Party at the Site and despite established data showing off-Site sources for the compounds; (5) whether reliance on a generalized industry "inventory" is a proper basis for requiring the inclusion of certain compounds as Site-related COCs; and (6) whether the Regional Board may order the regulated party to prepare environmental documents under CEQA, require the preparation of such documents outside of the order mandated by CEQA and its implementing regulations, and require the preparation of such documents without allowing sufficient time to do so.

III. CONCLUSION

For the foregoing reasons, Shell respectfully requests that the State Board stay the relevant portions of the Directive pending a decision on the merits of the concurrently filed Petition. Shell requests that the State Board expeditiously issue a stay as soon as possible in order to avoid irrecoverable investment of resources in advance of a decision on the merits.

DATED: February 24, 2014

CALDWELL LESLIE & PROCTOR, PC
MICHAEL R. LESLIE
DAVID ZAFT

By _____
DAVID ZAFT
Attorneys for Petitioners EQUILON ENTERPRISES LLC dba SHELL OIL PRODUCTS US and SHELL OIL COMPANY

PROOF OF SERVICE

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

At the time of service, I was over 18 years of age and **not a party to this action**. I am employed in the County of Los Angeles, State of California. My business address is 725 South Figueroa Street, 31st Floor, Los Angeles, California 90017-5524.

On February 24, 2014, I served true copies of the following document(s) described as **REQUEST FOR STAY** on the interested parties in this action as follows:

State Water Resources Control Board
Office of Chief Counsel
Jeannette L. Bashaw, Legal Analyst
1001 "I" Street, 22nd Floor
Sacramento, CA 95814
Telephone: (916) 341-5155
Facsimile: (916) 341-5199
E-Mail: jbashaw@waterboards.ca.gov

BY E-MAIL OR ELECTRONIC TRANSMISSION: I caused a copy of the document(s) to be sent from e-mail address odanaka@caldwell-leslie.com to the persons at the e-mail addresses listed in the Service List. I did not receive, within a reasonable time after the transmission, any electronic message or other indication that the transmission was unsuccessful.

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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on February 24, 2014, at Los Angeles, California.

Margie Odanaka

PROOF OF SERVICE

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

At the time of service, I was over 18 years of age and **not a party to this action.** I am employed in the County of Los Angeles, State of California. My business address is Apex Attorney Services, 1055 West Seventh Street, Suite 250, Los Angeles, CA 90017.

On February 24, 2014, I served true copies of the following document(s) described as **REQUEST FOR STAY** on the interested parties in this action as follows:

Samuel Unger
California Regional Water Quality Control
Board - Los Angeles Region
320 W. Fourth Street, Suite 200
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Tel.: (213) 576-6600
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I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on February 24, 2014, at Los Angeles, California.

Apex Attorney Services

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION

CLEANUP AND ABATEMENT ORDER NO. R4-2011-0046
REQUIRING

SHELL OIL COMPANY

TO CLEANUP AND ABATE WASTE
DISCHARGED TO WATERS OF THE STATE
PURSUANT TO CALIFORNIA WATER CODE SECTION 13304[1]
AT THE FORMER KAST PROPERTY TANK FARM,
CARSON, CALIFORNIA

(FILE NO. 97-043)

Cleanup and Abatement Order No. R4-2011-0046 (Order) requires Shell Oil Company (hereinafter, the "Discharger") to assess, monitor, and cleanup and abate the effects of petroleum hydrocarbon compounds and other contaminants of concern discharged to soil and groundwater at their former Kast Property Tank Farm facility (hereinafter, the "Site") located southeast of the intersection of Marbella Avenue and East 244th Street, in Carson, California.

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) herein finds:

BACKGROUND

1. **Discharger:** Shell Oil Company (SOC), previously Shell Company of California, is a Responsible Party (RP) due to its: (a) ownership of the former Kast Property Tank Farm, and (b) former operation of a petroleum hydrocarbon tank farm at the Site. The Discharger has caused or permitted waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and has created a condition of pollution or nuisance.

2. **Location:** The Site is located southeast of the intersection of Marbella Avenue and East 244th Street in the City of Carson, California. The Site occupies approximately 44 acres of land and is bordered by the Los Angeles County Metropolitan Transportation Authority railroad right-of-way on the north, Lomita Boulevard on the south, Marbella Avenue on the west, and Panama Avenue on the east (Figure 1). The Site was previously owned by the Discharger, who operated three oil storage reservoirs from the 1920s to the mid-1960s. The central and southern reservoirs each had a capacity of 750,000 barrels of oil and the northernmost reservoir had a capacity of 2,000,000 barrels of oil. The Site presently consists of the Carousel residential neighborhood and city streets.

[1] Water Code section 13304 (a) states: Any person who has discharged or discharges waste into the waters of this state in violation of any waste discharge requirement or other order or prohibition issued by a regional board or the state board, or who has caused or permitted, causes or permits, or threatens to cause or permit any waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and creates, or threatens to create, a condition of pollution or nuisance, shall upon order of the regional board, clean up the waste or abate the effects of the waste, or, in the case of threatened pollution or nuisance, take other necessary remedial action, including, but not limited to, overseeing cleanup and abatement efforts.

3. **Groundwater Basin:** The Site is located on the Torrance Plain of the West Coast Groundwater Basin (Basin), in the southwestern part of the Coastal Plain of Los Angeles County. Beneath the Site, the first encountered groundwater is estimated at 54 feet below ground surface (bgs). The Basin is underlain by a series of aquifers, the deeper of which are used for drinking water production. These aquifers are with increasing depth, the Gage aquifer, Lynwood aquifer, and Silverado aquifer. The nearest municipal water supply well is located approximately 400 feet west of the Site. As set forth in the *Water Quality Control Plan for the Los Angeles Region* (the Basin Plan), adopted on June 13, 1994, the Regional Board has designated beneficial uses for groundwater (among which include municipal and domestic drinking water supplies) in the West Coast Basin and has established water quality objectives for the protection of these beneficial uses.

4. As detailed in the findings below, the Discharger's activities at the Site have caused or permitted the discharge of waste resulting in soil, soil vapor, and groundwater pollution, including discharges of waste to the waters of the state, and nuisance.

SITE HISTORY

5. **Property Ownership and Leasehold Information:** Based on information submitted to the Regional Board by the Discharger, the Site has the following property ownership and leasehold history:

   a. According to the Sanborn maps dated 1924 and 1925, the Site was owned and operated by "Shell Company of California (Kast Property)" beginning in approximately 1924 until the mid-1960s. The Site was used as a tank farm, which included three crude oil storage reservoirs, Reservoir Nos. 5, 6 and 7. Reservoir No.5, the center reservoir, had a capacity of 750,000 barrels of oil and was under lease to General Petroleum Corporation. Reservoir No. 6, the southernmost reservoir, had a capacity of 750,000 barrels of oil; and Reservoir No. 7, the northernmost reservoir, had a capacity of 2,000,000 barrels of oil. According to Sanborn map notations, the reservoirs had concrete-lined earth-slopes with frame roofs on wood posts, surrounded by earth levees averaging 20 feet in height with 7 foot wide walks on top. One oil pump house was depicted on the 1925 Sanborn map within the southern portion of the Site. Since construction, the Site was used as a crude oil storage reservoir.

   b. In 1966, SOC sold the Site to Lomita Development Company, an affiliate of Richard Barclay and Barclay-Hollander-Curci (BHC), with the reservoirs in place. The Pacific Soils Engineering Reports dated January 7, 1966; March 11, 1966; July 31, 1967; and June 11, 1968 documented that: 1) Lomita Development Company emptied and demolished the reservoirs, and graded the Site prior to it developing the Site as residential housing; 2) part of the concrete floor of the central reservoir was removed by Lomita Development Company from the Site; and 3) where the reservoir bottoms were left in place, Lomita Development Company made 8-inch wide circular trenches in concentric circles approximately 15 feet apart to permit water drainage to allow the percolation of water and sludge present in the reservoirs into the subsurface.

c. In phases between 1967 and 1969, Lomita Development Company developed the Site into one- and two-story single family residential parcels and sold the developed lots to individual homeowners.

6. **Site Description and Activities:** According to information in the Regional Board's file on this Site, oil related operations at the Site began in 1923 and ended by the early 1960s. The Site was previously owned and operated by Shell Company of California, which was subsequently renamed Shell Oil Company, as a crude oil storage facility. The facility included equipment that pumped the oil to the nearby SOC's refinery for processing from three concrete-lined oil storage reservoirs with a total capacity of 3.5 million barrels. In 1966, SOC closed the Site and SOC sold the Site to Lomita Development Company, an affiliate of Richard Barclay and Barclay-Hollander-Curci. Subsequently, Lomita Development Company developed the Site into the Carousel residential neighborhood, which contains 285 single-family homes.

7. **Chemical Usage:** Based on the Phase I Environmental Site Assessment (ESA) dated July 14, 2008 conducted by Shell Oil Products[2] (SOPUS) consultant, URS Corporation, the Site was used for the storage of crude oil in all three reservoirs on the property from at least 1924 to 1966. Subsequent records indicate that in the 1960s the reservoirs may also have been used for storage of bunker oil. Ongoing investigations indicate petroleum hydrocarbon compounds including volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) are impacted in the subsurface soil, soil vapor, and groundwater underlying the Site.

EVIDENCE OF DISCHARGES OF WASTE AND BASIS FOR ORDER

8. **Waste Discharges:** The following summarizes assessment activities associated with the Site:

a. In 2007, under the regulatory oversight of the California Department of Toxic Substances Control (DTSC), an environmental investigation was initiated at the former Turco Products Facility (TPF). Soil vapor and groundwater were investigated in areas directly west of the Site and at locations in the northwestern portion of the Site. The DTSC-required investigation detected petroleum hydrocarbons, benzene, toluene, and chlorinated solvents in soil and soil vapor. A multi-depth soil vapor survey, which included soil vapor sampling on the Site at locations coincident with the former Kast Site footprints, detected benzene at concentrations up to 150 micrograms per liter (µg/l). Benzene was detected at TPF groundwater monitoring well MW-8, which has a northeast flow direction, at a concentration of 1,800 µg/l. Therefore, groundwater monitoring well MW-8 is located upgradient of the Kast Site. Chlorinated solvents were also detected at the Kast Site groundwater monitoring well MW-5.

b. The *Final Phase I Site Characterization Report* dated October 15, 2009, which was prepared by URS Corporation on behalf of SOPUS showed that soil impacts consisted primarily of petroleum hydrocarbons spanning a wide range of carbon chains and including Total Petroleum Hydrocarbons (TPH) as gasoline (g), TPH

[2] Shell Oil Products US is the d/b/a for Equilon Enterprises LLC, which is wholly owned by Shell Oil Company.

as diesel (TPHd), TPH as motor oil (TPHmo), benzene, and naphthalene (See Tables 1, 2A, 2B, and 3).

I. In June 2009, a subsurface investigation of public streets in the Carousel neighborhood consisting of ten cone penetrometer/rapid optical screening tools (CPT/ROST) was performed. The CPT/ROST logs indicated several locations within the Site with elevated hydrocarbon concentrations. The CPT/ROST logs also showed that the highest apparent soil impacts occurred at depths of 12 feet bgs, 36 feet bgs, and 40 feet bgs.

II. A total of 228 soil samples were collected during the Phase I Site Characterization. The analytical data for soil samples collected from soil borings advanced on public streets across the Site (Figure 2) were as follows:

i. The highest detected concentration of TPH was 22,000 milligrams per kilogram (mg/kg) and TPHg, TPHd, and TPHmo were 8,800, 22,000, and 21,000 mg/kg, respectively;

ii. Benzene, ethylbenzene, toluene, and xylenes were detected in concentrations as high as 21,000 micrograms per kilogram (µg/kg), 32,000 µg/kg, 12,000 µg/kg, and 140,000 µg/kg, respectively;

iii. SVOCs were detected in concentrations as high as 47 mg/kg of naphthalene, 38 mg/kg of 1-methylnaphthalene, 63 mg/kg of 2-methylnaphthalne, 12 mg/kg phenanthrene, and 9.0 mg/kg pyrene; and

iv. Arsenic and lead were detected in concentrations as high as 53.2 mg/kg and 52.5 mg/kg, respectively.

III. Soil vapor samples collected from a 5-foot depth and greater below the public streets in the Carousel neighborhood indicated elevated benzene and methane (Figures 3 and 4). Benzene was detected at a maximum concentration of 3,800µg/l, which exceeds the California Human Health Screening Level (CHHSL) value of 0.036 µg/l for benzene set for shallow soil vapor in a residential area. Methane was also detected in concentrations as high as 59.7 % (by volume) that significantly exceed its lower explosive limit of 5% (by volume), posing a potential safety hazard.

c. Between September 2009 and February 2010, residential soil and sub-slab soil vapor sampling was conducted at 41 parcels (Figure 5 a – f; Tables 1 and 2) and the results were as follows:

I. Surface and subsurface soil (0 to 10 feet bgs) detected concentrations of chemicals of concern that significantly exceeded soil screening levels as follows:

i. VOCs - Benzene (14,000 µg/kg), tetrachloroethylene (PCE) (22,000 µg/kg), 1,2,4-trimethylbenzene (34,000 µg/kg), and 1,3,5-trimethylbenzene (14,000 µg/kg);

ii. SVOCs - Naphthalene (18 mg/kg), Benzo(a)pyrene (2.9 mg/kg), benzo(a)anthracene (0.1 mg/kg), chrysene (0.27 mg/kg), phenanthrene (0.28 mg/kg), and pyrene (0.19 mg/kg); and

iii. Lead was also detected at a maximum concentration of 307 mg/kg.

II. The highest detected concentration of TPHg was 5,000 mg/kg, TPHd was 33,000 mg/kg, and TPHmo was 41,000 mg/kg;

III. As of September 27, 2010, sub-slab soil vapor samples have been collected from 172 homes in the Carousel neighborhood. Additional data continues to be collected as part of the Phase II Site Characterization. The validated data from the first 41 homes detected benzene, naphthalene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethylbenzene, p/m-xylenes, toluene, and acetone, at a maximum concentration of 4,500 micrograms per cubic meter (µg/m^3), 2,200 µg/m^3, 1,000 µg/m^3, 1,100 µg/m^3, 5,200 µg/m^3, 700 µg/m^3, 270 µg/m^3, respectively.

d. Between November 19, 2009 and February 15, 2010, additional step-out soil and soil vapor sampling at the elevated soil vapor sampling locations were conducted in selected locations beneath the public streets at the Site. The measured concentrations for petroleum hydrocarbons in soil were as follows:

I. The highest detected concentrations of TPHg was 9,800 mg/kg, TPHd was 22,000 mg/kg, and TPHmo was 21,100 mg/kg;

II. The highest detected concentrations of benzene was 33,000 µg/kg, Ethylbenzene was 42,000 µg/kg, toluene was 11,000 µg/kg, and xylenes were 140,000 µg/kg, respectively;

III. SVOCs were detected in concentrations as high as 47 mg/kg of naphthalene, 33 mg/kg of 1-methylnaphthalene, 53 mg/kg of 2-methylnaphthalne, 6.1 mg/kg phenanthrene, and 3.9 mg/kg pyrene; and

IV. Arsenic and lead were detected in concentrations as high as 28.2 mg/kg and 13.6 mg/kg, respectively.

e. In July 2009, the installation of six on-site groundwater monitoring wells (Figure 6) were completed and quarterly groundwater monitoring was initiated. Groundwater was encountered at 53 feet bgs. Groundwater samples from five of the six wells contained concentrations of benzene at a maximum concentration of 140 µg/L and trichloroethylene (TCE) at a maximum concentration of 290 µg/L. One of the monitoring wells (MW-3) contains a free product or a light non-aqueous phase liquid (LNAPL) with a maximum measured thickness of 9.01 foot as of May 27, 2010.

9. Source Elimination and Remediation Status at the Site

a. The results of the initial soil and soil vapor investigation indicate the presence of elevated methane and benzene at concentrations exceeding the Lower Explosive Limit and the CHHSL for shallow soil vapor, at several locations beneath the public streets at the Site. On October 15, 2009, the Regional Board directed the Discharger to expeditiously design and implement an interim remedial action.

b. On May 12, 2010 the Regional Board approved SOPUS's proposed Soil Vapor Extraction (SVE) pilot test in order to evaluate the use of this technology as a remedial option for VOCs at the Site.

10. Summary of Findings from Subsurface Investigations

a. Regional Board staff have reviewed and evaluated numerous technical reports and records pertaining to the release, detection, and distribution of wastes on the Site and its vicinity. The Discharger has stored, used, and/or discharged petroleum hydrocarbon compounds at the Site. Elevated levels of TPH and other wastes have been detected in soil, soil vapor and groundwater beneath the Site.

b. The sources for the evidence summarized above include, but are not limited to:

I. Various technical reports and documents submitted by the Discharger or its representatives to Regional Board staff.

II. Site inspections conducted by Regional Board staff, as well as meetings, letters, electronic mails, and telephone communications between Regional Board staff and the Discharger and/or its representatives.

III. Subsurface drainage study for the Site reservoirs submitted by Girardi and Keese, the law firm retained by some of the residents of the Carousel neighborhood.

11. Summary of Current Conditions Requiring Cleanup and Abatement

a. Based on the Phase I ESA for the Site dated July 14, 2008 (prepared by URS Corporation) and the most recent information provided to the Regional Board by SOPUS: 1) SOC sold the Kast Site to Lomita Development Company, an affiliate of Richard Barclay and Barclay-Hollander-Curci, in 1966 with the reservoirs in place; 2) the Pacific Soils Engineering Reports from 1966 to 1968 indicate that Lomita Development Company emptied and demolished the reservoirs, and residential housing; 3) part of the concrete floor of the central reservoir was removed by Lomita Development Company from the Site; and 4) where the reservoir bottoms were left in place, Lomita Development Company made 8-inch wide circular trenches in concentric circles approximately 15 feet apart to permit water drainage to allow percolation of water and sludge present in the reservoirs into the subsurface.

b. There is no consistent trend in the vertical distribution of detected concentrations of petroleum hydrocarbon compounds that can be discerned from soil boring data to date. Although, the majority of the aforementioned highest detected TPH concentrations were obtained from the 2.5-foot depth samples, there were multiple locations where the highest concentrations were in the 5-foot or 10-foot samples. This may be due to the nature of previous development activities by Lomita Development Company at the Site (i.e., the construction and demolition of the former reservoirs and site grading in preparation for development of the residential tract).

c. On May 11, 2010, Environmental Engineering and Contracting, consultants hired by Girardi and Keese, conducted exploratory trenching in order to locate and identify the obstructions that have been frequently encountered during the advancement of shallow soil borings at many of the residential homes investigated to date. Regional Board staff observed the encountering of an approximately 8-inch thick concrete slab extending at the trench excavation termination depth of 9 feet, 2 inches. The Pacific Soils Engineering Report dated January 7, 1966 states that the reservoirs were lined with a "four inch blanket of reinforced concrete". These obstructions are presumed to be remnants of the concrete liners of the former reservoir.

d. Results from the 169 Interim Residential Sampling Reports submitted to the Regional Board through November 17, 2010 indicate that for surface and subsurface soil sampling (0 to 10 feet bgs), the cancer risk index estimate is between 0 and 10 for 107 residential parcels, between 10 and 100 for 60 parcels, and exceeded 100 for 2 parcels. In the area where the highest cancer index is documented, SVOCs (i.e. Benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene and chrysene), benzene, and ethylbenzene were the primary chemicals of potential concern (COPCs) contributing to the cancer risk index.

   For the Carousel neighborhood investigation, the Regional Board is using the most protective cancer risk screening levels recommended by the State and federal governments, which is one in one million (1×10^{-6}) additional risks. For screening purposes, the Regional Board routinely uses the most conservative (health-protective assumptions) risk based screening levels of 1×10^{-6} for the target chemical. This screening level is based on a target risk level at the lower end of the US Environmental Protection Agency (USEPA) risk management range of one-in-a-million risk (1×10^{-6}) for cancer risk and a hazard quotient of 1.

   The presence of a chemical at concentrations in excess of a CHHSL does not indicate that adverse impacts to human health are occurring or will occur; but suggests that further evaluation of potential human health concerns is warranted (Cal-EPA, 2005). It should also be noted that CHHSLs are not intended to "set ... final cleanup or action levels to be applied at contaminated sites" (Cal-EPA, 2005).

e. Results from the 169 Interim Residential Sampling Reports submitted to the Regional Board through November 17, 2010 also indicate that for the sub-slab

soil vapor data collected from the residential parcels, the cancer risk index estimate was between 0 and 10 for 147 parcels, between 10 and 100 for 20 parcels, and greater than 100 for 2 parcels. The two highest cancer risk index were estimated as 550 and 120. In most cases, benzene was the primary contributor to the cancer risk index estimate.

f. The Office of Environmental Health Hazard Assessment (OEHHA) performed a quantitative risk evaluation of TPH using surface and subsurface (0 to 10 feet bgs) soil TPH fractionation data for the 41 residential parcels (Table 3). Based on the risk calculation, OEHHA estimated maximum exposures for a child and compared the resulting exposure estimates of reference dosages with that provided by DTSC interim guidance dated June 16, 2009. OEHHA concluded that aromatic hydrocarbons in the C-9 to C-32 range at five parcels exceeded their reference values for children (Exhibit 1).

g. The San Francisco Bay Regional Water Quality Control Board developed the Environmental Screening Level (ESL) as guidance for determining when concentration of TPH may present a nuisance and detectable odor. The ESL, based on calculated odor indexes, for residential land-use. is 100 mg/kg for TPHg and TPHd. The soil TPHg and TPHd data obtained from the Site were detected up to 9,800 mg/kg and 85,000 mg/kg, respectively, which exceed the ESL.

12. **Pollution of Waters of the State**: The Discharger has caused or permitted waste to be discharged or deposited where it is, or probably will be, discharged into the waters of the state and creates, or threatens to create, a condition of pollution or nuisance. As described in this Order and the record of the Regional Board, the Discharger owned and/or operated the site in a manner that resulted in the discharges of waste. The constituents found at the site as described in Finding 8 constitute "waste" as defined in Water Code section 13050(d). The discharge of waste has resulted in pollution, as defined in Water Code section 13050(l). The concentration of waste constituents in soil and groundwater exceed water quality objectives contained in the Water Quality Control Plan for the Los Angeles Region (Basin Plan), including state-promulgated maximum contaminant levels. The presence of waste at the Site constitutes a "nuisance" as defined in Water Code section 13050(m). The waste is present at concentrations and locations that *"is injurious to health, or is indecent, or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property . . . and [a]ffects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal."*

13. **Need for Technical Reports:** This Order requires the submittal of technical or monitoring reports pursuant to Water Code section 13267[3]. The Discharger is required to submit the reports because, as described in the Findings in this Order, the Discharger is responsible for the discharge of waste that has caused pollution and nuisance. The reports are necessary to evaluate the extent of the impacts on water quality and public health and to determine the scope of the remedy.

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[3] Water Code section 13267 authorized the Regional Board to require any person who has discharged, discharges, or is suspect of having discharged or discharging, waste to submit technical or monitoring program reports.

13. Although requested by the Discharger, the Regional Board is declining to name additional potentially responsible parties (PRPs) to this Order at this time. Substantial evidence indicates that the Discharger caused or permitted waste to be discharged into waters of state and is therefore appropriately named as a responsible party in this Order. However, the Regional Board will continue to investigate whether additional PRPs (including, but not limited to, Lomita Development Company, Richard Barclay, Barclay-Hollander-Curci, and/or any of its successors) caused or permitted the discharge of waste at the Site and whether these or other parties should be named as additional responsible parties to this Order or a separate Order. The Regional Board may amend this Order or issue a separate Order in the future as a result of this investigation. Although investigation concerning additional PRPs is ongoing, the Regional Board desires to issue this Order as waiting will only delay remediation of the Site.

14. The Discharger, in a letter to the Regional Board dated May 5, 2010 (Exhibit 2), stated that it is considering a variety of potential alternatives that can be applied at specific parcels and in the public streets in order to avoid environmental impacts and avoid any significant risks to human health at this Site. The Discharger also indicated that if it becomes necessary for residents to relocate temporarily to perform this work, the Discharger will take appropriate steps to minimize any inconvenience and compensate them for any resulting expenses.

15. Issuance of this Order is being taken for the protection of the environment and as such is exempt from provisions of the California Environmental Quality Act (CEQA) (Pubic Resources Code section 21000 et seq.) in accordance with California Code of Regulations, title 14, sections 15061(b)(3), 15306, 15307, 15308, and 15321. This Order generally requires the Discharger to submit plans for approval prior to implementation of cleanup activities at the Site. Mere submittal of plans is exempt from CEQA as submittal will not cause a direct or indirect physical change in the environment and/or is an activity that cannot possibly have a significant effect on the environment. CEQA review at this time would be premature and speculative, as there is simply not enough information concerning the Discharger's proposed remedial activities and possible associated environmental impacts. If the Regional Board determines that implementation of any plan required by this Order will have a significant effect on the environment, the Regional Board will conduct the necessary and appropriate environmental review prior to Executive Officer approval of the applicable plan.

16. Pursuant to section 13304 of the California Water Code, the Regional Board may seek reimbursement for all reasonable costs to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action.

THEREFORE, IT IS HEREBY ORDERED, pursuant to California Water Code section 13304 and 13267, that the Discharger shall cleanup the waste and abate the effects of the discharge, including, but not limited to, total petroleum hydrocarbons (TPH) and other TPH-related wastes discharged to soil and groundwater at the Site in accordance with the following requirements:

1. **Complete Delineation of On- and Off-Site Waste Discharges**: Completely delineate the extent of waste in soil, soil vapor, and groundwater caused by the discharge of wastes including, but not limited to, TPH and other TPH-related waste constituents at

the Site into the saturated and unsaturated zones. Assessment has been ongoing under Regional Board oversight, but assessment is not yet complete. If ongoing reinterpretation of new data derived from the tasks performed suggests that modification or expansion of the tasks approved by the Regional Board is necessary for complete assessment, the Discharger is required to submit a work plan addendum(a).

2. **Continue to Conduct Groundwater Monitoring and Reporting:**

   a. Continue the existing quarterly groundwater monitoring and reporting program previously required by the Regional Board, and

   b. As new wells are installed, they are to be incorporated into the existing groundwater monitoring and reporting program

3. **Conduct Remedial Action:** Initiate a phased cleanup and abatement program for the cleanup of waste in soil, soil vapor, and groundwater and abatement of the effects of the discharges, but not limited to, petroleum and petroleum-related contaminated shallow soils and pollution sources as highest priority.

   Shallow soils in this Order are defined as soils found to a nominal depth of 10 feet, where potential exposure for residents and/or construction and utility maintenance workers is considered likely (Ref. Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities – CalEPA 1996).

   Specifically, the Discharger shall:

   a. Develop a pilot testing work plan, which includes 1) evaluation of the feasibility of removing impacted soils to 10 feet and removal of contaminated shallow soils and reservoir concrete slabs encountered within the uppermost 10 feet, including areas beneath residential houses; and 2) remedial options that can be carried out where site characterization (including indoor air testing) is completed; 3) plans for relocation of residents during soil removal activities, plans for management of excavated soil on-site, and plans to minimize odors and noise during soil removal. The Discharger is required to submit this Pilot Test Work Plan to the Regional Board for review and approval by the Executive Officer no later than 60 days after the date of issuance of this Order. Upon approval of the Pilot Test Work Plan by the Executive Officer, the Discharger shall implement the Pilot Test Work Plan submit the Pilot Test Report that includes the findings, conclusions, and recommendations within 120 days of the issuance of the approval of the Pilot Test Work Plan.

   b. Conduct an assessment of any potential environmental impacts of the residual concrete slabs of the former reservoir that includes: (1) the impact of the remaining concrete floors on waste migration where the concrete floors might still be present; (2) whether there is a need for the removal of the concrete; and (3) the feasibility of removing the concrete floors beneath (i) unpaved areas at the Site, (ii) paved areas at the Site, and (iii) homes at the Site. The Discharger is required to submit this environmental impact assessment of the residual

concrete slabs to the Regional Board no later than 30 days after the completion of the Pilot Test.

c. Prepare a full-scale impacted soil Remedial Action Plan (RAP) for the Site. The Discharger is required to submit the RAP to the Regional Board for review and approval by the Executive Officer no later than 60 days after the date of the Executive Officer's approval of the Pilot Test Report.

I. The RAP shall include, at a minimum, but is not limited to:

i. A detailed plan for remediation of wastes in shallow soil that will incorporate the results from the Soil Vapor Extraction Pilot Test currently being performed.

ii. A plan to address any impacted area beneath any existing paved areas and concrete foundations of the homes, if warranted;

iii. A detailed surface containment and soil management plan;

iv. An evaluation of all available options including proposed selected methods for remediation of shallow soil and soil vapor; and

v. Continuation of interim measures for mitigation according to the Regional Board approved Interim Remediation Action Plan (IRAP).

vi. A schedule of actions to implement the RAP.

II. The RAP, at a minimum, shall apply the following guidelines and Policies to cleanup wastes in soil and groundwater. The cleanup goals shall include:

i. Soil cleanup goals set forth in the Regional Board's *Interim Site Assessment and Cleanup Guidebook, May 1996,* waste concentrations, depth to the water table, the nature of the chemicals, soil conditions and texture, and attenuation trends, human health protection levels set forth in *USEPA Regional Screening Levels (Formerly Preliminary Remediation Goals),* for evaluation of the potential intrusion of subsurface vapors (soil vapor) into buildings and subsequent impact to indoor air quality, California Environmental Protection Agency's *Use of Human Heath Screening Levels (CHHSLS) in Evaluation of Contaminated Properties,* dated January 2005, or its latest version, and Total Petroleum Hydrocarbon Criteria Working Group, Volumes 1 through 5, 1997, 1998, 1999; 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, Soil vapor sampling requirements are stated in the *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, USEPA Risk Assessment Guidance for Superfund, Parts A through E; USEPA User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings, 2003; USEPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, 2002; USEPA Supplemental Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, 2002; CalEPA Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities, CalEPA DTSC, February 1997; CalEPA Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbons (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process, CalEPA DTSC, July 2009. Cleanup goals for all contaminant of concerns shall be based on residential (i.e., unrestricted) land use.

ii. Groundwater cleanup goals shall at a minimum achieve applicable Basin Plan water quality objectives, including California's Maximum Contaminant Levels or Action Levels for drinking water as established by the California Department of Public Health, and the State Water Resources Control Board's "Antidegradation Policy" (State Board Resolution No. 68-16), at a point of compliance approved by the Regional Board, and comply with other applicable implementation programs in the Basin Plan.

iii. The State Water Resources Control Board's "Antidegradation Policy",which 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 exceedence of water quality objectives in the Regional Board's *Basin Plan*.

iv. The State Water Resources Control Board's "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304" (State Board Resolution No. 92-49), requires cleanup to background or the best water quality which is reasonable if background levels cannot be achieved and sets forth criteria to consider where cleanup to background water quality may not be reasonable.

III. The Discharger shall submit site-specific cleanup goals for residential (i.e., unrestricted) land use for the Executive Officer's approval concurrent with the submittal date of the Pilot Test Report. The proposed site-specific cleanup goals shall include detailed technical rationale and assumptions underlying each goal.

IV. Upon approval of the RAP by the Executive Officer, the Discharger shall implement the RAP within 60 days of the issuance of the approval of the **RAP**.

d. Continue to conduct residential surface and subsurface soil and sub-slab soil vapor sampling under the current Regional Board approved work plan dated September 24, 2009. If the ongoing reinterpretation of new assessment data derived from the tasks described in the work plan suggests that modification or expansion of the tasks proposed in the **RAP** is necessary for complete cleanup, then the Discharger shall submit addenda to the September 24, 2009 work plan to the Regional Board for review and approval by the Executive Officer no later than 60 days of the date of issuance of this Order.

e. If the ongoing groundwater monitoring and investigation warrants, the Discharger shall:

I. Install new wells in order to complete the groundwater monitoring well network and to fully delineate the impacted groundwater plume, and

II. Prepare a detailed impacted groundwater **RAP**. The Regional Board will set forth the due date of the groundwater **RAP** at a later date.

4. Public Review and Involvement:

a. Cleanup proposals and **RAP** submitted to the Regional Board for approval in compliance with the terms of this Order shall be made available to the public for a minimum 30-day period to allow for public review and comment. The Regional Board will consider any comments received before taking final action on a cleanup proposal and **RAP**.

b. The Discharger shall encourage public participation. The Discharger is required to prepare and submit a Public Participation Plan for review and approval by the Executive Officer, with the goal of having the Regional Board provide the stakeholders and other interested persons with:

I. Information, appropriately targeted to the literacy and translational needs of the community, about the investigation and remedial activities concerning the discharges of waste at the Site; and

II. Periodic, meaningful opportunities to review, comment upon, and to influence investigation and cleanup activities at the Site.

c. Public participation activities shall coincide with key decision making points throughout the process as specified or as directed by the Executive Officer of the Regional Board.

5. **Time Schedule:** The Discharger shall submit all required technical work plans and reports by the deadlines stated in this Order, which are summarized in Table 4. As field activities at this Site are in progress, additional technical documents may be required and/or new or revised deadlines for the technical documents may be issued. Therefore, Table 4 may be updated as necessary. The Discharger shall continue any remediation or monitoring activities until such time as the Executive Officer determines that sufficient cleanup has been accomplished to fully comply with this Order..

6. The Regional Board's authorized representative(s) shall be allowed:

a. Entry upon premises where a regulated facility or activity is located, conducted, or where records are stored, under the conditions of this Order;

b. Access to copy any records that are stored under the conditions of this Order;

c. Access to inspect any facility, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and

d. The right to photograph, sample, and monitor the Site for the purpose of ensuring compliance with this Order, or as otherwise authorized by the California Water Code.

7. **Contractor/Consultant Qualification:** A California licensed professional civil engineer or geologist, or a certified engineering geologist or hydrogeologist shall conduct or direct the subsurface investigation and cleanup program. All technical documents required by this Order shall be signed by and stamped with the seal of the above-mentioned qualified professionals.

8. This Order is not intended to permit or allow the Discharger to cease any work required by any other Order issued by this Regional Board, nor shall it be used as a reason to stop or redirect any investigation or cleanup or remediation programs ordered by this Regional Board or any other agency. Furthermore, this Order does

not exempt the Discharger from compliance with any other laws, regulations, or ordinances which may be applicable, nor does it legalize these waste treatment and disposal facilities, and it leaves unaffected any further restrictions on those facilities which may be contained in other statues or required by other agencies.

9. The Discharger shall submit 30-day advance notice to the Regional Board of any planned changes in name, ownership, or control of the facility; and shall provide 30-day advance notice of any planned physical changes to the Site that may affect compliance with this Order. In the event of a change in ownership or operator, the Discharger also shall provide 30-day advance notice, by letter, to the succeeding owner/operator of the existence of this Order, and shall submit a copy of this advance notice to the Regional Board.

10. Abandonment of any groundwater well(s) at the Site must be approved by and reported to the Executive Officer of the Regional Board at least 14 days in advance. Any groundwater wells removed must be replaced within a reasonable time, at a location approved by the Executive Officer. With written justification, the Executive Officer may approve of the abandonment of groundwater wells without replacement. When a well is removed, all work shall be completed in accordance with California Department of Water Resources Bulletin 74-90, "California Well Standards," Monitoring Well Standards Chapter, Part III, Sections 16-19.

11. The Regional Board, through its Executive Officer or other delegate, may revise this Order as additional information becomes available. Upon request by the Discharger, and for good cause shown, the Executive Officer may defer, delete or extend the date of compliance for any action required of the Discharger under this Order. The authority of the Regional Board, as contained in the California Water Code, to order investigation and cleanup, in addition to that described herein, is in no way limited by this Order.

12. Any person aggrieved by this action of the Regional Board may petition the State Water Resources Control Board (State Water Board) to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at:

    http://www.waterboards.ca.gov/public_notices/petitions/water_quality

    or will be provided upon request.

13. Failure to comply with the terms or conditions of this Order may result in imposition of civil liabilities, imposed either administratively by the Regional Board or judicially by the Superior Court in accordance with Sections 13268, 13308, and/or 13350, of the California Water Code, and/or referral to the Attorney General of the State of California.

14. None of the obligations imposed by this Order on the Discharger are intended to constitute a debt, damage claim, penalty or other civil action which should be limited

or discharged in a bankruptcy proceeding. All obligations are imposed pursuant to the police powers of the State of California intended to protect the public health, safety, welfare, and environment.

Ordered by: _____ Date: 3-11-11

Deborah J. Smith
Chief Deputy Executive Officer

ATTACHMENTS

FIGURES

Figure 1: Site Vicinity Map
Figure 2: Previous Exploration Location
Figure 3: Proposed Soil Vapor Sampling Locations
Figure 4: Benzene and Methane Concentrations in Soil Vapor
Figure 5a: Carousel Houses Tested as of March 15, 2010
Figure 5b: Residential Methane Screening Results as of March 15, 2010
Figure 5c: Summary of Results of Testing for Benzene Concentrations in Soil Vapor as of March 15, 2010
Figure 5d: Summary of Results of Testing for Non-Benzene Concentrations in Soil Vapor as of March 15, 2010
Figure 5e: Summary of Soil Sampling Results (0-10' Below Surface) as of March 15, 2010
Figure 5f: Methane Concentrations in Soil Vapor at 5 Feet Below Surface as of March 15, 2010
Figure 6: Proposed Groundwater Monitoring Well Locations

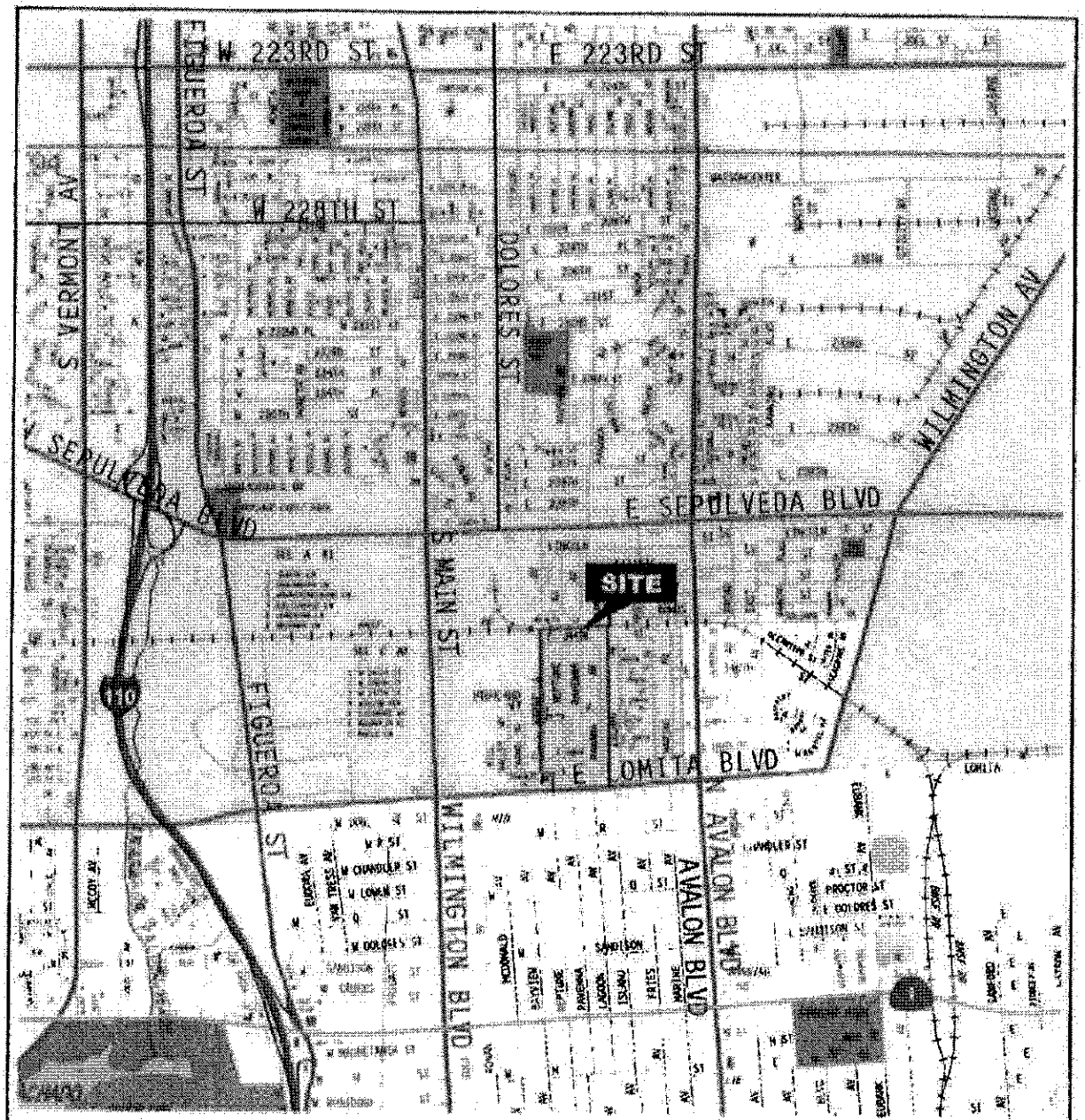
TABLES

Table 1: Data Summary from Phase I and Phase II Site Characterization for Soil and Soil Vapor
Table 2A: Summary of Soil Samples Analytical Results -VOCs, SVOCs, and TPH
Table 2B: Summary of Soil Vapor Analytical Results -VOCS and Fixed Gases
Table 3: Maximum Concentration of Aliphatic and Aromatic Hydrocarbons by Hydrocarbon Fractionations at Individual Properties
Table 4: Deadlines for Technical Work Plans and Reports

EXHIBITS

Exhibit 1: OEHHA's Memorandum dated May 19, 2010
Exhibit 2: Shell Oil Company Letter to the Regional Board dated May 5, 2010

Note: All Figures and Tables, except Table 4, were taken from technical reports prepared by SOPUS's consultant, URS Corporation



SITE VICINITY MAP

Project No. 49194314	Date: JUNE 2008	Project: Former KAST Property	Figure 1

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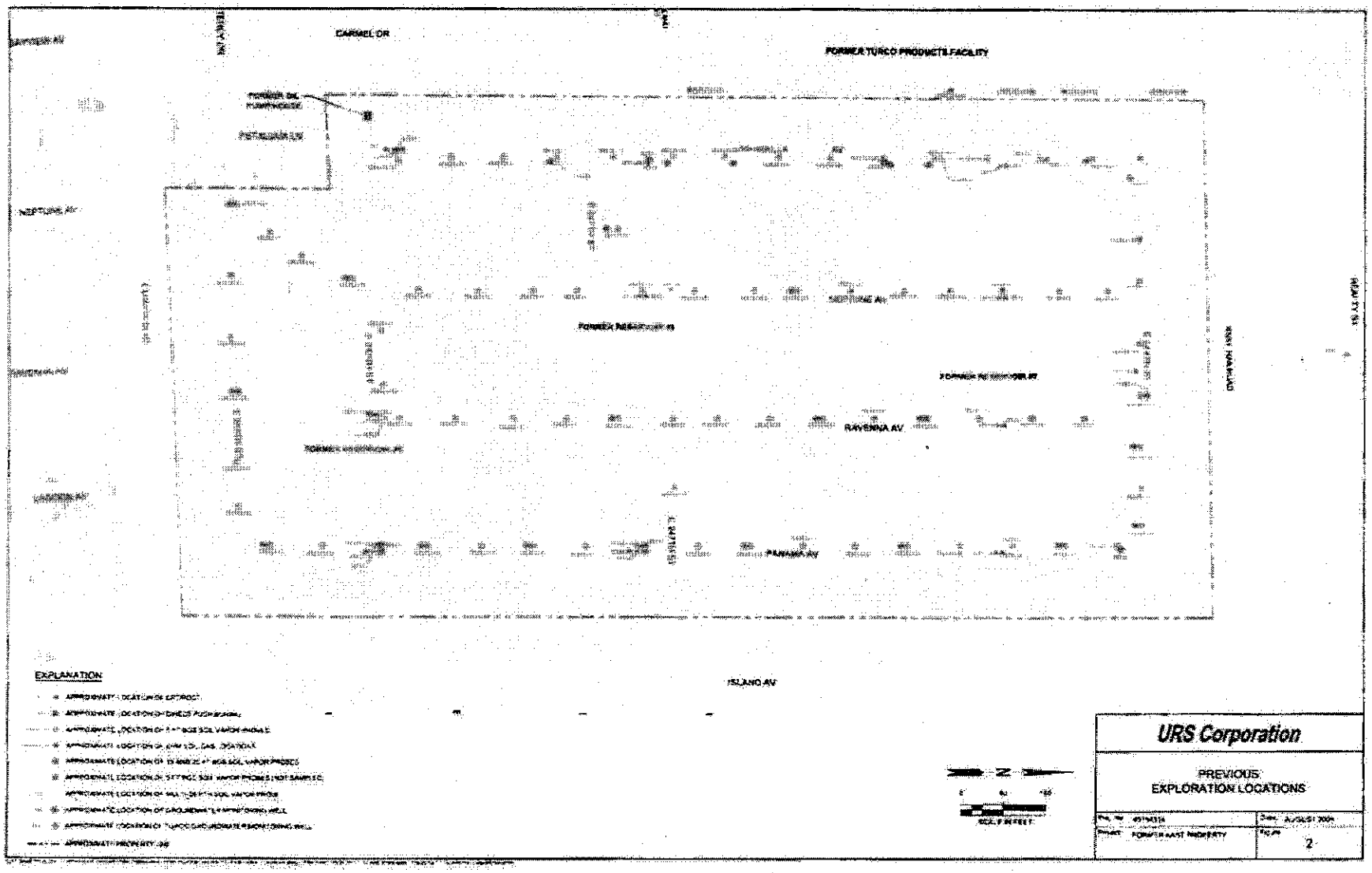


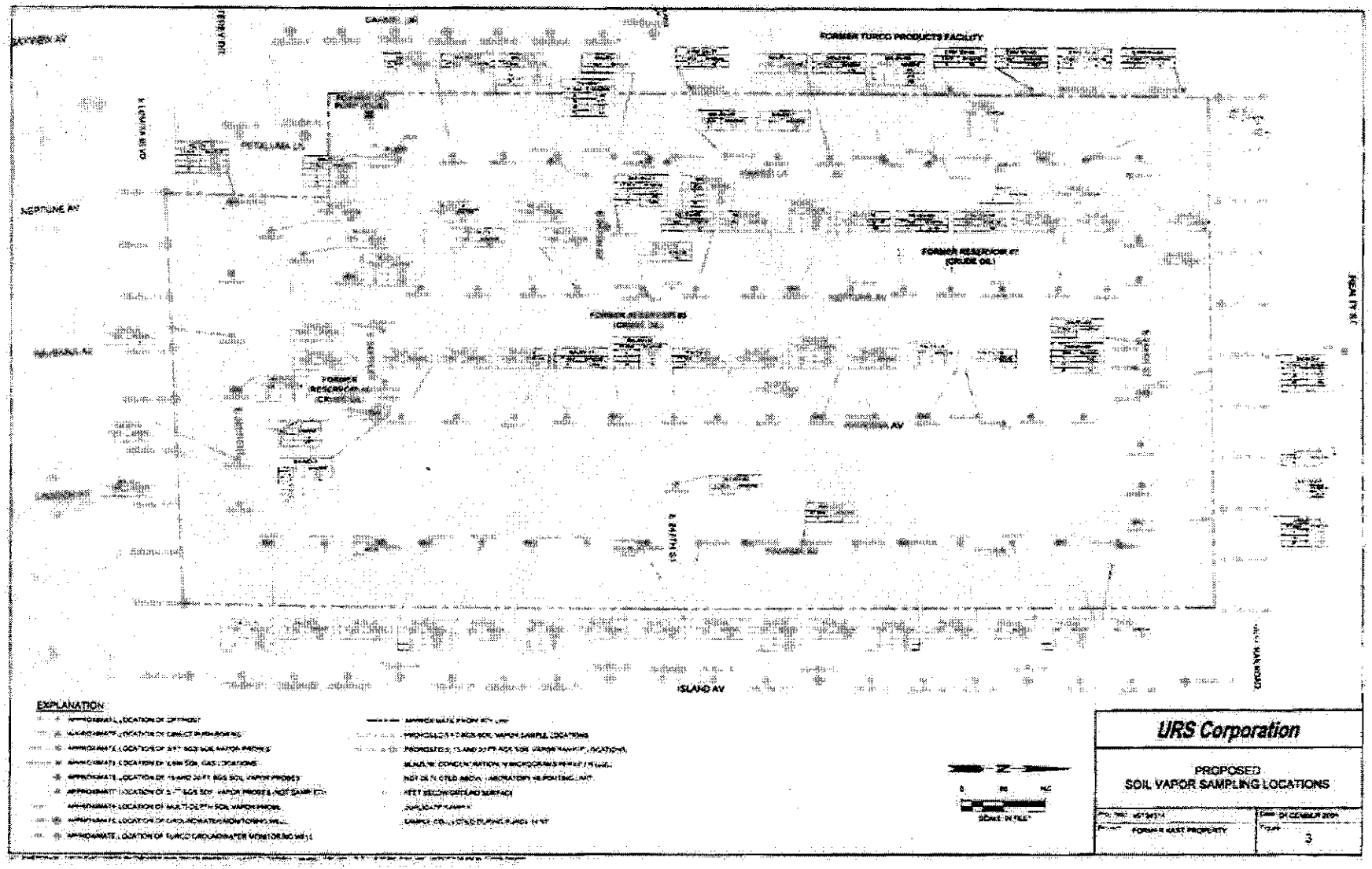
URS Corporation

PREVIOUS EXPLORATION LOCATIONS

Date: AUGUST 2009

Project: FORMER MAST PROPERTY

Figure: 2



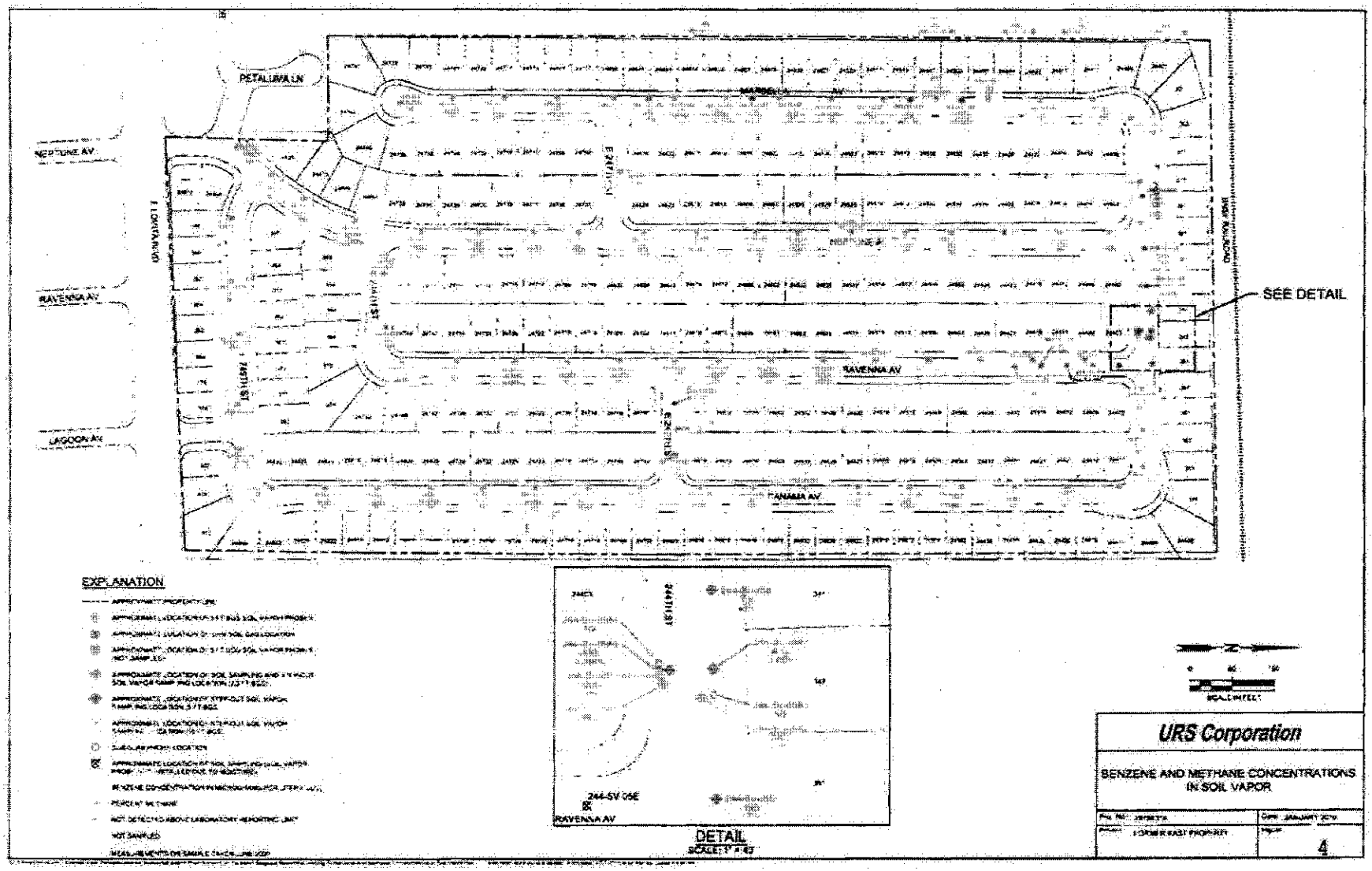
URS Corporation

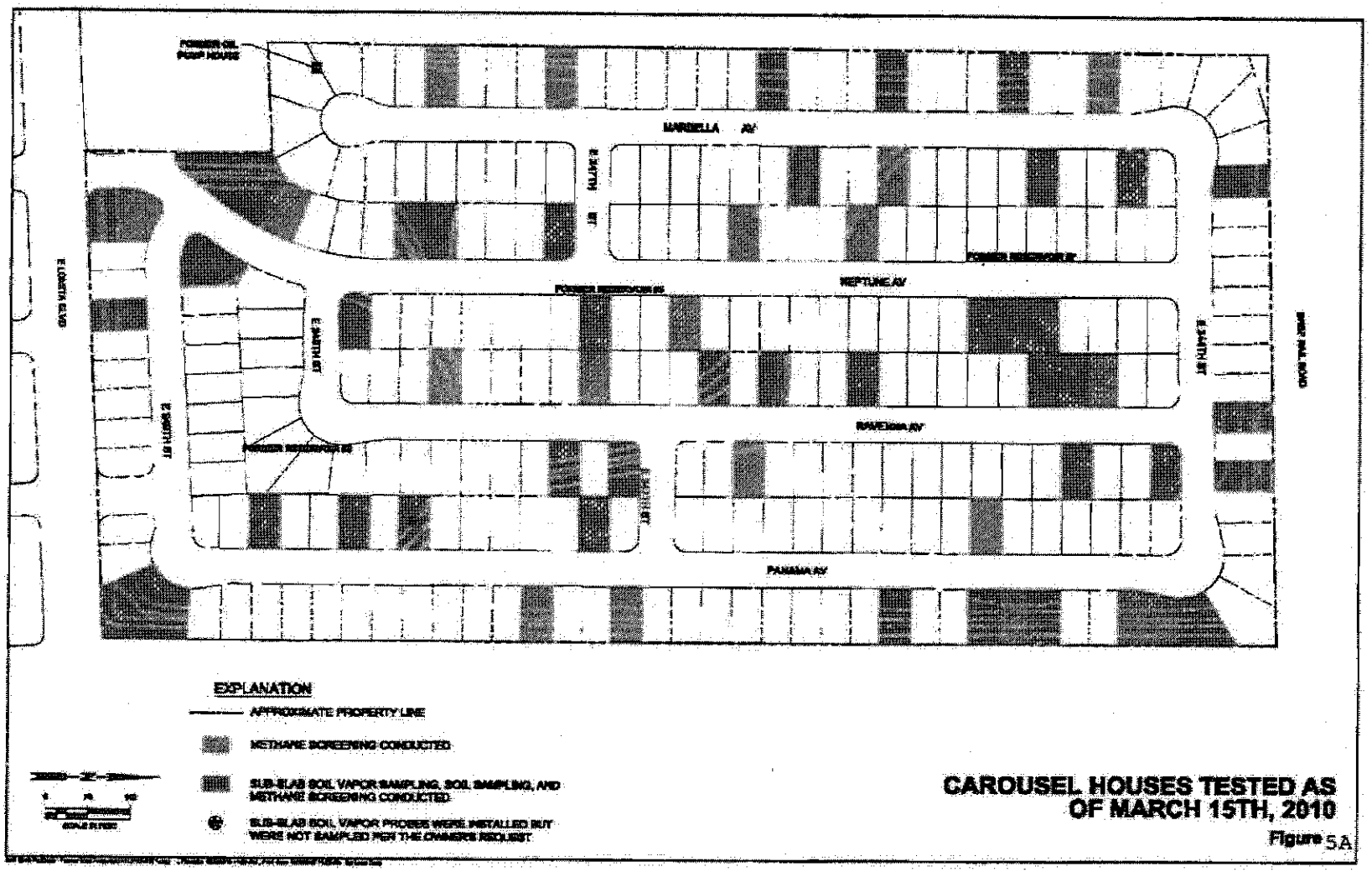
PROPOSED
SOIL VAPOR SAMPLING LOCATIONS

FORMER KAST PROPERTY

DECEMBER 2004

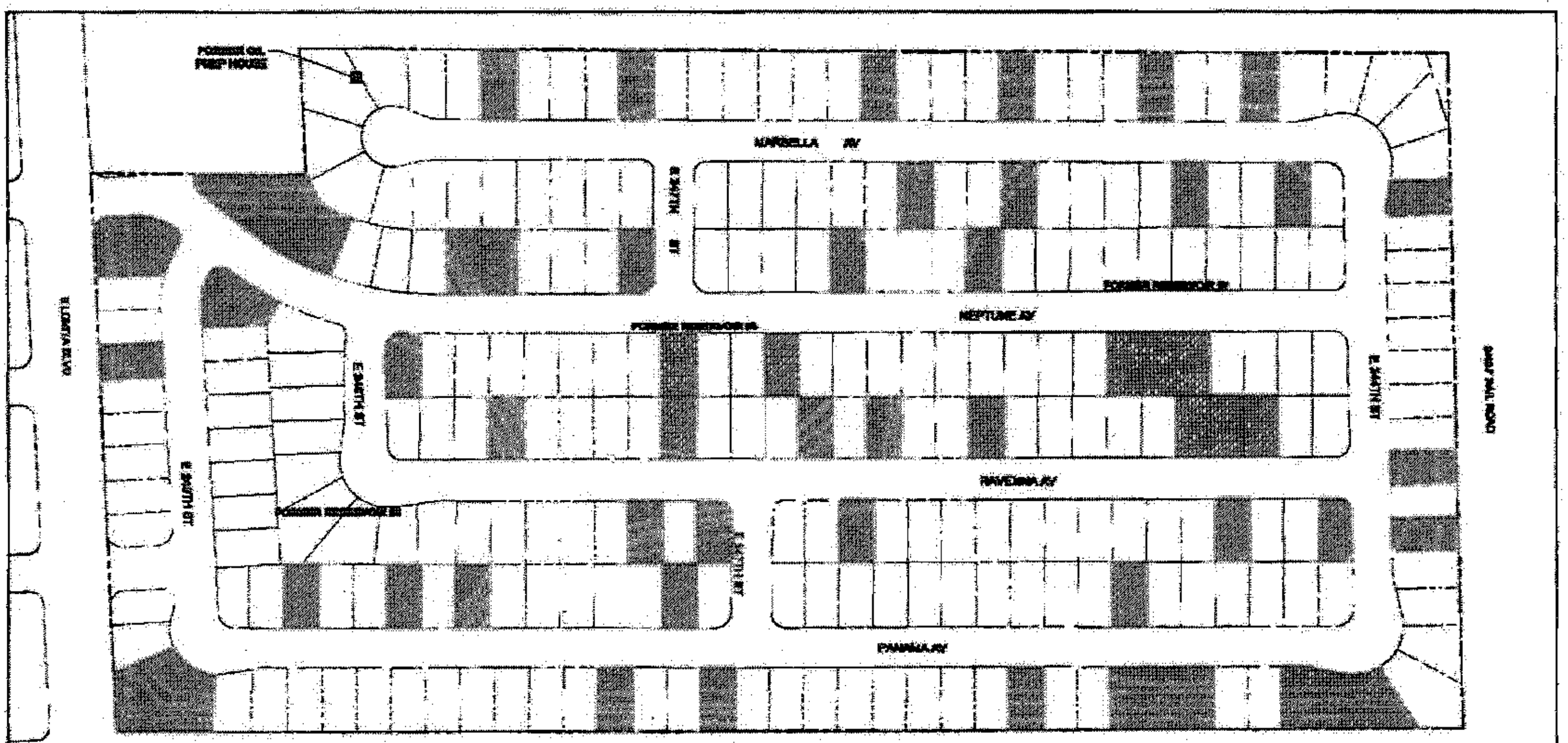
3


PETALUMA LN
NEPTUNE AV
RAVENNA AV
LAGOON AV
FLORIDA AVE
ESPLANADE
1ST ST
2ND ST
RAVENNA AV
PANAMA AV
SEE DETAIL
EXPLANATION
244-SV 05E
RAVENNA AV
DETAIL
URS Corporation
BENZENE AND METHANE CONCENTRATIONS IN SOIL VAPOR
FORMER EAST PROPERTY
4



CAROUSEL HOUSES TESTED AS OF MARCH 15TH, 2010

Figure 5A



EXPLANATION

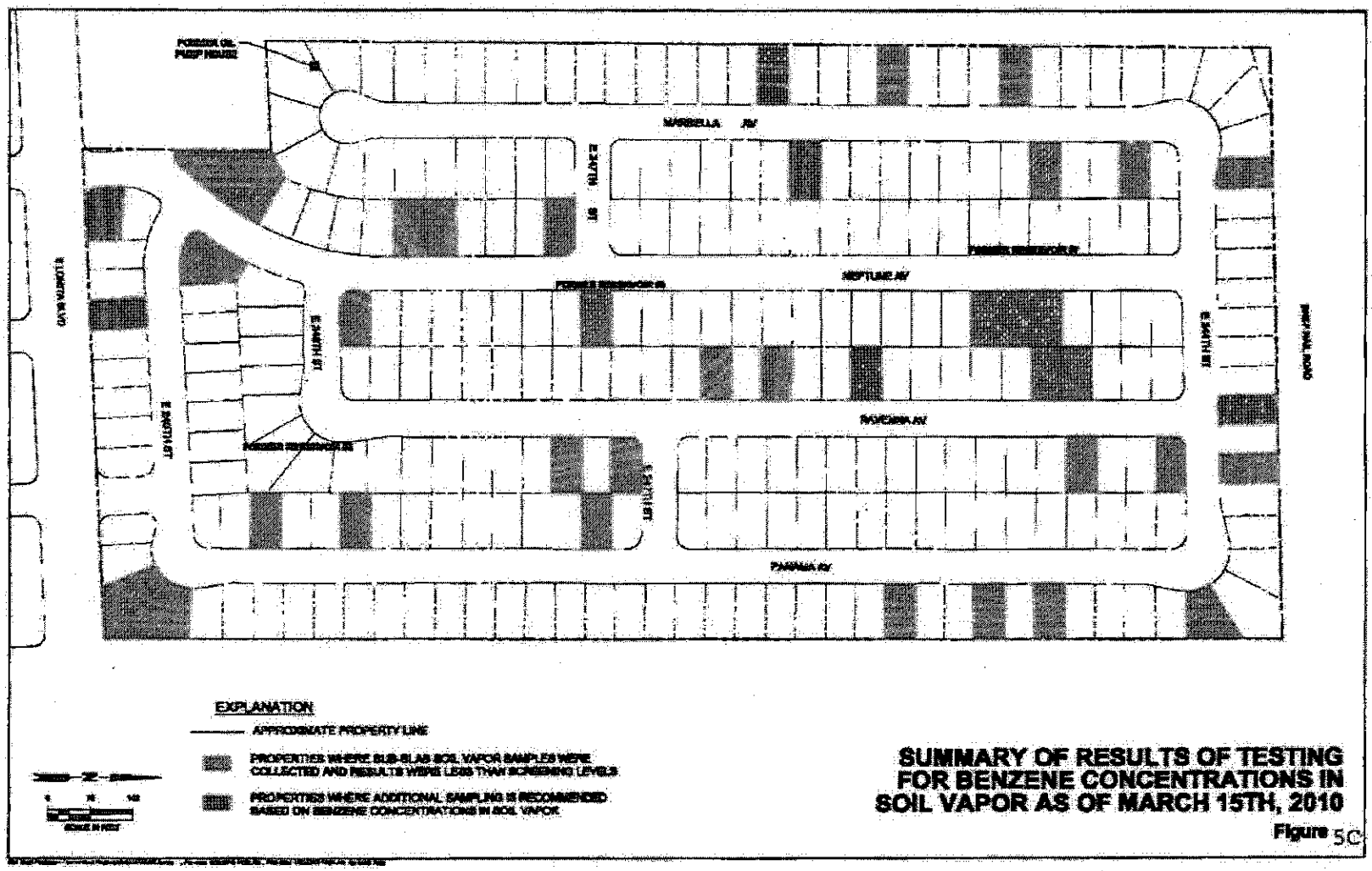
APPROXIMATE PROPERTY LINE

METHANE SCREENING LESS THAN 10% LEL

METHANE SCREENING GREATER THAN OR EQUAL TO 10% LEL (NO HOUSES EXCEED 10% LEL FOR METHANE)

RESIDENTIAL METHANE SCREENING RESULTS AS OF MARCH 15TH, 2010

Figure 5B



EXPLANATION

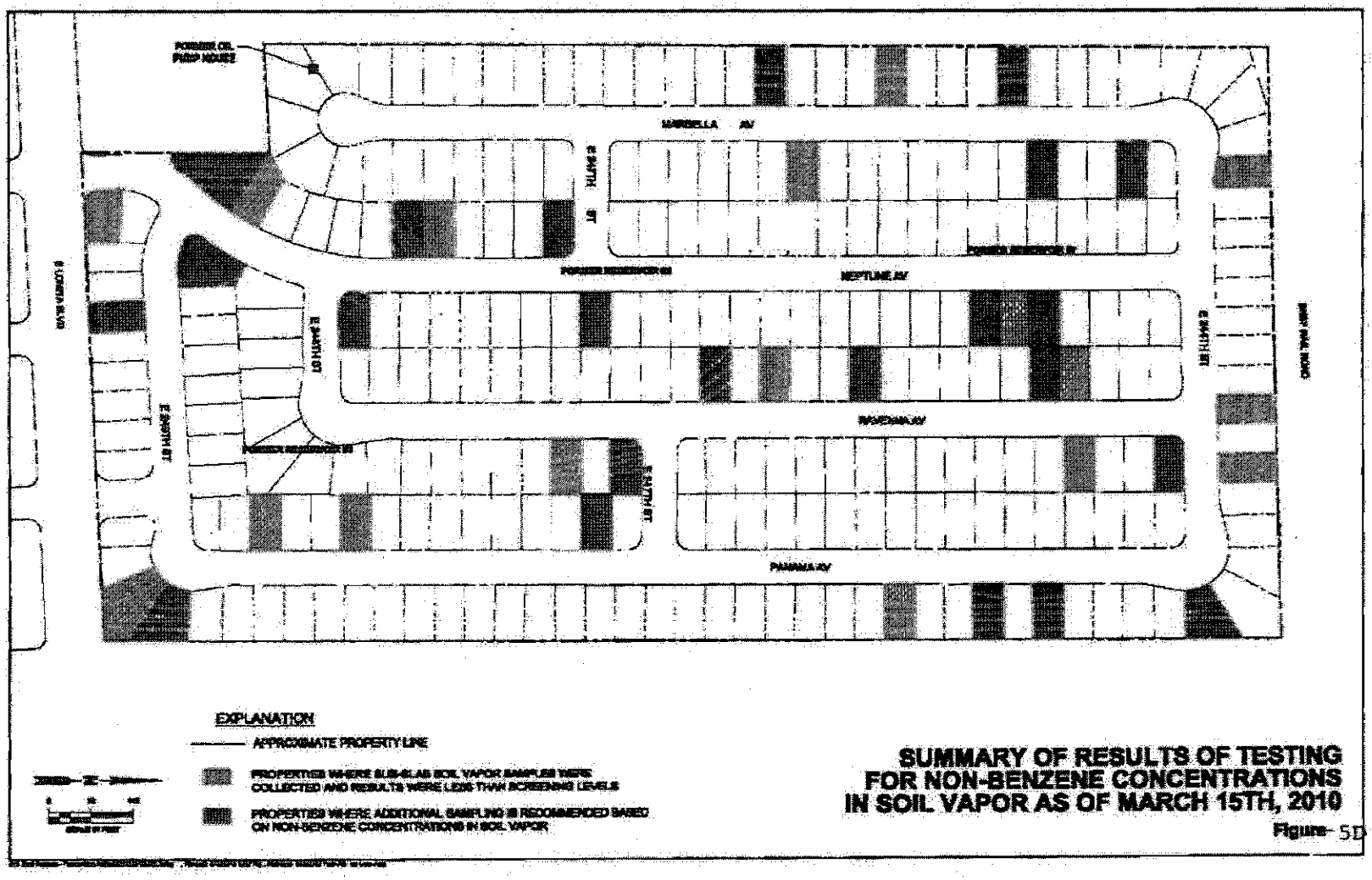
APPROXIMATE PROPERTY LINE

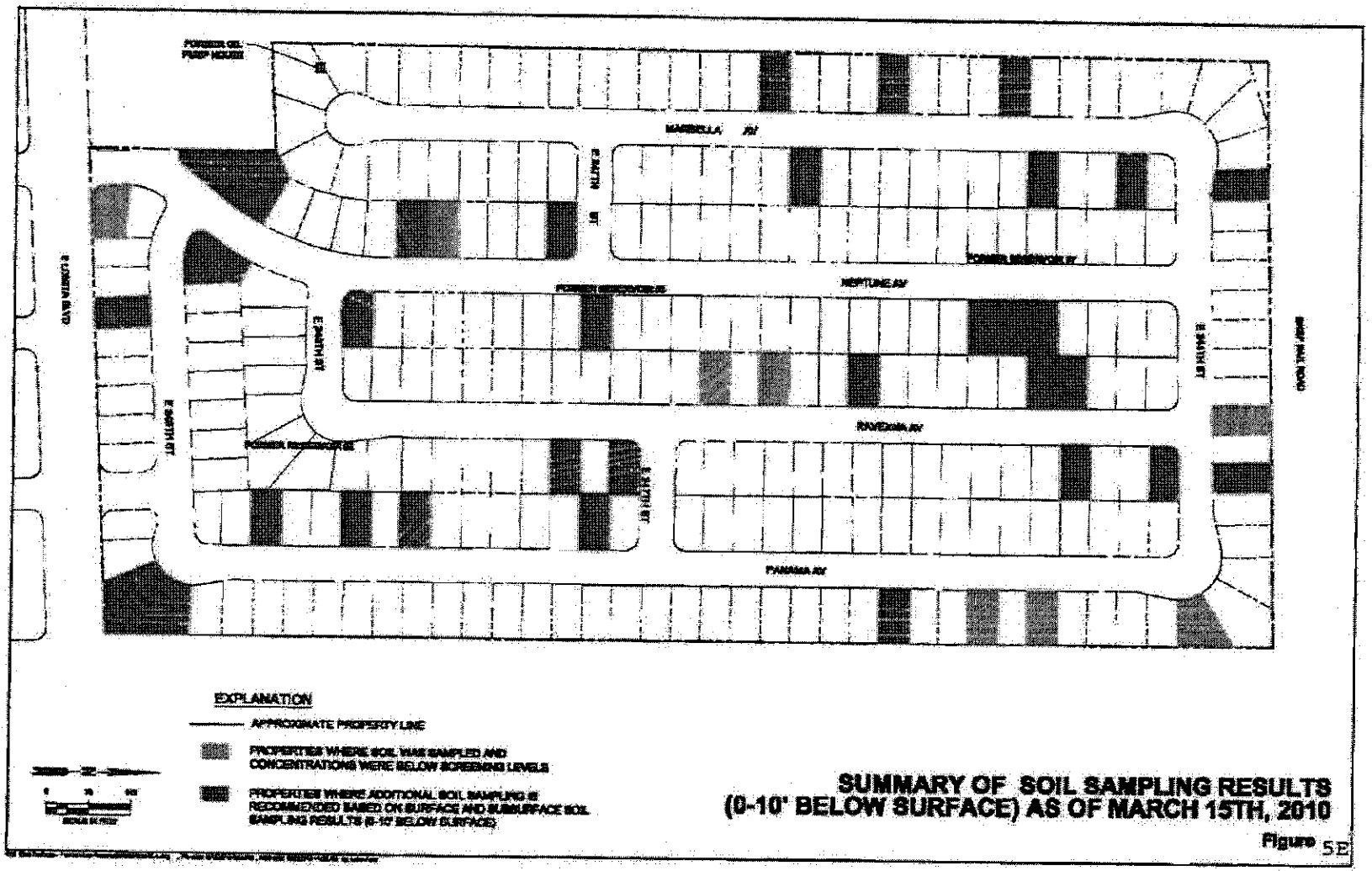
PROPERTIES WHERE SUB-SLAB SOIL VAPOR SAMPLES WERE COLLECTED AND RESULTS WERE LESS THAN SCREENING LEVELS

PROPERTIES WHERE ADDITIONAL SAMPLING IS RECOMMENDED BASED ON BENZENE CONCENTRATIONS IN SOIL VAPOR

SUMMARY OF RESULTS OF TESTING FOR BENZENE CONCENTRATIONS IN SOIL VAPOR AS OF MARCH 15TH, 2010

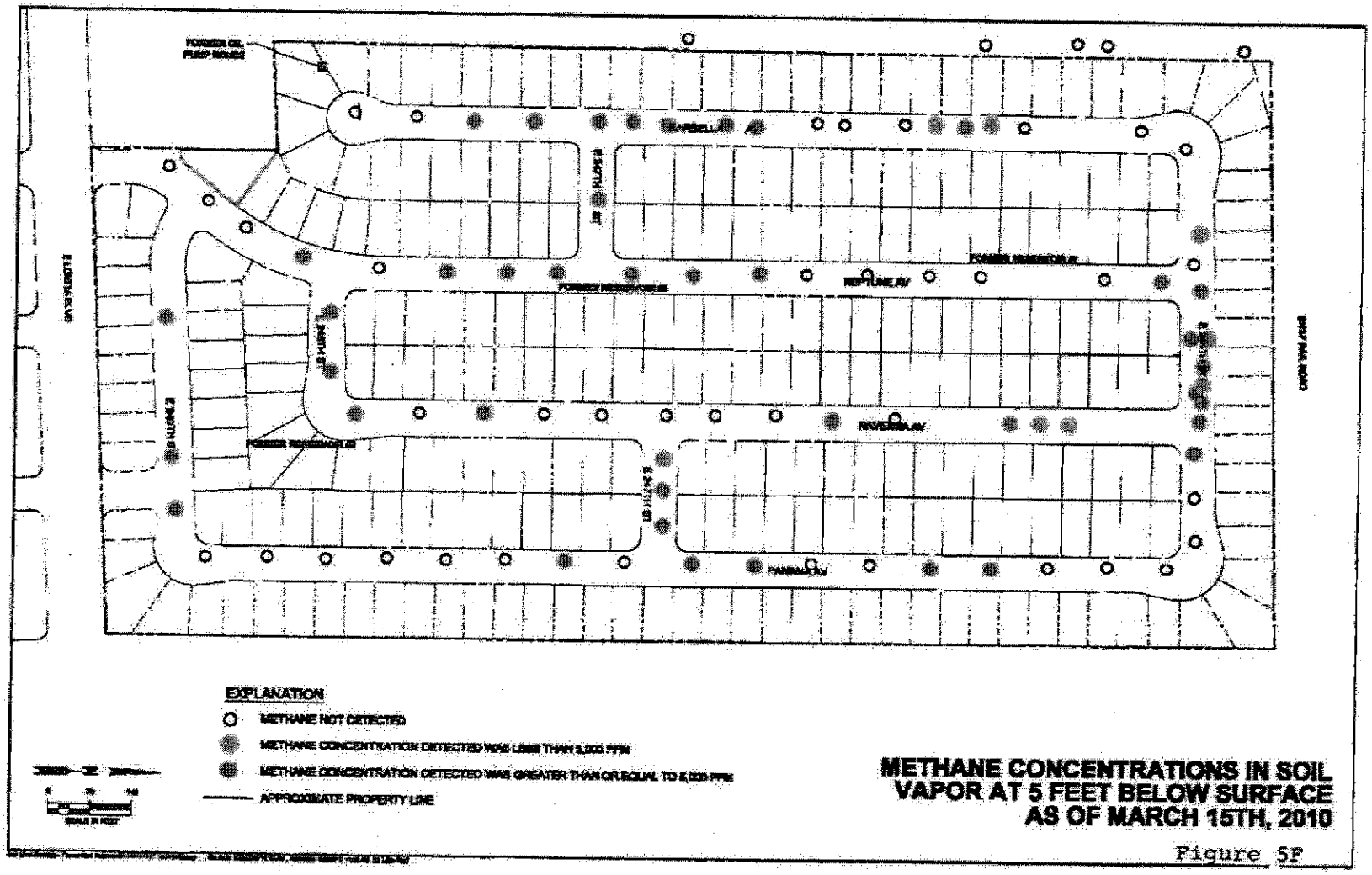
Figure 5C


EXPLANATION
APPROXIMATE PROPERTY LINE
PROPERTIES WHERE SUB-SLAB SOIL VAPOR SAMPLES WERE COLLECTED AND RESULTS WERE LESS THAN SCREENING LEVELS
PROPERTIES WHERE ADDITIONAL SAMPLING IS RECOMMENDED BASED ON NON-BENZENE CONCENTRATIONS IN SOIL VAPOR
SUMMARY OF RESULTS OF TESTING FOR NON-BENZENE CONCENTRATIONS IN SOIL VAPOR AS OF MARCH 15TH, 2010
Figure- 5D



SUMMARY OF SOIL SAMPLING RESULTS (0-10' BELOW SURFACE) AS OF MARCH 15TH, 2010

Figure 5E



METHANE CONCENTRATIONS IN SOIL VAPOR AT 5 FEET BELOW SURFACE AS OF MARCH 15TH, 2010

Figure 5F

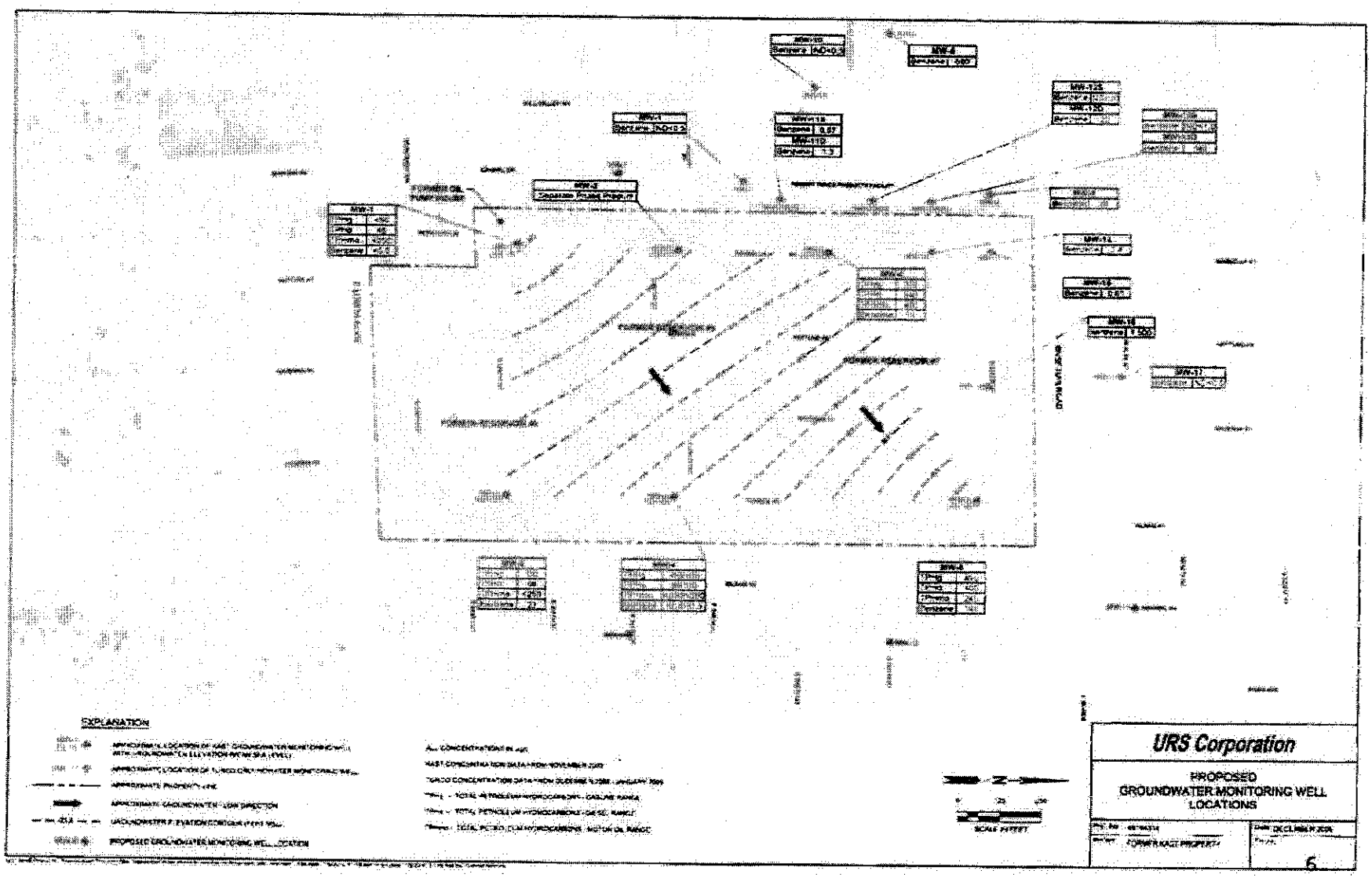

EXPLANATION
URS Corporation
PROPOSED
GROUNDWATER MONITORING WELL
LOCATIONS
FORMER RAGE PROPERTY
DECEMBER 2008
6

Table 1. Data Summary - Phase I & II Site Characterization

Medium	Constituents	Phase	Units	% of Sample Detection	5%ile	25%ile	Median	75%ile	95%ile	Maximum Detected Concentration
Soil	Benzene	I	UG/KG	24.0%	ND 0.445	ND 0.5	ND 0.6	ND 110	4600	34000
		II	UG/KG	55.2%	ND 0.13	ND 0.24	0.405	0.48	180	14000
	Benzo (a) Pyrene	I	MG/KG	0%	ND 0.25	ND 0.25	ND 0.25	ND 1.25	ND 2.5	ND
		II	MG/KG	67.2%	ND 0.0025	ND 0.011	0.25	0.25	2.5	3.6
	Naphthalene	I	MG/KG	22.3%	ND 0.00455	ND 0.0055	ND 0.25	ND	14	29
		II	MG/KG	43.5%	0.0015	0.0041	0.013	ND 0.25	4.7	61
	TPH as Diesel	I	MG/KG	39.4%	ND 2.5	ND 2.5	ND 2.5	2700	13000	22000
		II	MG/KG	71.8%	ND 2.5	ND 2.5	70	470	7300	33000
	TPH as Gasoline	I	MG/KG	40.6%	ND 0.11	ND 0.125	ND 0.14	190	4300	8800
		II	MG/KG	43.7%	ND 0.063	ND 0.10	ND 0.10	0.18	660	5500
	TPH as Motor Oil	I	MG/KG	36.0%	ND 12.5	ND 12.5	ND 12.5	3500	11000	21000
		II	MG/KG	74.7%	ND 12.5	ND 12.5	205	930	8900	41000
Soil Vapor	Methane	I	%	55.1%	ND 0.39	ND 0.42	1.35	12.6	50.3	62.6
		II	%	4.1%	ND 0.00011	ND 0.00012	ND 0.00012	ND 0.00012	ND 0.00024	78
	Benzene	I	UG/L	85.1%	ND 0.0016	0.028	0.10	3.3	150	3800
		II	UG/L	27.6%	ND 0.0018	ND 0.0018	ND 0.0019	0.0038	0.013	6.5
	Naphthalene	I	UG/L	3.4%	ND 0.016	ND 0.12	ND 1.1	ND 8.5	ND 46	1.2
		II	UG/L	26.7%	ND 0.0031	ND 0.0115	ND 0.012	0.0125	0.017	0.18

Shaded cells indicate not-detected result. 1/2 Detection limit reported
Phase II investigation reports submitted to Regional Board as of July 19, 2010

Table 1. Data Summary - Phase I & II Site Characterization

Medium	Constituents	Phase	Units	% of Sample Detection	5%ile	25%ile	Median	75%ile	95%ile	Maximum Detected Concentration
Soil	Benzene	I	UG/KG	24.0%	ND 0.445	ND 0.5	ND 0.6	ND 110	4600	34000
		II	UG/KG	55.2%	ND 0.13	ND 0.24	0.405	0.48	180	14000
	Benzo (a) Pyrene	I	MG/KG	0%	ND 0.25	ND 0.25	ND 0.25	ND 1.25	ND 2.5	ND
		II	MG/KG	67.2%	ND 0.0025	ND 0.011	0.25	0.25	2.5	3.6
	Naphthalene	I	MG/KG	22.3%	ND 0.00455	ND 0.0055	ND 0.25	ND	14	29
		II	MG/KG	43.5%	0.0015	0.0041	0.013	ND 0.25	4.7	61
	TPH as Diesel	I	MG/KG	39.4%	ND 2.5	ND 2.5	ND 2.5	2700	13000	22000
		II	MG/KG	71.8%	ND 2.5	ND 2.5	70	470	7300	33000
	TPH as Gasoline	I	MG/KG	40.6%	ND 0.11	ND 0.125	ND 0.14	190	4300	8800
		II	MG/KG	43.7%	ND 0.063	ND 0.10	ND 0.10	0.18	660	5500
	TPH as Motor Oil	I	MG/KG	36.0%	ND 12.5	ND 12.5	ND 12.5	3500	11000	21000
		II	MG/KG	74.7%	ND 12.5	ND 12.5	205	930	8900	41000
Soil Vapor	Methane	I	%	55.1%	ND 0.39	ND 0.42	1.35	12.6	50.3	62.6
		II	%	4.1%	ND 0.00011	ND 0.00012	ND 0.00012	ND 0.00012	ND 0.00024	78
	Benzene	I	UG/L	85.1%	ND 0.0016	0.028	0.10	3.3	150	3800
		II	UG/L	27.6%	ND 0.0018	ND 0.0018	ND 0.0019	0.0038	0.013	6.5
	Naphthalene	I	UG/L	3.4%	ND 0.016	ND 0.12	ND 1.1	ND 8.5	ND 46	1.2
		II	UG/L	26.7%	ND 0.0031	ND 0.0115	ND 0.012	0.0125	0.017	0.18

Shaded cells indicate not-detected result. 1/2 Detection limit reported
Phase II investigation reports submitted to Regional Board as of July 19, 2010

TABLE 1A
Summary of Soil Sample Analytical Results- VOCs, SVOCs, and TPH
Addendum to the IRAP- Further Site Characterization Report
Former Kast Property

LOCATION NAME			244SV05A7	244SV05A7	244SV05A7
SAMPLE DATE			2/2/2010	2/2/2010	2/2/2010
SAMPLE DEPTH, ft bgs			2.5	5	10
SAMPLE NAME			244SV05A7-2.5	244SV05A7-5	244SV05A7-10
SAMPLE DELIVERY GROUP (SDG)	Method	Unit	10-02-0133	10-02-0133	10-02-0133
1,2,4-Trimethylbenzene	SW8260B	µg/kg	14,000	9,700	33,000
1,3,5-Trimethylbenzene			3,300	300	12,000
Acetone			< 4000	< 4200	< 11000
Benzene			11,000	9,600	3,900
Chlorobenzene			< 80	< 85	< 220
cis-1,2-Dichloroethene			< 80	< 85	< 220
Cumene (Isopropylbenzene)			4,000	4,500	6,300
Ethylbenzene			12,000	12,000	19,000
Methyl-tert-Butyl Ether			< 160	< 170	< 440
Naphthalene			7,300	7,200	9,800
n-Butylbenzene			2,800	2,400	5,100
p-Isopropyltoluene			2,500	1,800	5,000
Propylbenzene			6,200	6,800	9,600
sec-Butylbenzene			2,100	2,500	3,500
tert-Butylbenzene			94	120	< 220
Toluene			< 80	< 85	< 220
Vinyl Acetate			< 800	< 850	< 2200
Xylenes, Total			7,300	2,500	56,000
1-Methylnaphthalene	SW8270C	mg/kg	19	9.9	13
2-Methylnaphthalene			28	16	21
Fluorene			< 5.0	< 5.0	< 5.0
Naphthalene			11	7.8	10
Phenanthrene			7.4	< 5.0	< 5.0
Pyrene			< 5.0	< 5.0	< 5.0
TPH as Gasoline	M8015	mg/kg	2,500	2,500	5,000
TPH as Motor Oil	M8015	mg/kg	8,100	6,200	6,700
TPH as Diesel	SW8015B	mg/kg	65,000	6,500	6,600

Notes:

Bold text indicates results above laboratory reporting limit.

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

ft bgs = feet below ground surface

TABLE 2D
Summary of Soil Vapor Analytical Results - VOCs and Fixed Gases
IRAP Further Site Characterization
Former Kast Property

LOCATION NAME			244-SV-05A5	244-SV-05A6	244-SV-05A7
SAMPLE DATE			2/4/2010	2/4/2010	2/4/2010
SAMPLE DEPTH, FT BGS			2.5	5	10
SAMPLE NAME			244-SV05A5-2.5	244-SV05A6-5	244-SV05A7-10
SAMPLE DELIVERY GROUP (SDG)	Method	Unit	1002129A/B	1002129A/B	1002129A/B
1,2,4-Trimethylbenzene	TO15	UG/M3	18000	< 2800	31000
1,3,5-Trimethylbenzene			< 6200	< 2800	6800
4-Ethyltoluene			17000	< 2800	20000
Benzene			390000 j	430000 j	630000
Cumene (isopropylbenzene)			7600	8200	14000
Cyclohexane			1800000 j	470000 j	2700000 E
Ethylbenzene			50000	44000	85000
Heptane			1000000 j	< 2400	120000
Hexane			1900000 j	3300 j	250000
Naphthalene			590 J b	760 J b	1300 J b
o-Xylene			20000	< 2500	< 4900
p/m-Xylene			110000	< 2500	120000
Propylbenzene			8400	9300	15000
Toluene			33000	< 2200	< 4200
Carbon Dioxide	D1946	%	5.2	0.89	11
Methane			23	0.086	25
Oxygen			4.5	20	7.3

Notes:

Bold text indicates results above laboratory reporting limit.

$\mu g/m^3$ = micrograms per cubic meter

% = percent

B = Compound detected in associated laboratory method blank (laboratory qualified)

J = Estimated value (laboratory qualified)

b = Compound detected in associated laboratory method blank (qualified during validation)

j = Estimated value (qualified during validation as the result is possibly biased high)

E = Estimated value. Result exceeded instrument calibration range during analysis

FT BGS = Feet below ground surface

Table 3

Maximum Concentrations of Aliphatic and Aromatic Hydrocarbons by Hydrocarbon Fractionation at Individual Properties

Street Name	House No	Units	Aliphatics (C5 - C8)	Aromatics (C6 - C8)	Aliphatics (C9 - C18)	Aromatics (C9 - C16)	Aliphatics (C19 - C32)	Aromatics (C17 - C32)
244TH ST	351	MG/KG	ND	ND	ND	ND	46	26
244TH ST	361	MG/KG	ND	ND	ND	ND	30	29
249TH ST	345	MG/KG	0.84	ND	140	300	220	240
249TH ST	352	MG/KG	ND	ND	ND	17	46	59
249TH ST	412	MG/KG	ND	0.014	ND	39	80	71
MARBELLA AVE	24412	MG/KG	2300	2	4100	2400	3100	4400
MARBELLA AVE	24426	MG/KG	2.2	0.1	220	240	340	210
MARBELLA AVE	24433	MG/KG	ND	ND	1300	6800	7200	6000
MARBELLA AVE	24517	MG/KG	ND	ND	ND	15	12	27
MARBELLA AVE	24532	MG/KG	350	54	1000	1200	1900	1600
MARBELLA AVE	24603	MG/KG	2	0.058	980	2400	1300	2000
NEPTUNE AVE	24422	MG/KG	1.4	ND	79	170	190	180
NEPTUNE AVE	24426	MG/KG	ND	ND	37	63	99	92
NEPTUNE AVE	24502	MG/KG	0.64	ND	32	72	94	110
NEPTUNE AVE	24632	MG/KG	ND	ND	51	220	300	420
NEPTUNE AVE	24703	MG/KG	68	2.5	1100	2500	2000	2300
NEPTUNE AVE	24725	MG/KG	ND	ND	ND	ND	ND	ND
NEPTUNE AVE	24729	MG/KG	ND	ND	ND	ND	37	35
NEPTUNE AVE	24738	MG/KG	710	130	2100	2000	1900	1300
NEPTUNE AVE	24815	MG/KG	ND	ND	ND	ND	100	54
NEPTUNE AVE	24825	MG/KG	ND	ND	ND	22	84	160
NEPTUNE AVE	24912	MG/KG	ND	ND	ND	ND	12	10
PANAMA AVE	24406	MG/KG	ND	ND	ND	56	260	250
PANAMA AVE	24430	MG/KG	ND	ND	ND	ND	ND	ND
PANAMA AVE	24502	MG/KG	ND	ND	ND	ND	ND	ND
PANAMA AVE	24518	MG/KG	ND	ND	17	48	110	130
PANAMA AVE	24709	MG/KG	2.8	1.1	1100	6100	5100	7200
PANAMA AVE	24739	MG/KG	5.9	0.25	14	240	96	250
PANAMA AVE	24809	MG/KG	53	3.8	220	520	440	570
PANAMA AVE	24823	MG/KG	210	ND	610	540	560	1000
PANAMA AVE	24838	MG/KG	ND	ND	ND	22	98	130
RAVENNA AVE	24402	MG/KG	680	60	680	630	920	730
RAVENNA AVE	24416	MG/KG	3.8	0.32	640	1500	2000	1900
RAVENNA AVE	24419	MG/KG	1.2	0.07	280	510	790	890
RAVENNA AVE	24423	MG/KG	780	23	820	830	700	600
RAVENNA AVE	24523	MG/KG	2.4	0.16	100	250	210	290
RAVENNA AVE	24603	MG/KG	ND	ND	ND	ND	15	ND
RAVENNA AVE	24613	MG/KG	76	ND	500	340	590	760
RAVENNA AVE	24700	MG/KG	ND	ND	15	67	340	410
RAVENNA AVE	24712	MG/KG	1.1	0.013	140	130	240	360

Note: The concentrations shown are the maximum concentration detected at each property.

The maximum concentration of aliphatic or aromatic hydrocarbons in a particular carbon-chain range may not occur in the same sample as the maximum concentrations in a different carbon-chain range.

Table 4: Target Schedule

Task	Estimated Start Date	Target Completion Date	Schedule (on, ahead or behind)	Comments
Pilot Testing Work Plan	03/11/11	05/10/11		Within 60 days of the issuance of the CAO
Regional Board review of Pilot Testing Work Plan	05/11/11	07/11/11		Regional Board reviews Report and issues Response and approval
Pilot Test Report	07/12/11	11/07/11		Final Report due within 120 days with a bi monthly progress reporting
Environmental Impact Assessment (EIA) Report	NA	12/07/11		Within 30 days of the completion of the Pilot Testing Report
Regional Board Review of Pilot Test and EIA Reports	11/08/11	01/09/12		Review of Piolot Test & EIA Reports and Response
Site- Specific Cleanup Goals (SSCG)	NA	11/07/11		Due date is concurrent with the Pilot Test Report due date.
30 day Public Review of SSCG	11/08/11	12/08/11		
Remedial Action Plan (RAP)	01/11/12	03/11/12		Within 30 days of the completion of the Pilot Testing Report
30 day Public Review of RAP	03/12/12	04/12/12		
Regional Board Review of Remedial Action Plan	04/13/12	06/13/12		
Implementation of RAP	06/20/12			
Groundwater Monitoring and Reporting	On going			Quarterly Monitoring Program

Notes: (1) Dates are considered estimates and subject to revision in response to evolving field conditions and potential weather-related delays.
(2) Project schedule reconciled/updated at the end of each calendar month.

Exhibit 1

Office of Environmental Health Hazard Assessment

Joan E. Denton, Ph.D., Director
Headquarters • 1001 I Street • Sacramento, California 95814
Mailing Address: P.O. Box 4010 • Sacramento, California 95812-4010
Oakland Office • Mailing Address: 1515 Clay Street, 16th Floor • Oakland, California 94612

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Dr. Teklewold Ayalew
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.,
Lead Staff Toxicologist
Integrated Risk Assessment Branch

DATE: May 19, 2010

SUBJECT: TPH DATA FOR 41 HOMES AT THE FORMER KAST SITE IN CARSON, CA (R4-09-17) OEHHA # 880212-01

Document reviewed

- Memo: "Kast TPH Data for 41 homes" dated April 6, 2010.

Site characterization

- Analytical data for TPH in soils data are supplied for 41 homes. Sample depths are not always stated but those that are provided are either 0.5 or 5 feet.

Hazard Assessment

Based on the data in the memo, I estimated maximum exposures for a child and compared the resulting exposure estimates to DTSC reference dosages (RfDs).

- In the table below, columns 3-8 show the maximum TPH concentrations detected at each property.
- Columns 9-14 show the corresponding TPH ingestion by a 15 kg child ingesting 200 mg soil per day.
- Columns 15-20 show the corresponding hazard quotients for a 15 kg child, obtained by dividing the daily ingestion by the reference dose. Hazard quotients exceeding unity are in bold font.

Street Name	House No	Aliphatics (C5 - C8)	Aromatics (C6 - C8)	Aliphatics (C9 – C18)	Aromatics (C9 - C16)	Aliphatics (C19 - C32)	Aromatics (C17 - C32)	Aliphatics (C5 - C8)	Aromatics (C6 - C8)	Aliphatics (C9 - C18)	Aromatics (C9 - C16)	Aliphatics (C19 - C32)	Aromatics (C17 - C32)	Aliphatics (C5 - C8)	Aromatics (C6 - C8)	Aliphatics (C9 - C18)	Aromatics (C9 - C16)	Aliphatics (C19 - C32)	Aromatics (C17 - C32)
		Detected concentrations (mg/kg)						Estimated child dose (mg/kg/day)						Hazard ratio (child)					
244TH ST	351	ND	ND	ND	ND	46	26					6.1E-4	3.5E-4	0.0E+0	*	0.0E+0	0.0E+0	3.1E-4	1.2E-2
244TH ST	361	ND	ND	ND	ND	30	29					4.0E-4	3.9E-4	0.0E+0	*	0.0E+0	0.0E+0	2.0E-4	1.3E-2
249TH ST	345	0.84	ND	140	300	220	240	1.1E-5		1.9E-3	4.0E-3	2.9E-3	3.2E-3	2.8E-4	*	1.9E-2	1.3E-1	1.5E-3	1.1E-1
249TH ST	352	ND	ND	ND	17	48	59				2.3E-4	6.4E-4	7.9E-4	0.0E+0	*	0.0E+0	7.6E-3	3.2E-4	2.6E-2
249TH ST	412	ND	0.014	ND	39	80	71				5.2E-4	1.1E-3	9.5E-4	0.0E+0	*	0.0E+0	1.7E-2	5.3E-4	3.2E-2
MARBELLA AVE	24412	2300	2	4100	2400	3100	4400	3.1E-2	2.7E-5	5.5E-2	3.2E-2	4.1E-2	5.9E-2	7.7E-1	*	5.5E-1	**1.1**	2.1E-2	**2.0**
MARBELLA AVE	24426	2.2	0.1	220	240	340	210	2.9E-5	1.3E-6	2.9E-3	3.2E-3	4.5E-3	2.8E-3	7.3E-4	*	2.9E-2	1.1E-1	2.3E-3	9.3E-2
MARBELLA AVE	24433	ND	ND	1300	6800	7200	6000			1.7E-2	9.1E-2	9.6E-2	8.0E-2	0.0E+0	*	1.7E-1	**3.0**	4.8E-2	**2.7**
MARBELLA AVE	24517	ND	ND	ND	15	12	27				2.0E-4	1.6E-4	3.6E-4	0.0E+0	*	0.0E+0	6.7E-3	8.0E-5	1.2E-2
MARBELLA AVE	24532	350	54	1000	1200	1900	1600	4.7E-3	7.2E-4	1.3E-2	1.6E-2	2.5E-2	2.1E-2	1.2E-1	*	1.3E-1	5.3E-1	1.3E-2	7.1E-1
MARBELLA AVE	24603	2	0.058	980	2400	1300	2000	2.7E-5	7.7E-7	1.3E-2	3.2E-2	1.7E-2	2.7E-2	6.7E-4	*	1.3E-1	**1.1**	8.7E-3	8.9E-1
NEPTUNE AVE	24422	1.4	ND	79	170	190	180	1.9E-5		1.1E-3	2.3E-3	2.5E-3	2.4E-3	4.7E-4	*	1.1E-2	7.6E-2	1.3E-3	8.0E-2
NEPTUNE AVE	24426	ND	ND	37	63	99	92			4.9E-4	8.4E-4	1.3E-3	1.2E-3	0.0E+0	*	4.9E-3	2.8E-2	6.6E-4	4.1E-2
NEPTUNE AVE	24502	0.64	ND	32	72	94	110	8.5E-6		4.3E-4	9.6E-4	1.3E-3	1.5E-3	2.1E-4	*	4.3E-3	3.2E-2	6.3E-4	4.9E-2
NEPTUNE AVE	24632	ND	ND	51	220	300	420			6.8E-4	2.9E-3	4.0E-3	5.6E-3	0.0E+0	*	6.8E-3	9.8E-2	2.0E-3	1.9E-1
NEPTUNE AVE	24703	68	2.5	1100	2500	2000	2300	9.1E-4	3.3E-5	1.5E-2	3.3E-2	2.7E-2	3.1E-2	2.3E-2	*	1.5E-1	**1.1**	1.3E-2	**1.02**
NEPTUNE AVE	24725	ND	ND	ND	ND	ND	ND							0.0E+0	*	0.0E+0	0.0E+0	0.0E+0	0.0E+0
NEPTUNE AVE	24729	ND	ND	ND	ND	37	35					4.9E-4	4.7E-4	0.0E+0	*	0.0E+0	0.0E+0	2.5E-4	1.6E-2
NEPTUNE AVE	24738	710	130	2100	2000	1900	1300	9.5E-3	1.7E-3	2.8E-2	2.7E-2	2.5E-2	1.7E-2	2.4E-1	*	2.8E-1	8.9E-1	1.3E-2	5.8E-1
NEPTUNE AVE	24815	ND	ND	ND	ND	100	54					1.3E-3	7.2E-4	0.0E+0	*	0.0E+0	0.0E+0	6.7E-4	2.4E-2
NEPTUNE AVE	24825	ND	ND	ND	22	84	160				2.9E-4	1.1E-3	2.1E-3	0.0E+0	*	0.0E+0	9.8E-3	5.6E-4	7.1E-2
NEPTUNE AVE	24912	ND	ND	ND	ND	12	10					1.6E-4	1.3E-4	0.0E+0	*	0.0E+0	0.0E+0	8.0E-5	4.4E-3
PANAMA AVE	24406	ND	ND	ND	56	260	250				7.5E-4	3.5E-3	3.3E-3	0.0E+0	*	0.0E+0	2.5E-2	1.7E-3	1.1E-1
PANAMA AVE	24430	ND	ND	ND	ND	ND	ND							0.0E+0	*	0.0E+0	0.0E+0	0.0E+0	0.0E+0
PANAMA AVE	24502	ND	ND	ND	ND	ND	ND							0.0E+0	*	0.0E+0	0.0E+0	0.0E+0	0.0E+0
PANAMA AVE	24518	ND	ND	17	48	110	130			2.3E-4	6.4E-4	1.5E-3	1.7E-3	0.0E+0	*	2.3E-3	2.1E-2	7.3E-4	5.8E-2
PANAMA AVE	24709	2.8	1.1	1100	6100	5100	7200	3.7E-5	1.5E-5	1.5E-2	8.1E-2	6.8E-2	9.6E-2	9.3E-4	*	1.5E-1	**2.7**	3.4E-2	**3.2**
PANAMA AVE	24739	5.9	0.25	14	240	96	250	7.9E-5	3.3E-6	1.9E-4	3.2E-3	1.3E-3	3.3E-3	2.0E-3	*	1.9E-3	1.1E-1	6.4E-4	1.1E-1
PANAMA AVE	24809	53	3.8	220	520	440	570	7.1E-4	5.1E-5	2.9E-3	6.9E-3	5.9E-3	7.6E-3	1.8E-2	*	2.9E-2	2.3E-1	2.9E-3	2.5E-1

PANAMA AVE	24823	210	ND	610	540	560	1000	2.8E-3		8.1E-3	7.2E-3	7.5E-3	1.3E-2	7.0E-2	*	8.1E-2	2.4E-1	3.7E-3	4.4E-1
PANAMA AVE	24838	ND	ND	ND	22	96	130				2.9E-4	1.3E-3	1.7E-3	0.0E+0	*	0.0E+0	9.8E-3	6.4E-4	5.8E-2
RAVENNA AVE	24402	680	60	680	630	920	730	9.1E-3	8.0E-4	9.1E-3	8.4E-3	1.2E-2	9.7E-3	2.3E-1	*	9.1E-2	2.8E-1	6.1E-3	3.2E-1
RAVENNA AVE	24416	3.8	0.32	640	1500	2000	1900	5.1E-5	4.3E-6	8.5E-3	2.0E-2	2.7E-2	2.5E-2	1.3E-3	*	8.5E-2	6.7E-1	1.3E-2	8.4E-1
RAVENNA AVE	24419	1.2	0.07	280	510	790	890	1.6E-5	9.3E-7	3.7E-3	6.8E-3	1.1E-2	1.2E-2	4.0E-4	*	3.7E-2	2.3E-1	5.3E-3	4.0E-1
RAVENNA AVE	24423	780	23	820	830	700	600	1.0E-2	3.1E-4	1.1E-2	1.1E-2	9.3E-3	8.0E-3	2.6E-1	*	1.1E-1	3.7E-1	4.7E-3	2.7E-1
RAVENNA AVE	24523	2.4	0.16	100	250	210	290	3.2E-5	2.1E-6	1.3E-3	3.3E-3	2.8E-3	3.9E-3	8.0E-4	*	1.3E-2	1.1E-1	1.4E-3	1.3E-1
RAVENNA AVE	24603	ND	ND	ND	ND	15	ND					2.0E-4		0.0E+0	*	0.0E+0	0.0E+0	1.0E-4	0.0E+0
RAVENNA AVE	24613	76	ND	500	340	590	760	1.0E-3		6.7E-3	4.5E-3	7.9E-3	1.0E-2	2.5E-2	*	6.7E-2	1.5E-1	3.9E-3	3.4E-1
RAVENNA AVE	24700	ND	ND	15	67	340	410			2.0E-4	8.9E-4	4.5E-3	5.5E-3	0.0E+0	*	2.0E-3	3.0E-2	2.3E-3	1.8E-1
RAVENNA AVE	24712	1.1	0.013	140	130	240	360	1.5E-5	1.7E-7	1.9E-3	1.7E-3	3.2E-3	4.8E-3	3.7E-4	*	1.9E-2	5.8E-2	1.6E-3	1.6E-1
RfD								0.04		0.1	0.03	2	0.03	* = No RfD					

- Aromatic hydrocarbons in the C-9 to C-32 range at 24412, 24433, and 24603 Marbella Avenue, 24709 Panama Avenue, and 24703 Panama Neptune exceed their reference values for children (i.e. the hazard quotient is ≥ 1.
- While a hazard quotient ≥ 1does not indicate that there will be definite toxic effects, it does indicate that the concentration exceeds the level that we can say is definitely safe.

Conclusions

- Aromatic hydrocarbons in the C-9 to C-32 range at five properties exceed their reference values for children (i.e. the hazard quotient is ≥ 1).

If you have any questions, do not hesitate to call or e-mail me at 916-323-2635 or JCarlisle@OEHHA.CA.gov, respectively.

Memo reviewed by:

Ned Butler, PhD
Staff Toxicologist
Integrated Risk Assessment Branch

Exhibit 2

Shell Oil Company
One Shell Plaza
910 Louisiana Street
Houston, TX 77002
Tel (713) 241 5126
Email: ed.platt@shell.com
Internet http://www.shell.com

May 5, 2010

Ms. Tracy Egoscue
Executive Officer
California Regional Water Quality Control Board
Los Angeles Region
320 W. 4th Street, Suite 200
Los Angeles, CA 90013

Reference: Former Kast Property, Carson, California
Site Cleanup No. 1230; Site ID 2040330

Dear Ms Egoscue:

As you know, during the past several months, Shell Oil Company employees and contractors have worked tirelessly to investigate and address the environmental issues at the former Kast Property. To date, we have sampled at approximately one-third of the homes in the Carousel neighborhood, and we will continue our work in conjunction with the RWQCB, based upon applicable and appropriate scientific and regulatory standards that are protective of human health and the environment. Like the RWQCB, our goal is to protect the residents of the Carousel neighborhood and address the environmental issues, while minimizing disruption to residents and preserving the integrity of the community.

Although elevated levels of compounds of concern (COCs) have been found beneath the streets and at certain residential properties, based on the data collected so far, there is no imminent risk to residents or the public in the Carousel neighborhood. Also, while Shell's investigation is not yet complete, it does not appear at this time that there is any significant off-site migration of soil impacts or soil vapor impacts from the former Kast Property.

Our approach, which is to develop a coherent conceptual framework for the mitigation and remediation of the Carousel neighborhood, is consistent with the RWQCB's guidelines providing for a principled, phased approach to investigating and remediating environmental impacts. Specifically, this approach follows the guidance set out in the State Water Resources Control Board's Resolution 92-49. In accordance with these guidelines, it includes "an evaluation of cleanup alternatives that are feasible at the site" and consistent with the maximum benefit to the people of the State. Because the soil and groundwater assessment is ongoing, a full evaluation of cleanup alternatives is premature at this time.

Nevertheless, we are considering a variety of potential alternatives that can be applied at specific properties and in the public streets in order to address environmental impacts and avoid any significant risk to human health in the Carousel neighborhood. For example, Shell has submitted a work plan for the soil vapor extraction pilot test. While evaluating alternatives, we place a priority on keeping the community intact and minimizing any disruption to residents of the Carousel community. If it becomes necessary for residents to relocate temporarily to perform this work, Shell will take appropriate steps to minimize any inconvenience and compensate them for any resulting expenses. We are also sensitive to the residents' concerns about their property values and are open to a dialogue with the RWQCB regarding these issues.

In addition, Shell is continuing to monitor the groundwater to ensure that there are no significant impacts emanating from the former Kast Property. In this regard, it is essential that groundwater conditions both up-gradient and down-gradient be evaluated. To date, our investigation suggests that groundwater up-gradient of the former Kast property is significantly contaminated. One potential source of this contamination appears to be the former Fletcher Oil Refinery, which we understand the County Sanitation District is remediating.

We look forward to further dialogue with the RWQCB regarding the draft Feasibility Study outline, recently submitted, as well as the Site Conceptual Model, to be submitted later this month. The Site Conceptual Model will provide: (1) an overview of our investigation efforts to date; (2) additional information regarding potential on and off-site sources for the COCs; and (3) a review of the available options for remediation of the former Kast property.

We appreciate your leadership on this project.

Sincerely,

William E. Platt
Manager, Environmental Claims
Shell Oil Company

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.

Comments and Directives on Shell's Proposed SSCGs

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
Shahin Nourishad, Los Angeles County Fire Department
Miguel Garcia, Los Angeles County Fire Department
Alfonso Medina, Los Angeles County Department of Health
Cole Landowski, Los Angeles County Department of Health
Angelo Bellomo, Los Angeles County Department of Health
Karen A. Lyons, Shell Oil Products US
Roy Patterson, URS Corporation
Chris Osterberg, URS Corporation
Michelle Vega, Edelman
Robert Ettinger, Geosyntec
Mark Grivetti, Geosyntec
Thomas V. Girardi, Girardi and Keese Lawyers
Robert W. Bowcock, Integrated Resources Management, LLC

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Matthew Rodriquez
Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

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 95^{th} 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

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.
        - (f) 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.

  <u>Concern/Issue:</u>

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. This is appropriate 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." This was not done.

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.

References

Cal-EPA, 2013. Human Health Risk Assessment (HHRA) Note, HERO HHRA Note Number 3, regarding DTSC recommend methodology for use of USEPA Regional Screening Levels (RSLS) in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities. Issue date May 21, 2013 with interpretation of the earlier version (assumed to be August 2012) version of the note.

Cal-EPA, 2011. Human Health Risk Assessment (HHRA) Note, HERO HHRA Note Number 4, regarding Screening Level Human Health Risk Assessments, Issue date June 9, 2011.

Cal-EPA, 2011b. Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance), Department of Toxic Substances Control , California Environmental Protection Agency, October 2011.

Cal-EPA, January 2005. Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, Integrated Risk Assessment Section, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, November 2004, January 2005 Revision.

USEPA, 2001. RAGS. Vol 3. Part A.

USEPA ,2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.

USEPA ,1996. Soil Screening Guidance: Technical Background Document.

USEPA, 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. (IEUBK) Office of Research and Development,

Washington, D.C. EPA/540/R-93/081.

EPA, 2003a. Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, Final. EPA-540-R-03-001, OSWER 9285.7-54, December 1996 finalized January 2003.

EPA, 2003b. Assessing Intermittent or Variable Exposures at Lead Sites,. EPA-540-R-03-008, OSWER #9285.7-76.

California Water Boards

Edmund G. Brown Jr., Governor

Matthew Rodriguez, 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 C.P.
Los Angeles Regional Water Quality Control Board

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.

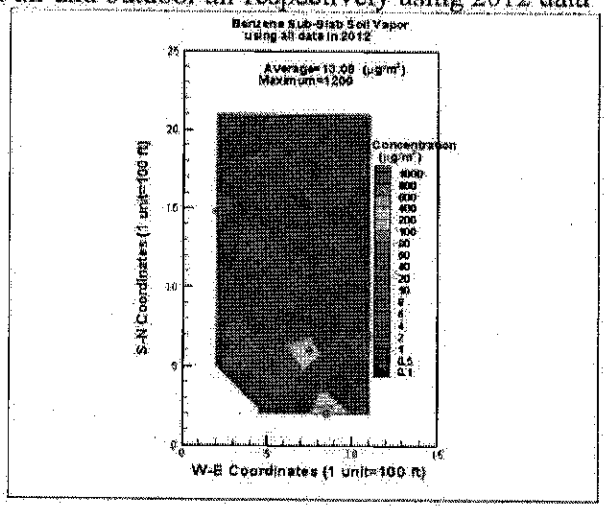
References:

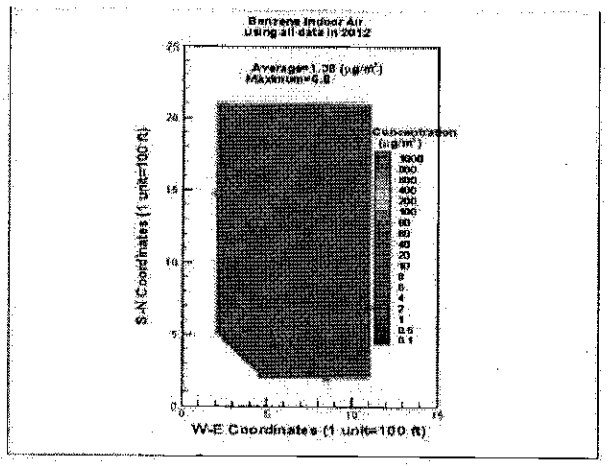
1."Site-specific Cleanup Goal Report for Former Kast Property", prepared by Geosyntech Consultants, February 22, 2013.

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





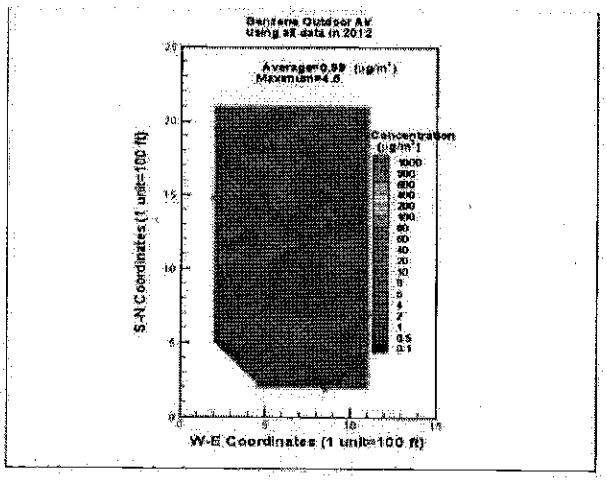
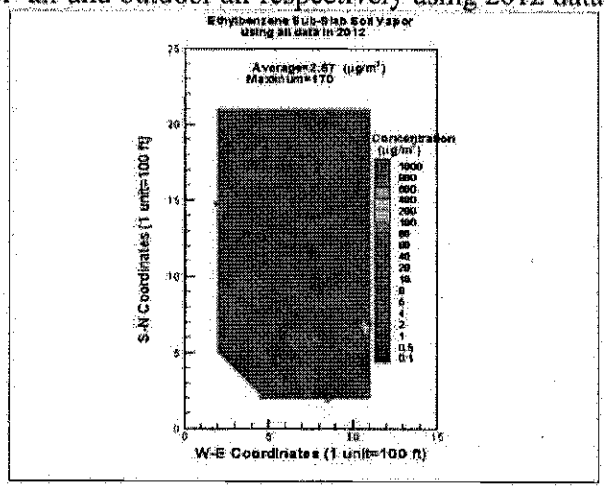
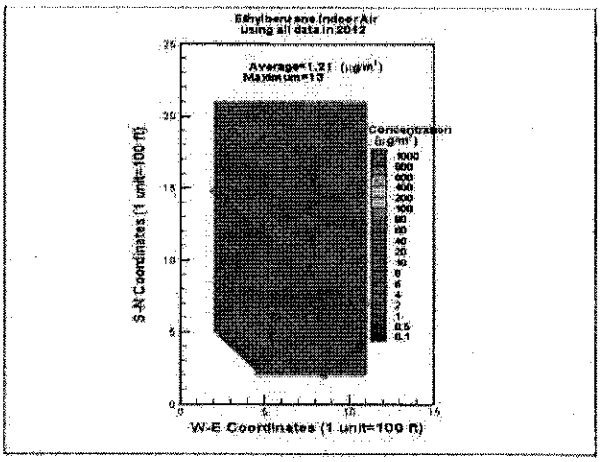


Figure 2 Spatial distribution of Ethylbenzene concentrations for sub-slab soil vapor, indoor air and outdoor air respectively using 2012 data





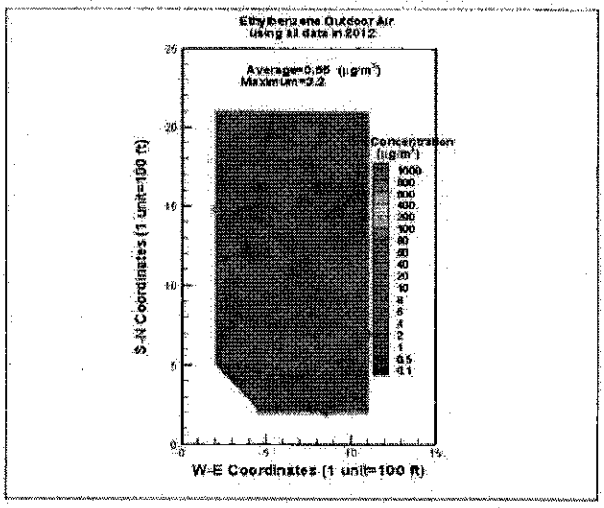
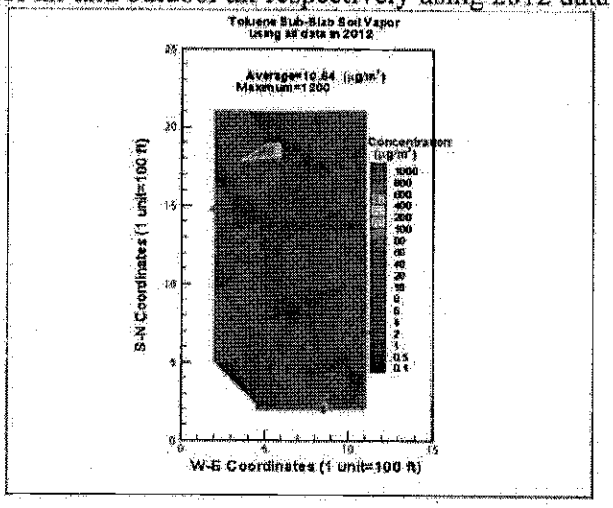
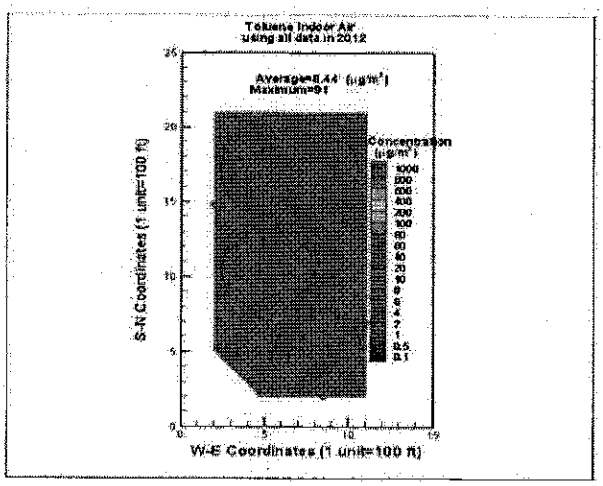


Figure 3 Spatial distribution of Toluene concentrations for sub-slab soil vapor, indoor air and outdoor air respectively using 2012 data





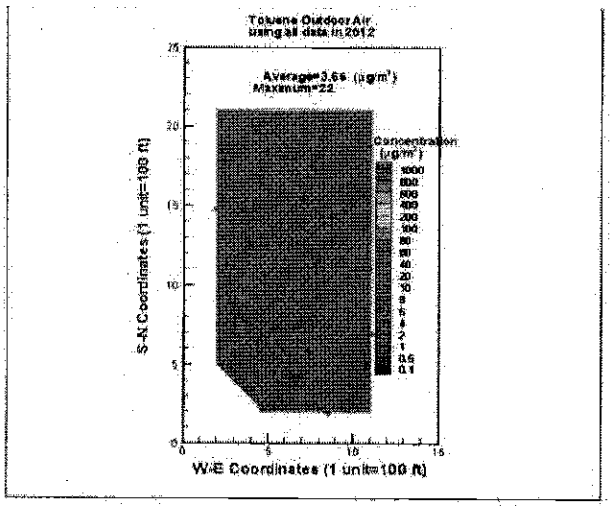
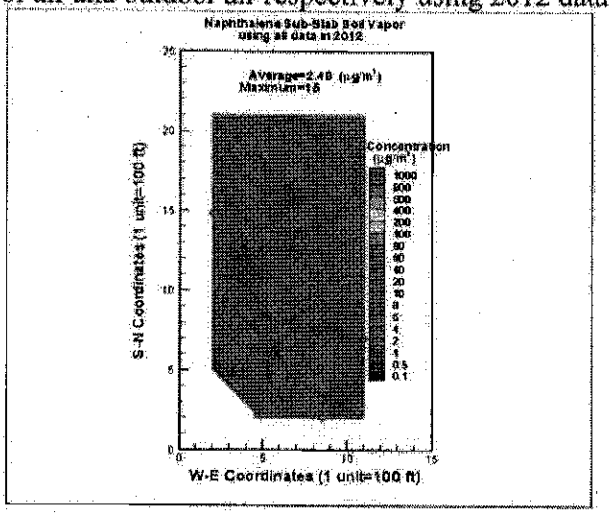
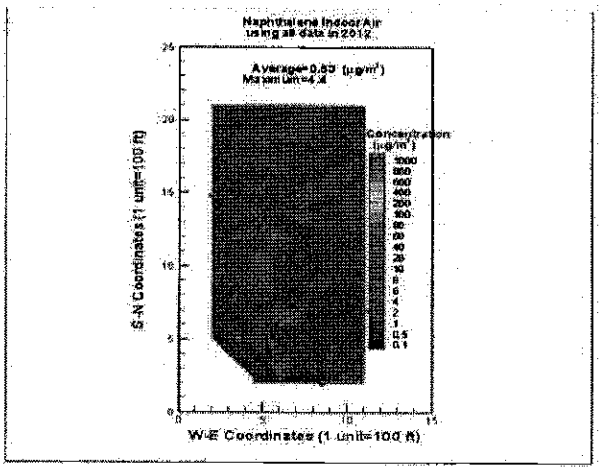


Figure 4 Spatial distribution of Naphthalene concentrations for sub-slab soil vapor, indoor air and outdoor air respectively using 2012 data





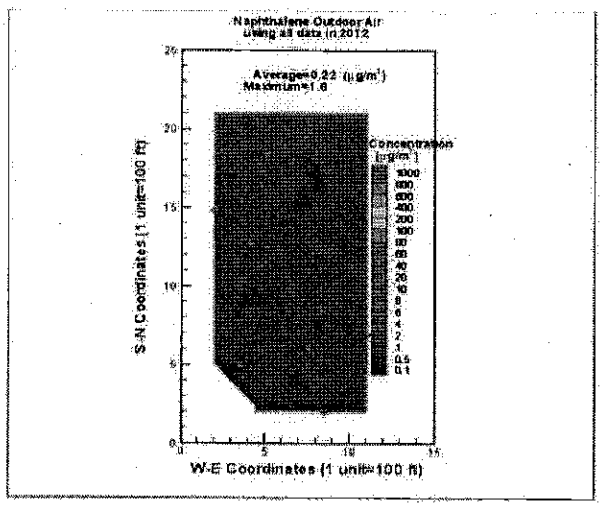


Table 1 Mean and maximum concentrations of petroleum hydrocarbon compounds in different spatial layers based on measured data at the Site in 2012

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

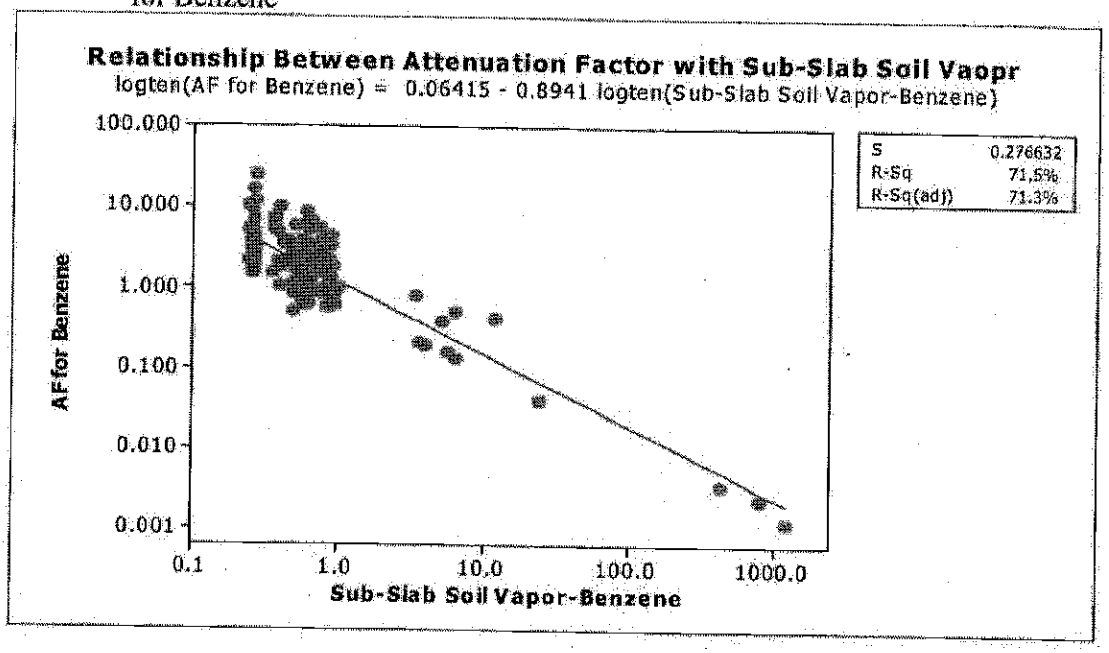


Figure 6 Vapor attenuation factor vs. sub-slab soil vapor in log-log scale for Ethylbenzene

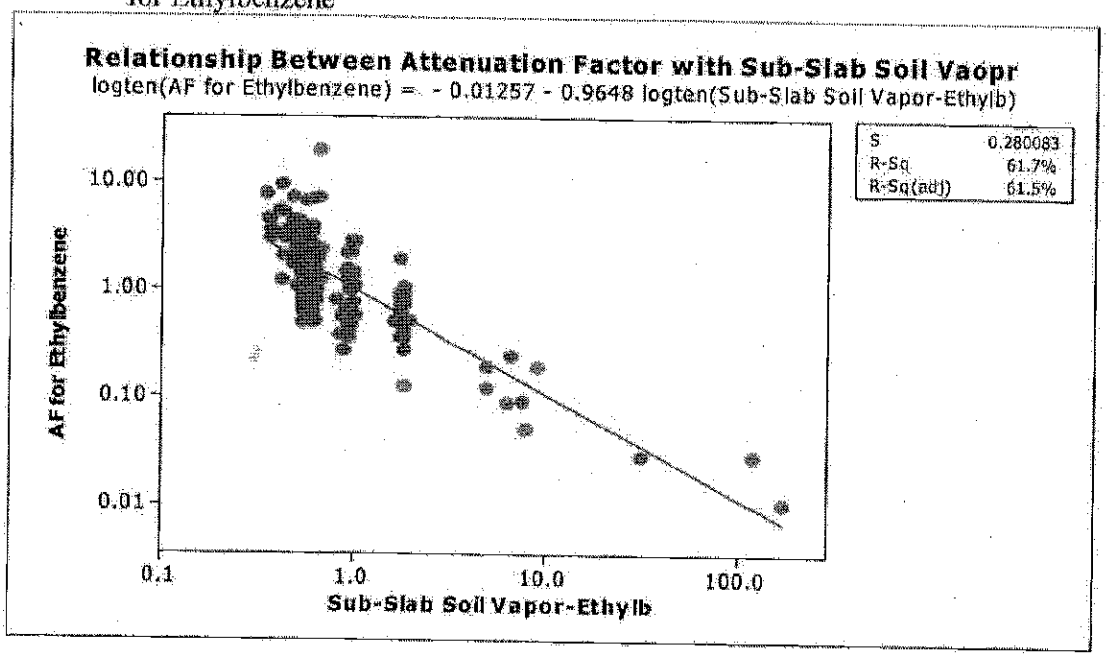


Figure 7 Vapor attenuation factor vs. sub-slab soil vapor in log-log scale for Naphthalene

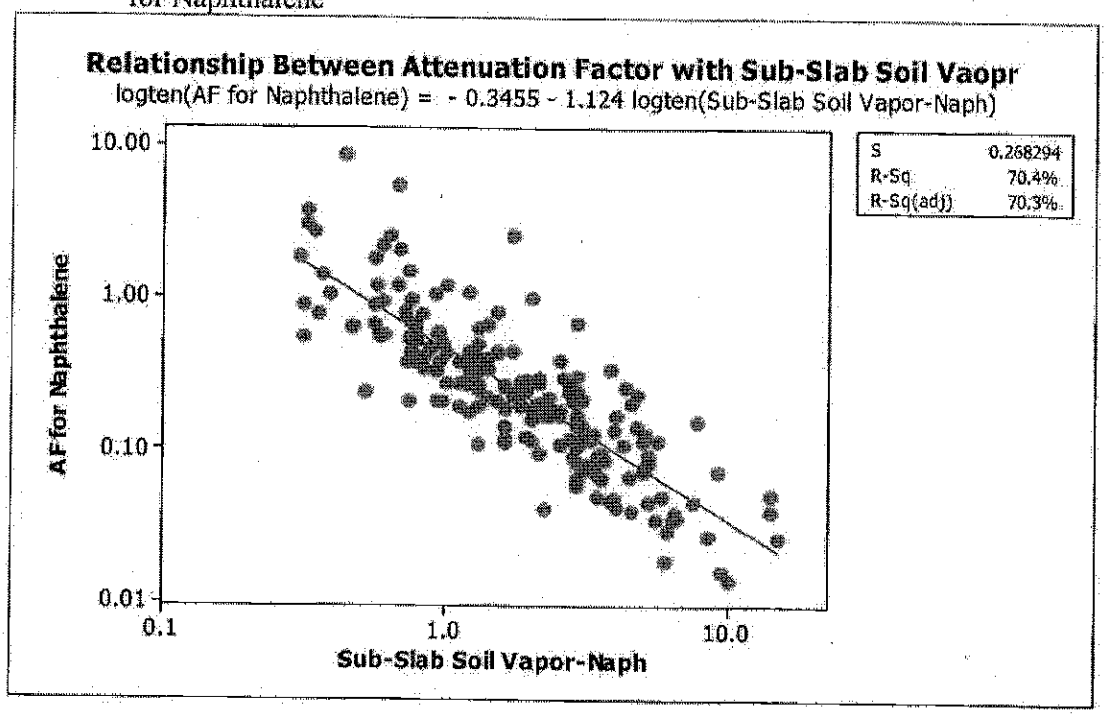


Figure 8 Vapor attenuation factor vs. sub-slab soil vapor in log-log scale for Toluene

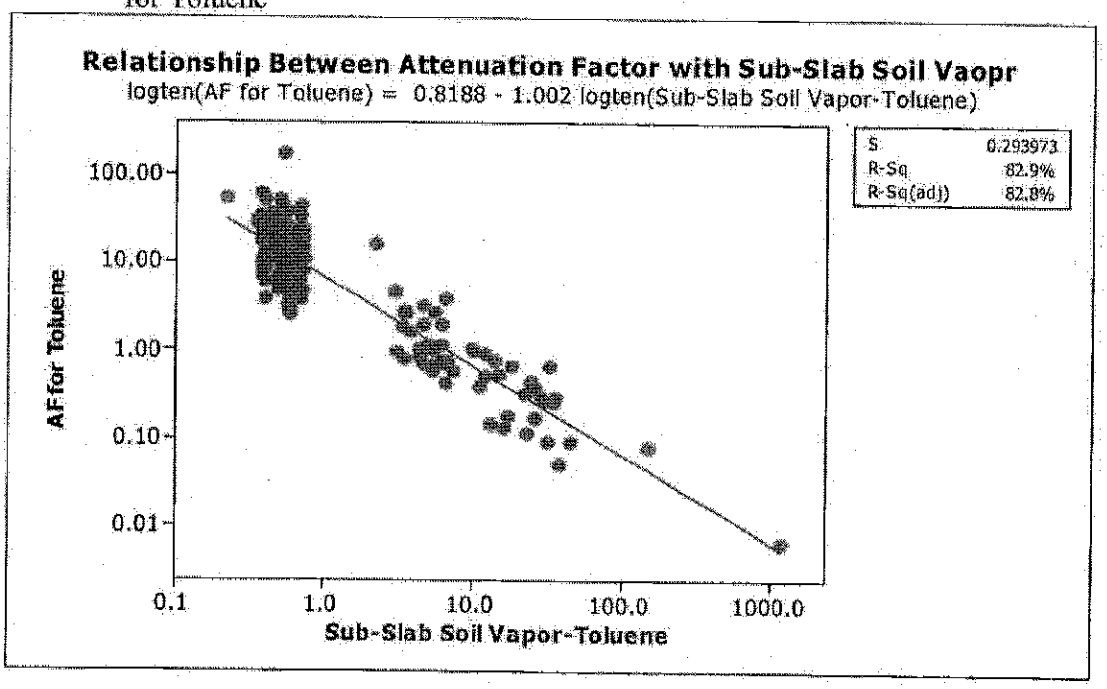


Figure 9 Percentile distribution of vapor attenuation factor for Benzene

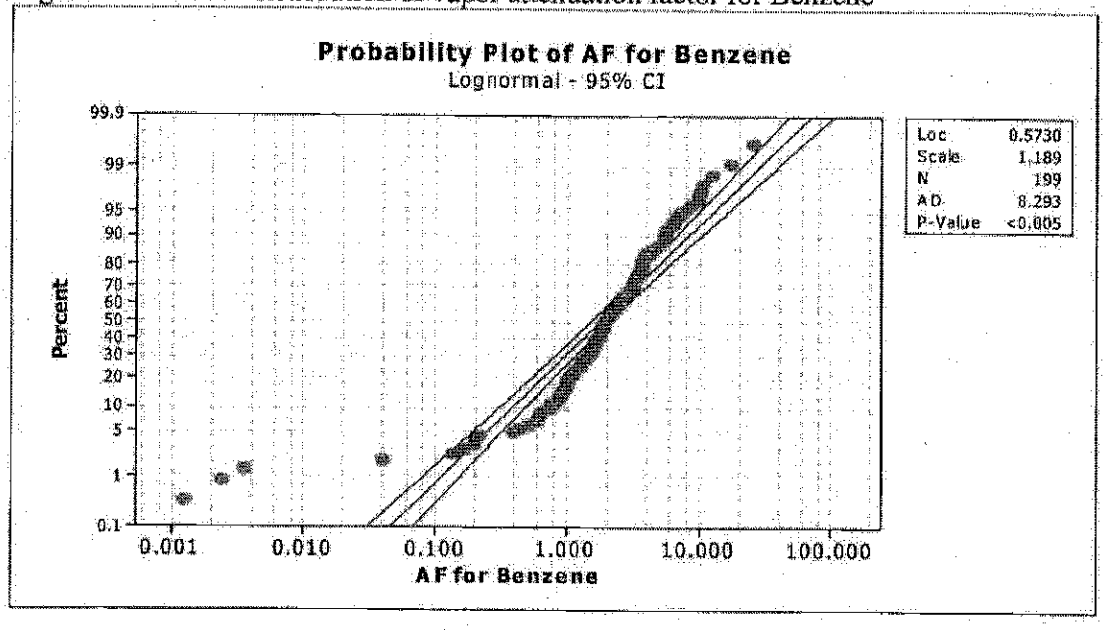


Figure 10 Percentile distribution of vapor attenuation factor for Ethylbenzene

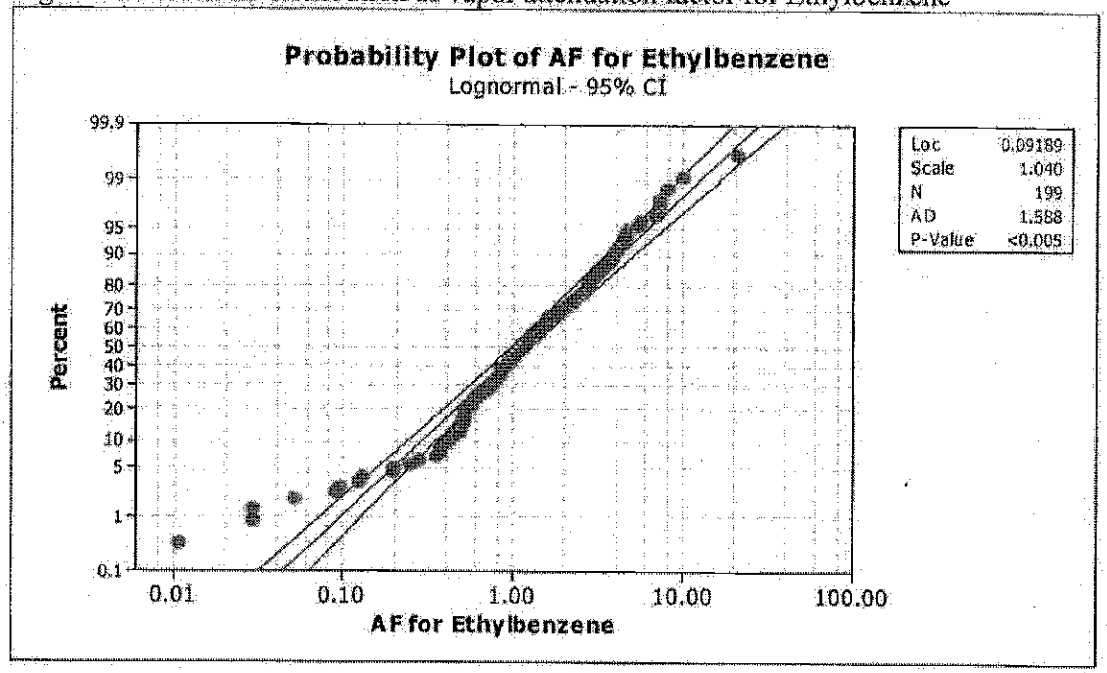


Figure 11 Percentile distribution of vapor attenuation factor for Naphthalene

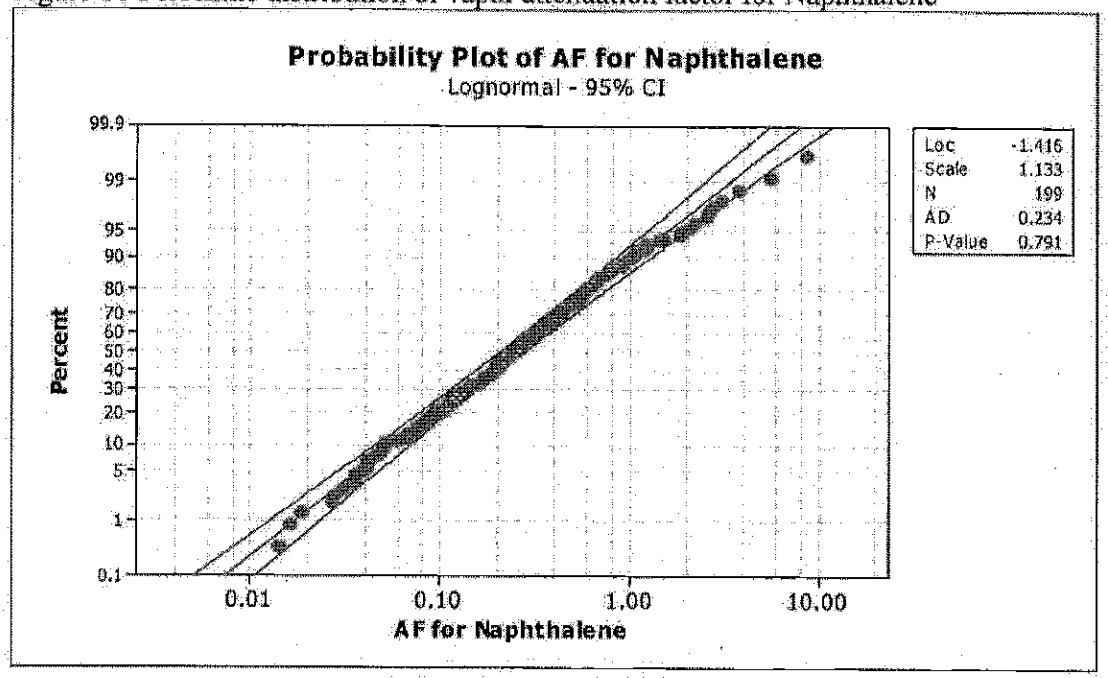


Figure 12 Percentile distribution of vapor attenuation factor for Toluene

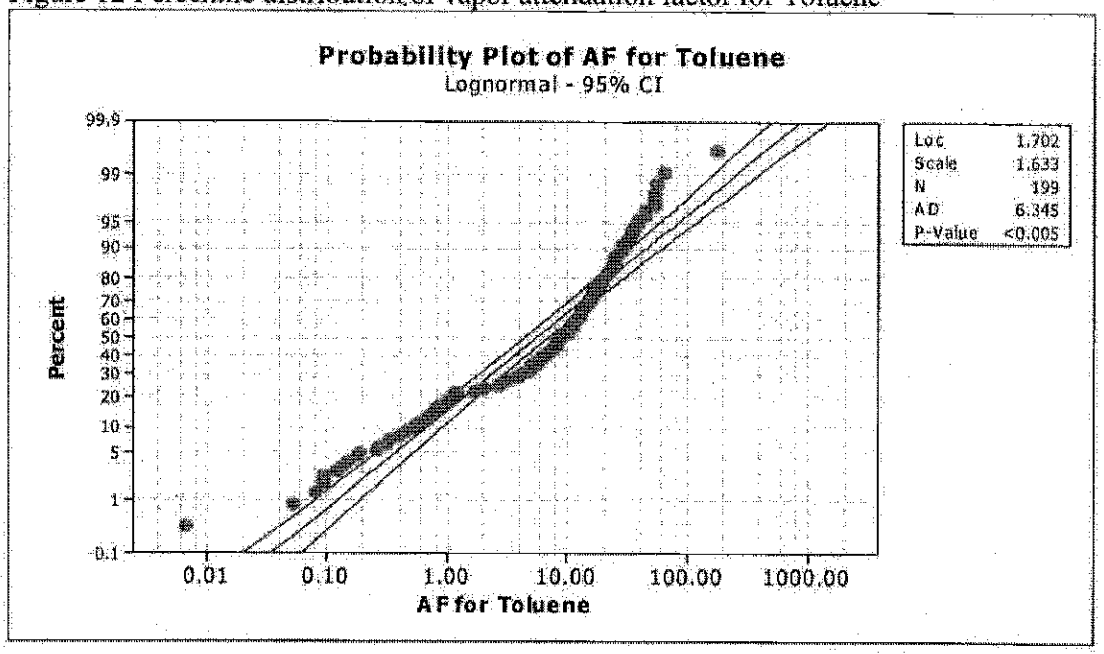


Figure 13 Vapor attenuation factor vs. sub-slab soil vapor in log-normal scale for Benzene

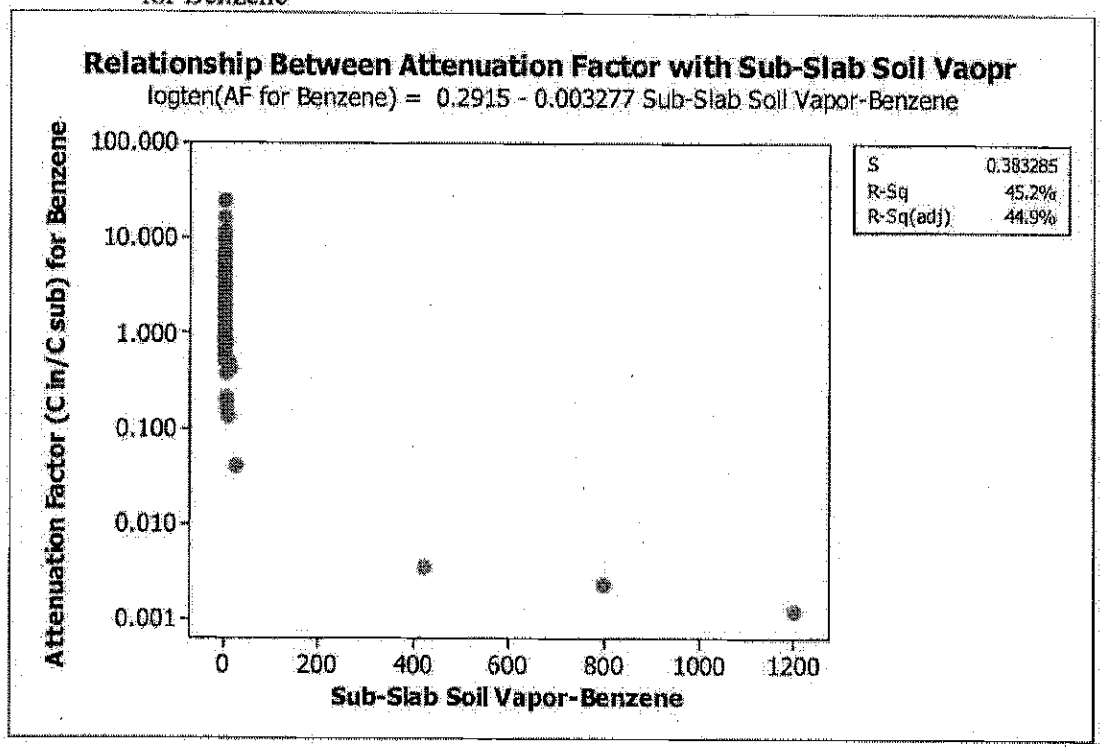


Figure 14 Vapor attenuation factor vs. sub-slab soil vapor in log-normal scale for Ethylbenzene

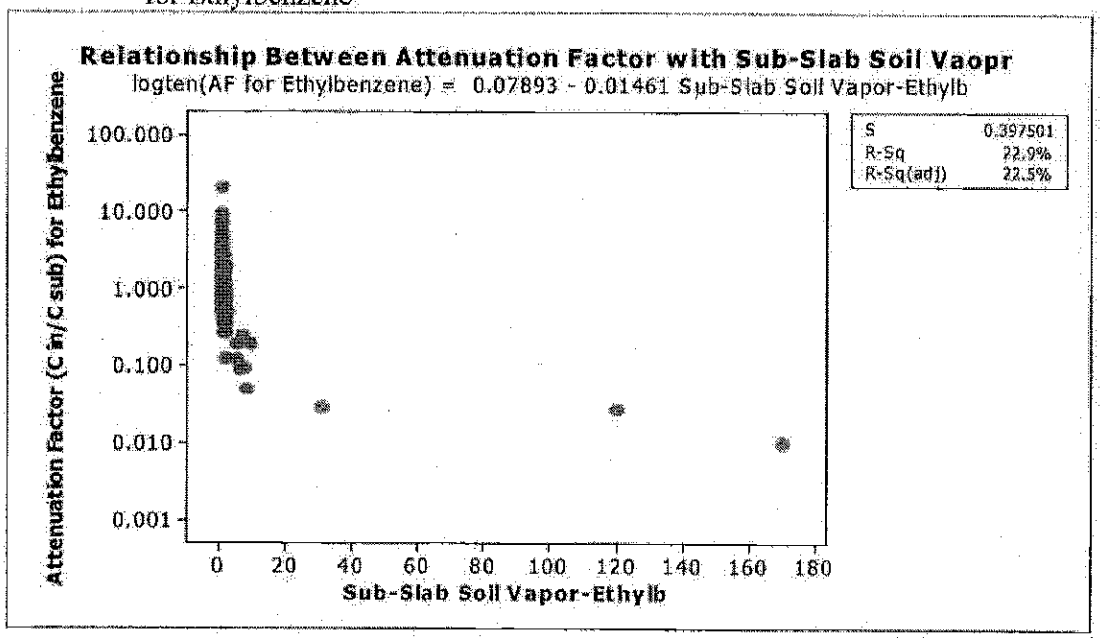


Figure 15 Vapor attenuation factor vs. sub-slab soil vapor in log-normal scale for Naphthalene

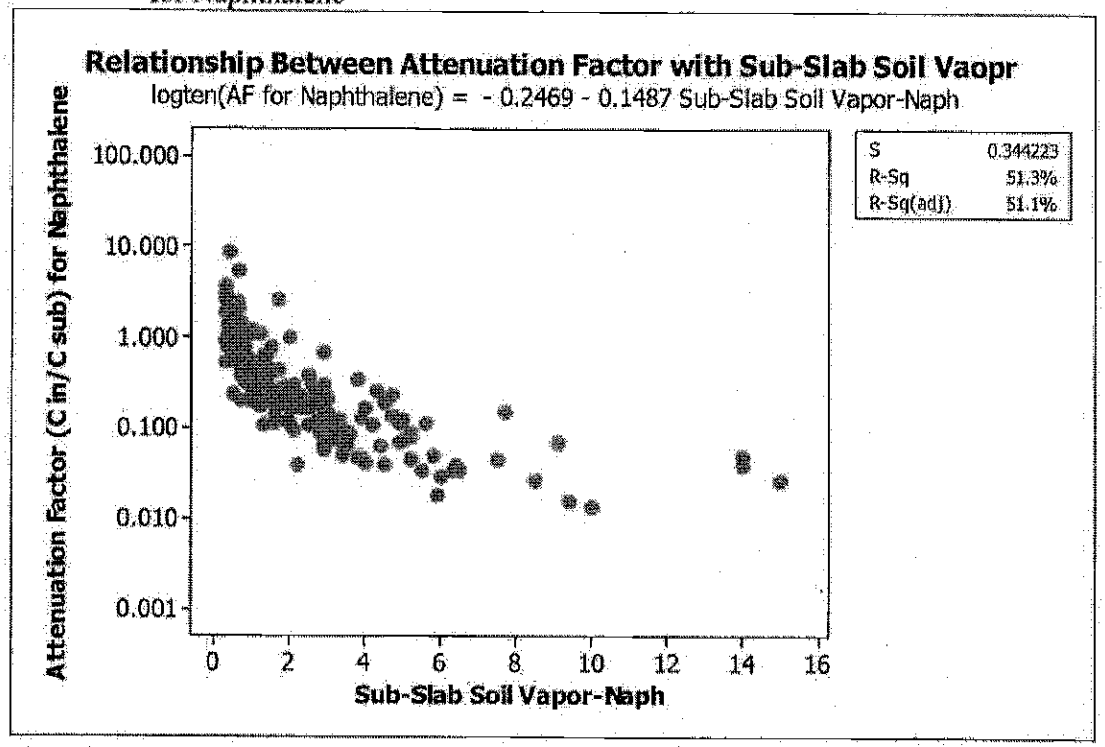
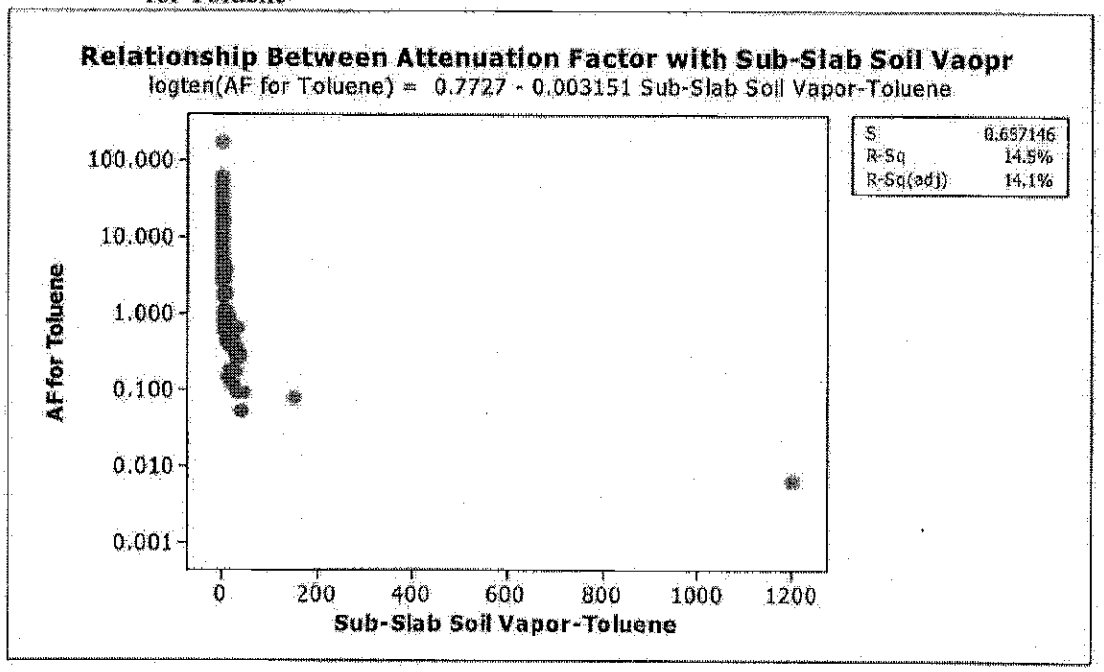


Figure 16 Vapor attenuation factor vs. sub-slab soil vapor in log-normal scale for Toluene



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Revised Site-Specific Cleanup Goal Report

Former Kast Property
Carson, California

Prepared by:

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engineers | scientists | innovators

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Project Number: SB0484-04-2

October 21, 2013

Geosyntec consultants

REVISED SITE-SPECIFIC CLEANUP GOAL REPORT

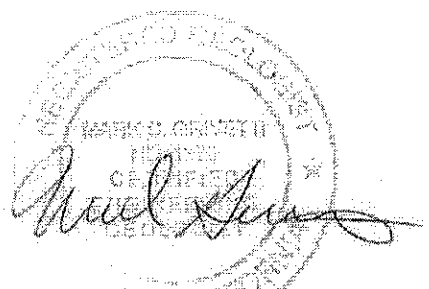
Former Kast Property
Carson, California

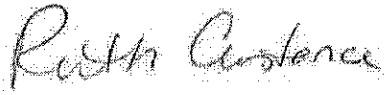
Prepared for:

Shell Oil Products US

Prepared by:

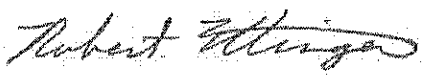
Geosyntec Consultants, Inc.





Mark Grivetti, P.G., CHG
Principal Hydrogeologist

Ruth Custance
Principal



Robert Ettinger
Principal

Geosyntec
consultants

CERTIFICATION

REVISED SITE-SPECIFIC CLEANUP GOAL REPORT

FORMER KAST PROPERTY

CARSON, CALIFORNIA

I am the Project Manager for Equilon Enterprises LLC doing business as Shell Oil Products US for this project. I am informed and believe that the matters stated in the Revised Site-Specific Cleanup Goal Report dated October 21, 2013 are true, and on that ground I declare, under penalty of perjury in accordance with Water Code section 13267, that the statements contained therein are true and correct.

Doug Weimer
Project Manager
Shell Oil Products US
October 21, 2013

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EXECUTIVE SUMMARY

This Revised Site-specific Cleanup Goal Report (Revised SSCG Report) was prepared for the Former Kast Property (Site) in Carson, California by Equilon Enterprises LLC, doing business as Shell Oil Products US (SOPUS) for Shell Oil Company, (Shell). In the Cleanup and Abatement Order No. R4-2011-0046, issued March 11, 2011 (CAO), Shell was required to submit Site-specific cleanup goals (SSCGs) following the completion of pilot testing at the Site and in advance of the Remedial Action Plan (RAP) for the Site. This Revised SSCG Report addresses comments provided by the Los Angeles Regional Water Quality Control Board (Regional Board) in their letter dated August 21, 2013.[1] In the letter, the Regional Board requested that the Site-specific Cleanup Goal Report originally submitted February 22, 2013 be revised in accordance with the specific directives and other comments provided in the letter. SOPUS was also directed to address all comments in the attachments to the Regional Board letter, including comments from the Office of Environmental Health Hazard Assessment (OEHHA), the UCLA Expert Panel, and Regional Board Staff.

Once the SSCGs are approved by the Regional Board, a full Human Health Risk Assessment (HHRA) incorporating the SSCGs will be conducted. The HHRA will further evaluate potential human health risks and will be used to guide final response actions for impacted media (soil, soil vapor and indoor air) at each residence on the Site. Evaluation of the final response actions may include a detailed Feasibility Study to select the final Site remedy. Details of the final Site remedy, as well as the Feasibility Study if conducted, will be included in the RAP, which is due to be submitted within 45 days after the Regional Board approves the SSCGs. The HHRA will be submitted prior to or concurrent with the RAP.

The Site is a former petroleum storage facility that operated from the mid-1920s to the mid-1960s, and was sold by Shell to residential developers Lomita Development Company and Barclay Hollander Corporation, now a subsidiary of Dole Food Company, Inc. The developers drained and decommissioned the reservoirs, graded the Site, and redeveloped it into the Carousel Community residential housing tract in the late 1960s. The objectives of the Revised SSCG Report are to propose remedial action objectives (RAOs) and site-specific cleanup goals (SSCGs) for soil, soil vapor, indoor air, and groundwater that will be used in preparation of the RAP. As required by the

[1] Appendix D contains responses by SOPUS to the agency and Expert Panel comments to the February 22, 2013 Site-specific Cleanup Goals Report.

Regional Board comments, the Revised SSCG Report presents cleanup goals that are based on technological and economic feasibility and that include all constituents of concern (COCs) identified for the Site, whether associated with Shell's historic use of the Site or associated with activities by other parties. Soil SSCGs are based on human health considerations and potential leaching to groundwater assuming that groundwater is a potable water source. For soil vapor, SSCGs have been developed for the vapor intrusion pathway into indoor air and potential human exposure, as well as considering both nuisance and potential methane-related risks. Groundwater SSCGs have been developed considering the Basin Plan, State Board Resolution No. 68-16, and State Board Resolution No. 92-49.

In order to meet the Regional Board's requirement that SSCGs are technologically and economically feasible, a Screening Feasibility Study (Screening FS) was conducted to evaluate a number of factors related to potential remedial alternatives that could be implemented at the Site. These factors included implementability; environmental considerations; reduction of toxicity, mobility, and volume; social considerations; other issues; and estimated cost of each remedial alternative. The remedial alternatives encompassed a range of possible response actions, including options which would result in unrestricted and restricted land use. Based on the outcome of this evaluation, the SSCGs associated with the most technologically and economically feasible alternative remedies were selected for the Site. As stated above, a more detailed Feasibility Study may be conducted in conjunction with the preparation of the RAP to evaluate potential response actions and select a final Site remedy.

Previous Site Evaluations

Analysis to develop SSCGs included data from the extensive environmental investigation of the Site, which has been conducted under the directives of the Regional Board. Environmental characterization of the Site has followed agency-approved work plans and according to accepted scientific protocols. The investigation is ongoing and is nearly completed as to soils, soil vapor and indoor air at the residential properties. As part of the characterization, investigations conducted include Site-wide and off-Site assessment of soil, soil vapor, and groundwater in roadways and an adjacent rail right-of-way. Property-specific investigations at individual residential properties have included assessment of soil, sub-slab soil vapor, indoor air, and methane screening. Over 10,000 soil samples, 2,000 soil vapor samples and 1,000 indoor air samples have been collected so far.

Through August 31, 2013, the following number of residential properties have been sampled:

- 267 properties (94%) have been screened for methane,
- 266 properties (93%) have had soil samples collected,
- 265 properties (93%) have had sub-slab soil vapor collected, and
- 241 properties (85%) have had been sampled for indoor air samples collected (of which 147 properties (52%) have had the required two rounds of indoor air sampling).

These investigations have indicated the presence of petroleum-related and some non-petroleum-related constituents. To date, over 700 Phase II Interim, Follow-up, and Final Interim Reports[2] have been prepared to document the results of these property-specific investigations and submitted to the Regional Board. These reports included property-specific Human Health Screening Risk Evaluations (HHSREs) and evaluation of interim response actions, which have been reviewed by the Regional Board and OEHHA on an ongoing basis.

The HHSREs provide a preliminary evaluation of potential human health risks associated with detected chemicals at individual properties to assist in interim response planning. The screening-level concentrations used in the HHSREs were developed following California Environmental Protection Agency (Cal-EPA), OEHHA and United States Environmental Protection Agency (USEPA) guidance. Screening levels are based on conservative health-protective assumptions and are used to gain a general understanding of potential issues at the Site. The presence of a chemical at a concentration in excess of a screening level does not indicate that adverse impacts to human health are occurring or will occur, but rather suggests that further evaluation of potential human health concerns is warranted.

As indicated in the Phase II Interim, Follow-up, and Final Interim Reports, concentrations of potential COCs exceeding screening levels were detected in various media (soil, soil vapor, indoor air and groundwater) at various properties at the Site. Based on these results, interim response actions to limit exposure to impacted soils and soil vapor were recommended, as appropriate. The investigations conducted at the Site to date have not found potentially hazardous levels of methane due to petroleum degradation in indoor air or in public areas at the Site. Additionally, the investigations to date have concluded that COCs detected in indoor air are reflective of background levels and are not indicative of vapor intrusion into indoor air.

[2] Multiple reports are submitted for each property.

Constituents of Concern

Potential COCs were initially identified by reviewing the Site investigation results and include constituents associated with the petroleum storage facility activities in the 1924 to 1966 time frame, as well as constituents that are interpreted to have been introduced from non-Site-related sources, such as the adjacent Turco chemical facility and the Fletcher Oil site, and post-development residential land-use activities. COCs potentially related to the previous operation of the Site as a crude/bunker oil storage facility are considered as Site-related COCs. The remaining COCs are considered non-Site-related COCs. Potential Site-related COCs 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.

Non-Site-related COCs include:

- Chlorinated VOCs;
- Trihalomethanes (THMs, which are associated with municipal water treatment);
- Oxygenated VOCs (including tert-butyl alcohol [TBA]); and
- Metals present in soil or groundwater at background levels.

SSCGs for all COCs (i.e., both Site-related and non-Site-related COCs) are presented in this report. The final list of COCs that was incorporated into the SSCG derivation was selected using a conservative screening process based on (1) detection of the constituent during Site investigation activities, (2) the screening levels presented in the HHSRE reports, and (3) background levels.

Remedial Action Objectives and Site-specific Cleanup Goals

Medium-specific response action objectives (RAOs) for soil, soil vapor, indoor air and groundwater were developed based on the results of the Site investigation and HHSREs. The proposed objectives of the remedial action at the Site are:

- Prevent human exposures to concentrations of COCs in soil, soil vapor, and indoor air such that total (i.e., cumulative) lifetime incremental carcinogenic risks are within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) risk range of 1×10^{-6} (one in a million) to 1×10^{-4} (or

one in ten thousand) and noncancer hazard indices are less than 1, or COC concentrations are below background, whichever is higher. Potential human exposures include onsite residents and construction and utility maintenance workers. The point of departure risk level for onsite residents is the lower end of the NCP risk range (i.e., 1×10^{-6}) and a noncancer hazard index less than 1.

- Prevent fire or explosion risks in homes, garages and other enclosed spaces (such as neighborhood utility vaults) due to the potential accumulation of methane generated from anaerobic biodegradation of petroleum hydrocarbons in soils. Eliminate methane in the subsurface to the extent technologically and economically feasible.
- Remove or treat light non-aqueous phase liquid (LNAPL) to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result.
- Reduce COCs in groundwater to the extent technologically and economically feasible to achieve, at a minimum, the water quality objectives in the Basin Plan to protect designated beneficial uses, including possible use as municipal supply in the future[3].

This Revised SSCG Report proposes medium-specific SSCGs for soil, soil vapor, indoor air, and groundwater designed to achieve these RAOs. The SSCGs were developed using the guidance documents and agency policies identified by the Regional Board, as well as other applicable resources. The SSCGs for each medium are summarized below.

SSCGs for Soil

SSCGs for soil were calculated considering human health exposure pathways (i.e., risk-based SSCGs), and the leaching to groundwater pathway. Risk-based SSCGs were developed using a methodology and approach similar to that used to conduct the property-specific HHRSEs. Risk-based SSCGs for the residential scenario are based on (1) frequent exposure assumptions (350 days per year) for shallow soil (e.g., from 0 to 2 feet below ground surface [bgs]), and (2) infrequent exposure assumptions (4 days per year) for soils at depth that residents are unlikely to contact more than a few times per year (e.g., from 2 to 10 feet bgs). Risk-based SSCGs for the construction and utility maintenance worker scenario are developed assuming exposures can occur to soil at

[3] Shallow impacted groundwater at the Site is not currently used for drinking water nor will be in the foreseeable future.

depths from 0 to 10 feet below ground surface (bgs). Soil SSCGs for the leaching to groundwater pathway are calculated using Site-specific soil physical properties following methods recommended in Regional Board (1996) and relevant USEPA guidance documents.

The SSCGs for soil are detailed in Section 6:

- The Soil SSCGs for residential exposures are chemical-specific numerical values for COCs assuming a target incremental cancer risk of 1×10^{-6} and a hazard quotient of 1. These numerical SSCGs are calculated for both frequent and infrequent exposure assumptions.
- The Soil SSCGs for construction and utility maintenance worker exposures are chemical-specific numerical values for COCs assuming a target incremental cancer risk of 1×10^{-5} and a hazard quotient of 1. These numerical SSCGs will be applied to soils from 0-10 feet bgs.
- The Soil SSCGs for the leaching to groundwater pathway are chemical-specific numerical values for COCs based on protection of groundwater to California Maximum Contaminant Levels (MCLs), Notification Levels (NLs), or risk-based values for COCs with no published MCL or NL.

The technological and economic feasibility of the various soil SSCGs were evaluated in the Screening FS. Based on the findings of the Screening FS, soil SSCGs to be used in preparation of the RAP are proposed.

SSCGs for Soil Vapor and Indoor Air

Soil vapor cleanup goals for the residential scenario are based on the sub-slab soil vapor analytical results, the indoor and outdoor air sample results, and a multiple-lines-of-evidence vapor intrusion pathway evaluation. In other words, multiple data evaluation approaches were used to assess whether there is a correlation between the sub-slab COC levels and the COC levels found in indoor air. As summarized here and discussed in detail in Section 7, the results of this multiple-lines-of-evidence evaluation indicate that sub-slab soil vapor concentrations do not have a significant effect on indoor air quality, and that COCs found in indoor air are related to COCs from outdoor air, attached garages and household product use. In their review of the residential sampling reports, the Regional Board and OEHHA have generally concurred in these findings.

Similar to the approach used to calculate soil SSCGs for the construction and utility maintenance worker exposure scenario, the soil vapor SSCGs for the construction and utility maintenance worker consider exposure to volatiles during excavation activities. Additionally, fire and explosion risks are considered for methane.

The multiple-lines-of-evidence evaluation considered the sub-slab soil vapor, indoor air, garage air, and outdoor air data for the 241 properties where indoor air and concomitant sub-slab soil vapor sampling has been conducted as of August 31, 2013. The evaluation relied on published studies of background concentrations of indoor and outdoor air quality. The conclusions of the evaluation are as follows.

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

- Multiple regression analysis results indicate that indoor air concentrations are correlated with outdoor or garage air concentrations and/or largely influenced by indoor sources. This statistical analysis indicates that sub-slab soil vapor concentrations do not have a significant effect on indoor air concentrations as compared to these other sources.

- The presence of background sources[4] of VOCs contributes to the variability in indoor air concentrations detected at the Site. Common household sources of VOCs include cigarette and cigar smoke, gasoline- or diesel-powered equipment, paints, glues, solvents, cleaners, and natural gas leaks. In addition, outdoor air COC levels, which impact indoor air, often exceed screening levels for indoor air.

- Although the literature background comparison and the multiple linear regression analysis indicate that the indoor air COC concentrations are due to background sources and not related to sub-slab soil vapor levels, sub-slab soil vapor SSCGs were calculated based on a vapor intrusion attenuation factor as directed by the Regional Board. These sub-slab soil vapor SSCGs may be used for corrective action planning; however, because the indoor air concentrations are due to background sources, mitigation or remediation will not result in a measureable reduction in indoor air risks.

- Using a single regression analysis of sub-slab soil vapor and indoor air results, a conservative upper-bound vapor intrusion attenuation factor of 0.001 was calculated to determine sub-slab soil vapor SSCGs as required by the Regional Board.

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[4] For vapor intrusion evaluations, background is defined as sources that are not due to subsurface impacts (i.e., contributions due to outdoor air or indoor sources).

The technological and economic feasibility of the potential residential soil vapor SSCGs were evaluated in the Screening FS. Based on the findings of the Screening FS, residential soil vapor SSCGs to be used in preparation of the RAP are proposed.

The SSCGs for construction and utility maintenance worker exposures are chemical-specific numerical values for COCs assuming a target incremental cancer risk of 1×10^{-5} and a hazard quotient of 1. These numerical SSCGs will be applied to soil vapor from 0-10 feet bgs. These numerical values are listed in the report.

Methane screening has been conducted in indoor structures on the Site and in utility vaults, storm drains, and sewer manholes at and surrounding the Site. The screening assessments have not found methane concentrations in enclosed spaces that would indicate a potential safety risk. Methane has not been detected in any of the more than 1,000 indoor air samples collected at the residences. Additionally, more than 2,000 sub-slab soil vapor samples have been collected at 265 properties at the Site and analyzed for methane. Methane resulting from anaerobic biodegradation of residual petroleum hydrocarbons above the interim action levels of 0.1% and 0.5% has been found in one sub-slab soil vapor probe located beneath the garage at a single property (out of more than 840 soil vapor probes installed at the Site); however, no methane exceedances were indicated during the indoor air screening at this property and methane was not detected in the analytical results of the indoor air sampling. Engineering controls were installed to mitigate potential risks due to methane detected beneath the garage at this location. Methane has been detected as a result of leaking natural gas utility lines, which were found at four of the residential properties, and a leaking sewer line at one residential property.

Proposed SSCGs for methane are the same as those presented in the Data Evaluation and Decision Matrix previously prepared for the Site. These SSCGs are consistent with California Environmental Protection Agency Department of Toxic Substances Control (Cal-EPA DTSC) guidance for addressing methane detected at school sites.

Methane Level	Response
>10%LEL (> 5,000 ppmv) Soil vapor pressure > 13.9 in H_2O	Evaluate engineering controls
> 2% - 10%LEL (> 1,000 - 5,000 ppmv) Soil vapor pressure > 2.8 in H_2O	Perform follow-up sampling and evaluate engineering controls

SSCGs for Groundwater

Uppermost (or first) groundwater (Shallow Zone) occurs at variable depths of approximately 51-68 feet bgs depending on well location and timing of sampling. The Gage aquifer underlies the Site at a depth of approximately 80-90 feet bgs, and is underlain by low permeability materials which separate the Gage aquifer from the underlying Lynwood aquifer. There is no documented or expected future use of groundwater within the Shallow Zone or Gage aquifer at or near the Site, and these water-bearing zones are not used as sources of drinking water. Furthermore, the local water purveyor has stated that drinking water supplied to the Carousel Community is safe.

Groundwater beneath the Site, including groundwater in the Shallow Zone and Gage aquifer, is impacted with various chemicals including petroleum hydrocarbons, chlorinated hydrocarbons, metals, and general minerals. Of these, potential Site-related COCs in groundwater which exceed a California drinking water MCL or health-based NL include benzene, naphthalene, and arsenic.

- Benzene: The distribution of benzene in groundwater beneath the Site is well defined, both laterally and vertically, and the dissolved benzene plume at the Site appears to be stable or declining. Concentrations of benzene are non-detect or close to non-detect in the three off-Site, downgradient monitoring wells located near the Site boundaries. The stable or declining plume is consistent with an old crude oil source and the well-documented process of natural degradation of petroleum hydrocarbon compounds in the subsurface environment through microbial activity.

- Naphthalene: Concentrations of naphthalene exceed the NL in two monitoring wells on-Site, both of which are also impacted by benzene.

- Arsenic: Concentrations of arsenic are above the MCL in multiple Site monitoring wells, with higher concentrations detected in the west central portion of the Site. The source of arsenic is likely naturally occurring. The concentrations of arsenic may be locally enhanced due to the presence of degrading petroleum hydrocarbon compounds which can cause arsenic to dissolve into groundwater from some naturally occurring minerals found beneath the Site. Arsenic is recognized as a regional contaminant in southern California groundwater.

- TPH: TPH does not have an MCL or NL. Concentrations of TPH exceeding the San Francisco RWQCB Environmental Screening Levels

(ESL)s were detected in four on-Site wells and the off-Site upgradient well (MW-7) in the most recent monitoring event.

Because no current or future use of the Shallow Zone and Gage aquifer at or near the Site is anticipated, the following groundwater SSCGs are proposed for the Site (consistent with the RAOs):

- Remove or treat LNAPL to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result, and
- Reduce concentrations of COCs in groundwater to the extent technologically 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.

The technological and economic feasibility of the potential groundwater SSCGs, detailed in Section 8, were evaluated in the Screening FS. Based on the findings of the Screening FS, groundwater SSCGs are proposed to be used in preparation of the RAP.

Screening Feasibility Study

A Screening FS was conducted to evaluate the technological and economic feasibility of the SSCGs. The Screening FS consists of a preliminary evaluation of representative remedial alternatives that could achieve various site SSCGs at the residential properties. The technological and economic feasibility for each alternative were compared and evaluated to the extent practical at this level of project development, and the technologically and economically feasible alternatives were selected for further detailed evaluation in the RAP.

Several remedial alternatives were evaluated in the Screening FS. The alternatives consist of different combinations of the following technologies:

- Sub-slab vapor mitigation;
- Capping;
- Institutional controls;
- Excavation;
- Soil vapor extraction (SVE);
- LNAPL/source removal;
- Hot spot remediation of groundwater; and
- Monitored natural attenuation (MNA).

The preliminary remedial alternatives were screened on the basis of the following criteria:

a) Implementability;
b) Environmental considerations;
c) Reduction of toxicity, mobility, and volume;
d) Social considerations; and
e) Estimated cost.

Cleanup goals that are technologically and economically feasible have been identified using the Screening FS. Based on this evaluation, four remedial alternatives and their associated SSCGs are recommended and will be further evaluated in the RAP. The technologically and economically feasible remedial alternatives identified in the Screening FS consist of:

- Surface soil excavation (0-2 feet bgs) in either open areas and/or areas beneath open and hardscape in areas exceeding soil SSCGs;
- Installation of sub-slab depressurization or ventilation system for properties exceeding soil vapor SSCGs;
- LNAPL removal to the extent technologically and economically feasible;
- Hot spot groundwater and deep soil remediation;
- Monitored natural attenuation for groundwater to achieve MCLs and/or background concentrations; and
- Institutional controls to address residual COCs in soils beneath homes and to limit access to unexcavated soils below 2 feet bgs and groundwater.

Under the identified remedial alternatives, the excavated and filled Site areas would achieve all proposed soil SSCGs. The unexcavated soils would meet the residential human health SSCGs assuming infrequent exposure and the utilization of institutional controls, and would meet nuisance goals.

Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the soils that remain in place. However, over time, groundwater concentrations for the petroleum-related COCs (TPH, naphthalene, benzene and to some extent arsenic) are expected to decline to levels protective of a municipal use for the water. This conclusion is based on the stable to declining plume present at the Site, the age of the source materials (leaching of the COCs has already occurred), and the proposed actions which include further source reduction (hot spot groundwater and deeper soil remediation with SVE). It is also noted that there will be no use of the impacted groundwater in the foreseeable future. Meeting municipal levels for other

COCs in Site groundwater including CVOCs and TBA will require remediation of upgradient sources.

Additionally, the identified remedial alternatives for soil vapor will achieve the SSCGs for VOCs and methane.

1.0 INTRODUCTION

This Revised Site-specific Cleanup Goal Report (Revised SSCG Report) was prepared for the Former Kast Property (Site) in Carson, California on behalf of Equilon Enterprises LLC, doing business as Shell Oil Products US (SOPUS), for Shell Oil Company ("Shell"). This Revised SSCG Report responds to comments provided by the Los Angeles Regional Water Quality Control Board (RWQCB or Regional Board) in their letter dated August 21, 2013. In the letter, the RWQCB requested that the Site-specific Cleanup Goal Report originally submitted February 22, 2013 (Geosyntec, 2013a) be revised in accordance with the specific directives and other comments provided in the letter. Shell was also directed to address all comments in the attachments to the letter, including comments from the Office of Environmental Health Hazard Assessment (OEHHA), the UCLA Expert Panel Interim Report, and Regional Board Staff. A summary of responses to comments contained in the RWQCB August 21 letter and attachments is provided in Appendix D. This summary provides a response to the comment and, where appropriate, a description of the location within the Revised SSCG Report where the comment is specifically addressed.

The Former Kast Property is a former petroleum storage facility that operated from the mid-1920s to the mid-1960s that was sold by Shell to residential real estate developers Lomita Development Company and Barclay Hollander Corporation, now a subsidiary of Dole Food Company, Inc., who had knowledge of the Site's former use and developers, who drained and decommissioned the reservoirs, graded the site and redeveloped it into the Carousel Community residential housing tract in the late 1960s. The site is located in the area between Marbella Avenue on the west and Panama Avenue on the east and E. 244th Street on the north to E. 249th Street to the south (Figure 1).

1.1 Background

This report was prepared in response to Cleanup and Abatement Order (CAO) No. R4-2011-0046 issued to Shell on March 11, 2011 by the California Regional Water Quality Control Board – Los Angeles Region (RWQCB or Regional Board). Section 3.c of the CAO orders Shell to "prepare a full-scale impacted soil Remedial Action Plan (RAP) for the Site." As a part of the RAP several requirements have been set forth that address the development of remedial action objectives (RAOs) and cleanup goals for the Site.

The CAO also ordered that a SSCG report be prepared in advance of the RAP and submitted concurrently with the Pilot Test Report. Pilot tests for the following technologies have been evaluated for applicability at the Site: soil vapor extraction

(SVE), in-situ chemical oxidation (ISCO), bioventing, and excavation. The results of these pilot studies have been submitted to the Regional Board (URS, 2010b; Geosyntec, 2012a; Geosyntec, 2012b; Geosyntec, 2013b; and URS, 2013a, d). Pilot Test Reports summarizing the results of the pilot studies were submitted to RWQCB in May 2013 and August 2013 (URS, 2013e, g) and an evaluation of the feasibility of removing the concrete slabs of the former reservoirs was submitted in June 2013 (URS and Geosyntec, 2013).

The SSCG Report was prepared to address these requirements of the CAO and provide an overview of the Site conditions, as well as the RAOs and cleanup goals to address petroleum hydrocarbon impacts at the Site. As noted above, this Revised SSCG Report addresses comments provided by the RWQCB on the February 22, 2013 SSCG Report.

The Revised SSCG Report presents cleanup goals that are based on technological and economic feasibility and includes all constituents of concern (COCs) identified for the Site. Soil SSCGs are based on exposure to human health and potential leaching to groundwater considering the groundwater as a potable water source. For soil vapor, SSCGs have been developed for the vapor intrusion pathway and considering nuisance and methane. Groundwater SSCGs have been developed considering the Basin Plan, State Board Resolution No. 68-16, and State Board Resolution No. 92-49.

The Revised SSCG Report is organized into the following sections:

- 1.0 Introduction
- 2.0 Site Conceptual Model
- 3.0 Pilot Test Results
- 4.0 Constituents of Concern and Remedial Action Objectives
- 5.0 Guidance Documents Considered
- 6.0 Soil
- 7.0 Soil Vapor, Indoor Air, and Outdoor Air
- 8.0 Groundwater
- 9.0 Evaluation of Technological and Economic Feasibility of SSCGs and Selection of SSCGs
- 10.0 Summary
- 11.0 References

1.2 Objectives

The objectives of this report are to provide the RAOs and site-specific cleanup goals (SSCGs) that will be used in the forthcoming Human Health Risk Assessment (HHRA) and RAP for the Site. Specifically, this report addresses the following requirements of the CAO:

- Evaluate impacts to shallow soils, defined in the CAO as soils from 0-10 feet below ground surface (bgs)[5] (CAO Section 3);
- Consider listed guidelines and Policies in the development of cleanup goals (CAO Section 3.c.II.i);
- Address groundwater cleanup goals considering the Basin Plan, State Board Resolution No. 68-16, and State Board Resolution No. 92-49 (CAO Sections 3.c.II.ii, iii, and iv); and
- Develop site-specific cleanup levels for residential (i.e., unrestricted) land use (CAO Section 3.c.III) and for construction/utility worker exposures.

In addition, this Revised SSCG Report addresses the directives provided in the August 21, 2013 RWQCB Review of the February 22, 2013 SSCG Report (Geosyntec, 2013a) to determine site-specific cleanup levels that are technologically and economically feasible.

1.3 Previous Response Actions

URS Corporation (URS) and Geosyntec Consultants (Geosyntec) are conducting environmental characterization at the Site on behalf of SOPUS and Shell, as requested in the Regional Board's Section 13267 letter dated May 8, 2008. As part of the characterization, investigations conducted at the Site include (1) Site-wide assessment of soil, soil vapor, and groundwater in roadways and an adjacent rail right-of-way, and (2) property-specific investigations at individual residential properties that have included assessment of soil, sub-slab soil vapor, and indoor air and methane screening.

Results of these investigations have detected the presence of a number of petroleum-related and some non-petroleum-related constituents. Total petroleum hydrocarbons (TPH) quantified as gasoline-range organics (TPHg), diesel-range organics (TPHd), and

[5] Impacts to shallow soils for residential properties and public rights of way are addressed in this report.

motor oil-range organics (TPHmo) have been detected in Site soils and groundwater. A number of volatile organic compounds (VOCs), including compounds associated with petroleum hydrocarbons (e.g., benzene, toluene, ethylbenzene, xylenes [BTEX], trimethylbenzenes, and other substituted aromatic compounds), and non-petroleum-related VOCs, including the chlorinated solvents trichloroethene (TCE) and tetrachloroethene (PCE) and related breakdown products, as well as chloroform and trihalomethanes associated with drinking water purification byproducts, have been detected in Site soils, groundwater, soil vapor, and indoor/outdoor air. In addition, polycyclic aromatic hydrocarbons (PAHs), including naphthalene and benzo(a)pyrene, have been detected in Site soils associated with hydrocarbon impacts. Various metals including arsenic have been detected in site soils and groundwater.

For each of the property-specific evaluations, a Human Health Screening Risk Evaluation (HHSRE) was conducted to provide a preliminary evaluation of potential human health risks associated with chemicals detected at the property. These were based on the analytical results of the soil, sub-slab soil vapor, and indoor air samples collected to date and conservative screening levels. The HHSREs were conducted in accordance with the approved HHSRE Work Plan (Geosyntec, 2009) and addendum (Geosyntec, 2010b). In conjunction with the HHSRE Work Plan, a Data Evaluation and Decision Matrix was developed (Geosyntec, 2010a). The purpose of the matrix was to identify potential follow-up interim response actions that could be performed upon evaluation of Phase II Site characterization of soil, sub-slab soil vapor, and indoor air analytical data and HHSRE screening results. The screening level concentrations that were used in the HHSRE are consistent with the California Environmental Protection Agency (Cal-EPA), Office of Environmental Health Hazard Assessment (OEHHA) and United States Environmental Protection Agency (USEPA) screening levels. Screening levels are based on general assumptions and are useful to gain a general understanding of potential issues at the Site. The presence of a chemical at concentrations in excess of a screening level does not indicate that adverse impacts to human health are occurring or will occur but suggests that further evaluation of potential human health concerns is warranted. A full Human Health Risk Assessment (HHRA) and an update to the Soil Background Evaluation (URS, 2010) will be conducted to further evaluate potential health risks and will be submitted with the RAP.

Based on the findings of the Phase II investigations, potential follow-up interim response actions were identified. The interim response actions that could be used at the Site were documented in the Interim Remediation Action Plan (IRAP, URS, 2009a). Through August 31, 2013, the number of properties that have been evaluated for potential interim response actions based on the matrix criteria and the IRAP are:

- 267 properties (94%) screened for methane,
- 266 properties (93%) for soil,
- 265 properties (93%) for sub-slab soil vapor, and
- 241 properties (85%) for indoor air (of which 147 properties (52%) have had the required two rounds of indoor air sampling).

These investigations have indicated the presence of petroleum-related and some non-petroleum-related constituents. To date, over 700 Phase II Interim, Follow-up, and Final Interim Reports[6] have been prepared to document the results of these property-specific investigations and submitted to the Regional Board. These reports included property-specific Human Health Screening Risk Evaluations (HHSREs) and evaluation of interim response actions.

The HHSREs provide a preliminary evaluation of potential human health risks associated with detected chemicals at individual properties to assist in interim response planning. The screening-level concentrations used in the HHSREs were developed following California Environmental Protection Agency (Cal-EPA), OEHHA and United States Environmental Protection Agency (USEPA) guidance. Screening levels are based on conservative health-protective assumptions and are used to gain a general understanding of potential issues at the Site. The presence of a chemical at a concentration in excess of a screening level does not indicate that adverse impacts to human health are occurring or will occur, but rather suggests that further evaluation of potential human health concerns is warranted.

As indicated in the Phase II Interim, Follow-up, and Final Interim Reports, concentrations of potential COCs exceeding screening levels were detected in various media (soil, soil vapor, indoor air and groundwater) across the Site. Based on these results, interim response actions to limit exposure to impacted soils and soil vapor were recommended, as appropriate. The investigations conducted at the Site did not identify potentially hazardous levels of methane due to petroleum degradation in indoor air or in public areas at the Site. Additionally, COCs detected in indoor air are reflective of background levels and are not indicative of vapor intrusion into indoor air. Interim response actions for COCs exceeding screening levels in soils were further evaluated at 21 properties and reported in the Evaluation of Interim Institutional and/or Engineering Control Letters submitted to the Regional Board.

[6] Multiple reports are submitted for each property.

As stated previously, a full HHRA will be submitted with the RAP. The HHRA will incorporate the SSCGs developed in this report and will be used to guide final response actions for impacted media at the Site.

2.0 SITE CONCEPTUAL MODEL

This section summarizes and updates the Site Conceptual Model (SCM), which was included as an appendix to the Plume Delineation Report (PDR) (URS, 2010a). The objectives of the SCM were to summarize the Site understanding related to: (1) identification of potential constituents of concern (COCs); (2) sources of COCs and potential release mechanisms; and (3) potential fate and transport of COCs, including identification of exposure pathways and receptors for the COCs. The information in this section has been updated to incorporate new data and understanding of the site obtained through site investigations conducted subsequent to the September 2010 date of the PDR.

2.1 Potential Sources and Potential Constituents of Concern

Historically, petroleum-related operations were associated with the Site. Crude oil was stored in three concrete-lined earthen reservoirs from 1924 to about 1966. Bunker oil, a very viscous residuum from refining of lighter-end hydrocarbons, was apparently also stored at the Site. Some records also refer to the storage of other heavy intermediate refinery streams. Due to the nature of former crude oil storage operations at the Site, and the oil production and former industrial operations in the surrounding area, a number of sources may have contributed to the contaminants that have been detected at and around the Site. Detailed information about potential sources was included in Section 4.0 of the SCM (URS, 2010a), and is summarized below.

The historical onsite petroleum storage reservoirs are considered to have been a source of petroleum releases to Site soils. The reservoirs are believed to have had reinforced concrete-lined earthen floors and sloped sidewalls with wood frame roofs supported by wooden posts and/or concrete pedestals, and they were surrounded by earthen levees averaging 20 feet in height. The site was sold by Shell to residential real estate developers Lomita Development Company and Barclay Hollander, now a subsidiary of Dole Food Company, Inc., who drained and demolished the reservoirs in the mid-late 1960s for the development of the residential housing tract. Where concrete from the reservoirs was not removed, records indicate that following the removal of residual hydrocarbons remaining in the reservoirs by the residential developer, the developer's contractors cut trenches into the reservoir bases so that the reservoirs would not pond water and adversely affect drainage/infiltration for the subsequent residential development on the Site. Concrete from the reservoir sides was then reportedly placed by the developer's contractors into the base of the reservoirs, and soil from the surrounding levees was subsequently graded and compacted in place, spreading existing petroleum impacts around the site.

In addition to the reservoirs, other potential sources include former pipelines, an onsite oil pump house, various offsite operations by others at surrounding facilities (including refining operations, refined hydrocarbon storage, industrial chemicals processing, and chemical milling operations, dry cleaners), offsite oil wells owned and operated by others, atmospheric depositions, and, likely to a smaller extent, various residential activities.

Compounds associated with crude or bunker oil include TPH and TPH-related compounds such as certain VOCs (primarily BTEX: benzene, toluene, ethylbenzene, and xylene), polycyclic aromatic hydrocarbons (PAHs), and possibly metals. Potential COCs were identified by reviewing the historical and current uses associated with the Site and were selected based on their likelihood of being associated with the petroleum storage facility operating in the 1924 to 1966 time frame. The potential introduction of COCs from non-Site-related sources and residential land-use activities was also considered. Section 5.0 of the SCM (URS, 2010a) contains detailed information about sources for each potential COC. Only COCs related to the previous operation of the Site as a crude/bunker oil storage facility are considered as Site-related COCs[7]. The remaining COCs are considered non-Site-related COCs. The remainder of this section discusses key potential COCs as follows:

- TPH;
- VOCs;
- Semi-volatile organic compounds (SVOCs) including PAHs;
- Metals; and
- Methane.

In addition to the above constituents, polychlorinated biphenyls (PCBs), pesticides, and fuel oxygenates were considered. PCBs and pesticides have not been detected in Site soils and are not considered COCs. The oxygenate tert-butyl alcohol (TBA) and other oxygenates have been detected in Site groundwater and/or other media; however as discussed below, TBA and other oxygenates were not used before the 1970's and are considered non-Site-related COCs.

[7] Note that Site- versus non-Site -related COCs are identified for purposes of the Site Conceptual Model. SSCGs for all compounds are provided later in this document in accordance with RWQCB directives.

2.1.1 Total Petroleum Hydrocarbons

The specific source of the crude oil stored in the reservoirs is not known. Crude oil is a complex mixture of various petroleum hydrocarbon compounds. TPH concentrations are often reported in general hydrocarbon chain ranges corresponding to gasoline, diesel, and motor oil. If the TPH from crude or bunker oil is present at sufficiently high concentration it will occur as a non-aqueous phase liquid (NAPL), which typically has lower density than water and is often referred to as "light NAPL" or LNAPL. LNAPL has been detected at the Site. An LNAPL sample collected and analyzed from Site monitoring well MW-3 was characterized as a relatively unweathered crude oil likely produced from the Monterey Formation, a common oil-producing geologic formation found throughout southern California.

Borings completed during Site characterization found evidence of petroleum releases at the Site. Elevated TPH and other indicators of petroleum releases were found: (1) beneath the footprint of the former reservoirs (below their bases, but primarily along the perimeter, in the area near the presumed joint between the reservoir bases and the reservoir sidewalls); (2) within the fill material above the base level of the former reservoirs (the source of these impacts appears to be from the developer's reuse of petroleum-impacted fill from other portions of the Site, such as berm areas), and (3) in areas outside the footprints of the former reservoirs. The impacts outside the former reservoirs are potentially from a combination of sources, including the developer's grading activities, possible former on-Site/off-Site pipelines or spills during operation of the storage facility, offsite sources, and shallow soil sources associated with residential activities.

2.1.2 Volatile Organic Compounds

Volatile organic compounds (VOCs) are light molecular weight hydrocarbons which have low boiling points and therefore evaporate readily. Some VOCs occur naturally in the environment, others occur only as a result of manmade activities, and some have both origins. Only VOCs associated with crude oil such as aromatic and aliphatic hydrocarbons are considered Site-related COCs. In addition to a crude oil source, these compounds may also have been released to the Site though accidental releases of gasoline or other refined petroleum products following residential development.

Site-related VOCs: The most prevalent VOCs associated with crude oil include aromatic compounds such as BTEX and aliphatic compounds such as the alkanes (e.g., hexane, heptane). They can impact soil or volatilize from the liquid or sorbed phase to impact soil vapor. For example, BTEX could volatilize from LNAPL and migrate

through soil as a soil vapor to an enclosed space or enter a building through vapor intrusion.

Benzene has been detected in Site soil, soil vapor, and groundwater. However, as indicated in regional groundwater concentration maps shown in Appendix E (Figure E-3), benzene is widespread in groundwater in the general Site area and additional sources in the area have been identified. For example, concentrations of benzene in excess of 3,000 µg/L have been detected at the Fletcher Oil and Refining Company site (Fletcher Oil site) located 1,300 feet west (generally upgradient) of the Site. Similarly, Leymaster Environmental Consulting (Leymaster, 2013) reports concentrations of benzene as high as 4,600 µg/L detected in shallow groundwater at the adjacent Turco site, likely associated with their former leaking underground storage tank (UST) (see discussion below).

It is apparent that former Site crude oil operations have contributed to the presence of benzene in shallow groundwater beneath the Site, but some off-Site sources (e.g., Turco leaking UST) have likely contributed to hydrocarbons detected in Site groundwater. It is unlikely that a significant mass of benzene from the Fletcher Oil site has migrated onto the Site, based on the distribution of benzene detections shown in Figure E-3 and the fact that the Fletcher Oil site is located approximately 1,000 feet from the Site. However, the Turco site which is located immediately upgradient of the Site and has had elevated benzene concentrations detected in monitoring wells located adjacent to the Site's western boundary, has likely contributed some benzene in the northwest portion of the Site.

Non-Site-related Chlorinated VOCs: Chlorinated VOCs include hydrocarbon compounds that contain chlorine atoms and are typically used as solvents (such as tetrachloroethene [PCE] and trichloroethene [TCE]). Although these compounds have been infrequently detected at the Site, they are not considered Site-related COCs because there is no historical evidence that chlorinated solvents were used at the Site and the observed distributions of TCE and PCE in soil do not indicate that these constituents are related to Site activities. If these constituents were used during former Site operations (there is no historical evidence that they were) and subsequently released to Site soils, it is expected that they would be more widely distributed and present in deeper soils. A general description of TCE and PCE in Site soils follows.

- TCE was detected in approximately 0.5% of the on-Site soil samples with a maximum concentration of 0.72 mg/kg (see Appendix E, Figure E-1). TCE was only detected in vadose-zone samples collected in shallow soil (i.e., 0 - 10 feet bgs) and only 11 of the 10,290 soil samples collected on the Site had

concentrations greater than 0.001 mg/kg. There were no detections of TCE in soils between 10 feet bgs and groundwater (a total of 249 samples).

- PCE was detected in approximately 1.6% of the on-Site soil samples with a maximum concentration of 19 mg/kg (see Appendix E, Figure E-2). The maximum PCE concentration was detected in a sample on the western edge of the Site. PCE was only detected in vadose-zone samples collected in shallow soil (i.e., 0 - 10 feet bgs) and only 66 of the 10,290 soil samples collected on the Site had concentrations greater than 0.001 mg/kg. There were no detections of PCE in soils between 10 feet bgs and groundwater (a total of 249 samples).

- TCE and PCE were most frequently detected in shallow soils on the western border of the Site. As shown on the figures included in Appendix E, other than samples collected on the western border of the Site, detected concentrations of TCE and PCE were generally less than 0.001 mg/kg. The detections of these constituents at higher concentrations along the western border of the Site, and only in shallow soils, suggest that their presence is related to other sources. These sources include the adjacent former Turco Products/Purex facility (Turco) where they are an identified COC (see below); the former Oil Transport Company, Inc. (OTC) site, which is now the location of the Monterey Pines community directly west of the Former Kast Property; or possibly residential chemical product use. A general description of the potential off-site sources, Turco and OTC, follows.

  Turco: Turco's former operations, which included the processing of industrial chemicals and chemical milling operations associated with aircraft production, resulted in contamination of soil and groundwater with VOCs. Contamination is greatest in the areas formerly used for chemical and hazardous waste storage, handling, and treatment. A summary of results of Turco's soil and groundwater investigations indicated that volatile compounds, including benzene, toluene, and chlorinated VOCs, were detected in the groundwater (ERM, 2010). These results are further discussed in Section 8.0. Soil, soil vapor, and groundwater samples were also collected in the Carousel Tract residential area east of the former Turco facility as part of Turco's investigation. Hydrocarbons, including benzene, toluene, xylenes, and ethylbenzene, and chlorinated solvents were detected (ERM, 2010; Leymaster, 2010; and Leymaster, 2013). In an April 2008 Fact Sheet for the former Turco facility, California Environmental Protection Agency Department of Toxic Substances Control (Cal-EPA DTSC) associated the detected VOCs within the soil vapor with past Turco operations (Cal-EPA DTSC, 2008).

Former OTC Facility: OTC operated a trucking firm from 1953 to 1996 specializing in the transportation of crude oil and asphalt (Cal-EPA DTSC, 2009a). The OTC site was used for truck parking and maintenance. The OTC site included one active oil well, above ground and underground fuel and water storage tanks, a clarifier, garage and mechanic shops, and truck wash down areas (PIC Environmental Services, 1996). It is documented that activities at the former OTC facility included the use of chlorinated solvents in the clarifier area (Ecology and Environment, Inc., 2013). In 1997, Blue Jay Partners constructed a residential subdivision called Monterey Pines on the OTC site. Prior to construction operations, seven underground storage tanks (USTs) used to store gasoline, diesel, and waste oil, and associated piping and dispensing islands, were excavated and removed from the site. A brick-lined sump and concrete clarifier were also removed. Soil sampling during the UST and clarifier removal indicated TPH, BTEX, TCE, and PCE impacts in soil (PIC Environmental Services, 1995). PCE and TCE concentrations as high as 1,840 µg/kg and 7,850 µg/kg, respectively, were detected in soils collected during soil excavation operations (PIC, 1995a). Cal EPA-DTSC (2009a) reported that during construction of the residential subdivision, contaminated soils were consolidated under the roads of the new subdivision. As part of the environmental investigation and plume delineation for the Former Kast Property, URS documented elevated concentrations of chlorinated VOCs beneath Monterey and Carmel Drives (URS, 2010a). URS reported TCE and PCE soil vapor concentrations as high as 20,000 µg/m^3 and 82,000 µg/m^3, respectively. These soil vapor concentrations are approximately one to two orders of magnitude higher than any TCE and PCE soil vapor concentrations reported in the adjacent southwest corner of the Site. More recently, USEPA completed an investigation within the OTC area (Monterey Pines neighborhood) and also documented the presence of chlorinated VOCs in both soil and soil vapor in areas near the Site (Ecology and Environment, 2013). DTSC did not believe the chlorinated VOC plume beneath the current Monterey Pines Development to be associated with the Former Kast Property (USEPA, 2012a).

In summary, although chlorinated solvents have been detected at the Site, it is unlikely that they are related to former Site operations for the following reasons:

- No records indicate that chlorinated solvents were used or stored at the former oil storage facility.

- Generally, TCE and PCE in vadose zone soils have been detected at relatively low concentrations and sporadically at shallow depths. There are no detections of these compounds in vadose zone soils between 10 feet and groundwater. If undocumented use of these solvents during former Site operations resulted in releases to Site soils, it is likely that they would be detected at higher concentrations, be more widely distributed, and be present in deeper soils.

- The number of TCE and PCE detections in soil (especially PCE) is relatively high on the western boundary of the Site, adjacent to the former Turco facility where TCE and PCE are COCs. Consequently, TCE and PCE in the western portion of the Site may be related to this off-Site facility.

The preponderance of the evidence points to the fact that chlorinated VOCs detected in Site soils are not related to Shell's operations at the Site:

- TCE and PCE were not detected in soil samples collected below a depth of 10 feet at the Site,

- TCE and PCE were detected very infrequently in the upper 10 feet at the Site, and

- The limited detections of TCE and PCE in the upper 10 feet at the Site were at low concentrations.

Given the low concentrations of these compounds in shallow Site soils and their lack of detection in deeper Site soils, the potential for any significant migration to groundwater from on-Site shallow soils is extremely low. As discussed in Section 8.0, off-Site sources are the most likely sources of the TCE, PCE, and other chlorinated solvents observed in groundwater beneath the Site.

Trihalomethanes (THMs) are another group of VOCs detected at the Site, and these can be present from residential activities. Common THMs include bromomethane, chloroform, bromodichloromethane, dibromochloromethane, and bromoform. These have all been detected in Site soils and soil vapor. Their presence at the Site is most likely related to irrigation of yards and landscaping or leaking water lines and other household water use, as THMs are found in the domestic water supply from the California Water Service Company which provides water to the area. THMs are used for water treatment/purification (California Water, 2008/2009). Although these compounds are present at the Site, they are not considered Site-related COCs.

Additionally, some chlorinated VOCs that have been detected at the Site are often found in household products that are generally perceived as safe by the average consumer. For example, 1,4-dichlorobenzene is a compound that is commonly detected in homes due to its presence in household products, including air fresheners, mothballs, and toilet deodorizer blocks (ATSDR, 2006). Other household products that contain these VOCs include paint degreasers and removers, adhesives and adhesive removers, and auto products including brake cleaners, carburetor cleaners, degreasers, and lubricants. Although typical releases are expected to be small, some of these compounds may have been released through resident activities. A list of commonly detected chemicals present on some of the residential properties as well as some known household products that contain these chemicals was provided in the SCM (URS, 2010a).

Non-Site-related Oxygenated VOCs: TBA has been detected in groundwater beneath the Site. TBA is a fuel oxygenate additive and is also a breakdown product of methyl-tert butyl ether (MTBE). TBA and MTBE were both used as gasoline additives beginning in 1979. Although this compound has been detected in Site groundwater, it is considered a non-Site-related COC because its use post-dates the Site use as a crude oil storage facility that ended in the 1960s. The presence of TBA at the Site is likely related to other sources, including offsite sources such as the adjacent former Turco site (discussed above) and the Fletcher Oil site located 1,300 feet west of the Site. Leymaster (2009) indicated that the Fletcher Oil site was used to refine and store petroleum products including crude oil, light distillates such as gasoline, naphtha, and intermediate and heavier distillates such as diesel and asphalt. The refinery was in operation from 1939 to 1992. TBA was detected in groundwater at both the Turco and Fletcher Oil sites. Available information indicates that TBA in groundwater was detected as high as 850 µg/L at the Turco site (Leymaster, 2010) and 800 µg/L at the Fletcher Oil site (Leymaster, 2012).

Residential Activities: Various residential activities which are not related to historical Site activities, including lawn care, hobbies and crafts, auto repair, and home maintenance such as painting, may have resulted in release of and subsequent detections of chemicals in soil, soil vapor, or indoor air. Although it is unlikely that a large volume of a contaminant would be released to the ground surface by resident activities, localized impacts could be noticeable in surface soils, soil vapor, or indoor air.

In summary, with respect to VOCs, only TPH-related VOCs are considered to be related to historical Site activities. Chlorinated VOCs, though present at the Site are not considered Site-related because their presence is not consistent with previous operation of the Site as a crude and bunker oil storage facility and for the other reasons detailed

above. Chlorinated VOCs are believed to be present at the Site as a result of either offsite sources (e.g., Turco or OTC) and/or residential activities. Oxygenated VOCs are similarly not considered Site-related because their presence is not consistent with previous operation of the Site as a crude and bunker oil storage facility and for the other reasons listed above. In particular, TBA and MTBE did not come into use as gasoline additives until the late 1970s, many years after the use of the Site as a crude oil storage facility had ended and Shell had sold the Site to others, which occurred in the mid-1960s.

2.1.3 Semi-volatile Organic Compounds

Semi-volatile organic compounds (SVOCs) are organic compounds which have a boiling point higher than water, but may volatilize when exposed to temperatures above room temperature. SVOCs vary widely in their chemical structures. Forms include, but are not limited to, PAHs, phthalates, and phenols. Certain SVOCs can be associated with crude oil and petroleum, and/or produced through combustion. Because of their association with crude oil, select SVOCs are considered Site-related COCs.

PAHs are composed of two or more aromatic hydrocarbon rings bound in a lattice formation. They are commonly found in crude oil, tar, coal, and residues from former manufactured gas plant sites. PAHs are also commonly produced as a by-product of burning fossil fuels (in power plants or vehicle emissions) or biomass fuels (like wood), or as residues from brush or forest fires. While PAHs may have been introduced historically from the crude oil storage operations at the Site, there are other natural and anthropogenic sources that may also be sources of PAHs detected at the Site. In addition to their derivation from the burning of organic materials, PAHs are widely distributed throughout modern urban areas in near-surface soils as a result of atmospheric deposition. As a result, PAHs are found in almost all urban and rural surface soils. PAHs are generally found at higher ambient concentrations in urban areas, near heavily traveled roadways, areas that have been occupied/established for an extended period of time, and areas downwind of urbanized areas (Cal-EPA DTSC, 2009b; Environ, 2002). The PAHs that have been most regularly detected at the Site include pyrene, phenanthrene, chrysene, benzo(a)anthracene, fluoranthene, 2-methylnaphthalene, naphthalene, benzo(a)pyrene, benzo(b)fluorathene, and benzo(g,h,i)perylene. Chrysene, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluorathene are in a group of PAHs that are associated with carcinogenic effects and are commonly evaluated together as the carcinogenic PAHs (cPAHs).

2.1.4 Metals

Metals may be found in crude oil in trace amounts, but are also naturally occurring in southern California soils or are present due to anthropogenic sources. Site investigations indicated the limited, localized presence of arsenic and lead in soils at concentrations above their respective California Human Health Screening Level (CHHSL, Cal-EPA OEHHA, 2005) or regional background values. The sources of these metals are not known. Other metals that are consistent with background concentrations or below CHHSLs are not considered COCs for the Site.

Lead is known to be deposited in urban areas through atmospheric deposition, which was most significant historically prior to the widespread phase-out of leaded gasoline in the late 1970s. Other potential sources of lead include lead-based paint, which may have been used during the crude oil storage operation and on residences before the use of lead-based paint was restricted in 1978.

Arsenic has been used in the past as a pesticide/rodenticide agent and as a wood preservative. It is not known to have been specifically used at the Site. However, it is possible it was used during the crude oil storage period, the residential period, or both. Arsenic is also known to occur naturally in soils and groundwater at concentrations exceeding risk-based screening levels.

Several other metals exceed the California Maximum Contaminant Level (MCL) in groundwater beneath the Site. These metals are arsenic, thallium, and antimony. Additional discussion of the distribution of these metals in groundwater is presented in Section 8.0.

2.1.5 Methane

Methane has been detected in soil vapor samples collected at the Site. Based on the characterization work completed, methane is present primarily as the by-product of anaerobic biological degradation of crude oil compounds in the soils beneath the Site (biogenic methane). Methane has also been detected as a result of leaking natural gas utility lines, which were found at several of the residential properties, and a leaking sewer line at one residential property.

Although petroleum hydrocarbons in the subsurface have likely fermented to produce methane at depth, such methane is generally not present in the shallow subsurface and has not been detected in residences or enclosed areas of the Site at levels that pose a hazard. In one instance to date, methane believed to be attributable to fermentation of

petroleum hydrocarbons was detected at a concentration above the interim action level in a sub-slab probe beneath a garage; however, methane was not detected above the interim action level in other sub-slab soil vapor probes located at this property and no methane exceedances were found during the indoor air screening and sampling conducted at this property. The detection at this location is anomalous in that it represents the only detection of petroleum hydrocarbon-related methane out of 840 sub-slab soil vapor locations sampled through August 31, 2013. Although methane has been indicated by hand-held instrument readings in a few instances during indoor air screening, in each of those cases the source was determined to be leaking natural gas lines or connections to a stove, clothes dryer, furnace, or fireplace. In none of these instances was the methane linked to subsurface hydrocarbon impacts.

Methane generated at depth typically migrates very slowly through soils because it is not under significant pressure. Transport is primarily through diffusion, and methane moving upward from depth is typically biologically degraded and/or significantly attenuated in the aerobic shallow soils before it reaches the surface. This bio-attenuation in the vadose zone is evident in the soil vapor data collected at the Site that has been reported in the Interim, Follow-up, and Final Interim Reports and the street soil vapor monitoring reports (URS, 2013b). These natural mechanisms explain the lack of elevated methane levels in the sub-slab soil vapor samples and in indoor air within the residences that have been tested.

2.1.6 Summary of Potential COCs

The SCM identifies a range of constituents that are potential COCs. These are divided into Site-related COCs (i.e., COCs considered to be potentially related to the previous operation of a crude/bunker oil storage facility) and non-Site-related COCs (i.e., COCs related to offsite activities, COCs related to site activities following Site redevelopment, and COCs representative of background conditions). Potential Site-related COCs include:

- TPH;
- TPH-related VOCs;
- TPH-related SVOCs (including PAHs);
- Metals (lead and arsenic); and
- Methane.

Non-Site-related COCs include:

- Chlorinated VOCs;

- THMs;
- Oxygenated VOCs including TBA; and
- Metals present in soil or groundwater at background levels.

Further discussion of COCs is provided in Section 4.0. The RAP will propose what corrective actions, if any, are warranted for the different COCs identified in this report.

2.2 Fate and Transport

Based on the presence of petroleum impacted soils, it appears that crude oil was released to the Site from the former crude oil storage operations. It is assumed that one release mechanism was through leakage of the crude oil storage reservoirs (primarily in the area where the side walls and floors were joined). Also, site grading for residential development appears to have redistributed impacted soils, particularly in the areas overlying the former reservoirs and outside the reservoir boundaries. There may also have been releases from former on-Site pipelines, in adjacent streets and rights-of-way, from adjacent oil production and industrial facilities owned and operated by others, and oil field operations (oil wells) owned and operated by others.

COCs released to soils during the crude oil storage operation presumably migrated downward through soils in the liquid phase. If sufficient volume existed (i.e., through significant leakage over a long period of time), crude oil containing the associated COCs would have migrated downward through the soil profile to the groundwater table as LNAPL. LNAPL has been detected at the groundwater table at MW-3 and adjacent MW-12 near the former location of a sidewall and floor joint of the central storage reservoir.

Petroleum VOCs, PAHs, and metals detected at the Site may be related to crude oil; however, some may be from other sources. For example, their origin at the Site may be through mechanisms such as atmospheric deposition or a combination of Site releases and atmospheric deposition as well as natural occurrence. The presence of secondary sources may complicate the pattern of detections in environmental media and therefore interpretation of transport pathways.

Once COCs enter the soil, they may migrate or have been redistributed via one or more of the mechanisms described below.

Construction Activities: The demolition, grading, and home construction activities, particularly Site grading by Lomita Development Company and Barclay Hollander, now a subsidiary of Dole Food Company, Inc., and their contractors, appear to have

redistributed some petroleum-containing soils at the Site, especially in surface soils (approximately the upper 10 feet). Such fill may have been derived from the Site itself (e.g., the berms that formed the reservoirs). Redistribution of petroleum-containing soil during grading by the developer is the most likely explanation for detection of petroleum hydrocarbons in the soils at the Site above the elevation of the former reservoir bases.

LNAPL Migration: If sufficient driving force was present, crude oil in the liquid phase could migrate directly through the soil column. For example, the presence of LNAPL in Site monitoring well (MW-3) indicates that crude oil migrated downward from near-surface release(s) to groundwater at this location. However, cessation of crude storage operations and decommissioning of the reservoirs, which occurred by the mid-1960s, have reduced this potential downward driving force for LNAPL migration.

Leaching: COCs may also have partitioned out of residual crude oil released to Site soils and into infiltrating water (via leaching) from rainfall or Site irrigation water that eventually came in contact with the crude oil in the subsurface. COCs most subject to leaching include VOCs, certain SVOCs, and, to a much lesser degree, PAHs and metals. Infiltrating water could potentially have carried these compounds downward through the soil column and eventually into groundwater.

Based on the SCM and the age of potential petroleum releases at the Site, groundwater impacts due to leaching from Site soils are expected to be stable or decrease. This is discussed further in Section 8 and supported by the age of on-Site releases (greater than 45 years) and the plume stability analysis conducted for the most significant Site-related COC - benzene. It is expected that the VOCs and other COCs currently present in the vadose zone will be further reduced over time through degradation processes and/or continued, but reduced leaching, as the sources diminish. As a result, constituents detected in soil, but not identified as groundwater COCs are not considered COCs for the soil leaching to groundwater pathway.

Groundwater Transport: COCs that reach groundwater would be subject to transport via moving groundwater. Shallow groundwater at the Site currently flows northeastward. The vertical gradient at the Site between the shallow water table aquifer and the underlying Gage aquifer is slightly downward or slightly upward depending upon the area of the Site (URS, 2013c). COCs are expected to migrate at rates much lower than the actual flow of groundwater, as concentrations will attenuate through adsorption to soil particles, dilution, biodegradation, and other mechanisms.

Volatilization: Some VOCs associated with crude oil, including BTEX and naphthalene, may have partitioned from crude oil into the vapor phase (soil vapor). These compounds have the potential to migrate through the Site soils and potentially impact residences through the vapor intrusion pathway. BTEX and naphthalene have generally been detected in deeper soil and soil vapor samples collected throughout the Site. Their presence in these deeper zones is generally attributed to their persistence in anaerobic (no or limited oxygen) conditions. Their migration upward into the shallow soils is limited because these soils are generally aerobic (contain oxygen) which then facilitates their degradation through microbial activity.

Degradation: As with most organic materials, crude oil is subject to biological degradation. A significant by-product of anaerobic biodegradation of crude oil is methane, which is present in the subsurface at the Site. As biological degradation proceeds, the volume of crude oil is decreased. Methane has the potential to migrate through the soil profile and impact residences through the vapor intrusion pathway. However, methane rapidly degrades biologically in the presence of sufficient bacteria and oxygen (Ririe and Sweeney, 1995; Eklund, 2010). It is likely that significant degradation of methane occurs in near-surface (top several feet) soils at the Site where oxygen is more plentiful than deeper zones (URS, 2013b). It is important to note that aerobic degradation of other petroleum compounds such as benzene also likely occurs in the near-surface soils at the Site.

Plant Uptake: Plant uptake of chemicals is controlled by the physical/chemical properties of the chemical, the environmental conditions, and the plant species. Lipophilicity (attraction to fatty compounds) and volatility are the two major parameters that dictate a chemical's potential for plant uptake. Hydrophilic (water-loving) and non-volatile organic compounds can enter plants by root uptake and be translocated to the aboveground parts of the plants through the transpiration stream; while lipophilic and volatile organic compounds enter plants mainly through air deposition.

For the COCs related to crude oil, PAHs, and BTEX, results of prior investigations suggests that the soil-root-above ground plant or fruit pathway plays an insignificant role in their uptake. For PAHs, a number of studies suggest that air deposition is the major pathway for plant uptake of PAHs (Edwards, 1983; Nakajima et al., 1995; Kipopoulou et al., 1999; Wilcke, 2000; Li et al., 2010). Li et al. (2010) investigated PAH distribution in water, sediment, soil, and plants, and no correlation was found between PAH concentrations in soils and plants, suggesting that plants accumulate PAHs mainly through air deposition and not through translocation from the soil to the

plant. Kaliszova et al. (2010) summarizes that "plant root PAH uptake was observed in some species, but the available data suggest that it does not represent a significant public health risk, even in heavily polluted soils." In addition, green plants may naturally produce benzo(a)pyrene (New Zealand Ministry for the Environment, 2011). For BTEX, either rapid degradation in the root-zone or volatilization to the atmosphere would occur, preventing effective uptake by plant roots. Volatile contaminants have a low potential to accumulate by root uptake because they quickly escape to air (Trapp and Legind, 2011). Consistent with the literature, Cal-EPA OEHHA does not require evaluation of the soil to root uptake pathway for organic compounds (Cal-EPA OEHHA, 2012). In addition, the CHHSLs which are derived by OEHHA based on an unrestricted land use do not include the produce ingestion pathway.

2.3 Potential Exposure Pathways Evaluated

Potential exposure to COCs at the Site is partly dependent on the type of chemicals that are present and the respective exposure media. For VOCs detected in soil, exposure may occur via direct contact to soil (dermal contact or incidental ingestion) as well as indirect exposure from vapors migrating from the subsurface into indoor or outdoor air. For non-volatile chemicals such as metals and most SVOCs and PAHs, direct human contact exposures should be considered as well as inhalation of particulates.

While the water beneath the Site is not currently used for drinking water, COCs in Site soils may migrate to groundwater through leaching and need to be addressed consistent with the Basin Plan, State Board Resolution No. 68-16 (if applicable), and State Board Resolution No. 92-49. As discussed in Section 2.2, chemical uptake from soil into plants for the primary COCs is considered insignificant. Therefore this pathway was not included in the SSCG derivation.

The potential for exposure is also dependent on the locations at which impacts are identified and the likelihood of different receptors to contact an impacted media. For example, reasonable maximum exposure assumptions are considered for soils which are readily available for human contact. Conversely, infrequent exposures may be considered for soils where limited contact is expected (e.g., soils covered by impermeable media such as a building foundation, driveway, or hardscape, or soils at greater depths). Consequently, this report evaluates cleanup goals for surface soils (considering frequent- and infrequent-exposure scenarios) as well as potential leaching to groundwater. Additionally, the residential exposure scenario is assumed to be limited to the residential properties, while construction and utility maintenance worker may be exposed to impact present on residential properties or within the public rights of way (e.g., utility work within streets).

The following receptors and exposure pathways are considered relevant for the Site.

Receptor	Exposure Medium	Potentially Complete Exposure Pathway
Onsite Resident	Shallow Surface Soil (0-2 feet bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation
	Shallow Subsurface Soil (>2-10 feet bgs)	• Infrequent Incidental Ingestion • Infrequent Dermal Contact • Outdoor Air Inhalation
	Soil Vapor	• Vapor Inhalation in Indoor Air via Vapor Intrusion
	Indoor Air	• Inhalation in Indoor Air
Construction and Utility Maintenance Worker	Shallow Soil (0-10 feet bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation
	Soil Vapor	• Vapor Inhalation in Outdoor Air
Groundwater	Shallow Soil (0-10 feet bgs)	• Leaching to Groundwater

3.0 PILOT TEST RESULTS

Pilot tests have been completed in accordance with RWQCB-approved work plans to evaluate potential remedial actions for the Site. Pilot tests include:

- Soil vapor extraction (SVE) pilot testing at three locations;
- In-situ chemical oxidation (ISCO) bench-scale testing using persulfate and ozone;
- Bioventing pilot testing at six locations; and
- Excavation pilot testing at two locations.

Detailed pilot testing procedures and results were provided in individual pilot test reports prepared by URS and Geosyntec and are summarized in the *Final Pilot Test Summary Report – Part 1* dated May 30, 2013 (URS, 2013e) and *Final Pilot Test Summary Report – Part 2* dated August 30, 2013 (URS, 2013g).

3.1 SVE Pilot Tests

SVE pilot tests were conducted to evaluate the potential effectiveness of using SVE to remove vapor-phase VOCs from subsurface soils. The SVE pilot test activities and results are detailed in the *Soil Vapor Extraction Pilot Test Report* (URS, 2010b).

SVE pilot tests were conducted at three onsite locations in areas with soil conditions ranging from likely favorable to potentially unfavorable for SVE. At each location, tests were done at three different depth intervals to evaluate the radius of vapor influence (ROVI) in shallow (5 to 10 feet bgs), intermediate (15 to 25 feet bgs), and deep (30 to 40 feet bgs) depth intervals.

On average, vapor flow rates observed from the extraction wells were sufficient for SVE operation. The effective ROVI in the shallow zone (5 to 10 feet bgs) ranged from 24 to 78 feet with an average of approximately 50 feet. The effective ROVI in the intermediate zone (15 to 25 feet bgs) was estimated to be 112 to 131 feet with an average of approximately 125 feet, and the estimated ROVI in the deep zone (30 to 40 feet bgs) was 75 to 156 feet with an average of approximately 115 feet.

Based on findings from the SVE pilot tests, URS concluded that SVE is a potentially feasible option for the remediation of TPHg and VOC-impacted soils at the Site in the intermediate and deep zones. For two of the three shallow test locations, soil permeability to air flow estimates indicated marginal suitability for SVE operations in the shallow zone.

Although SVE technology is potentially feasible for remediation of the lighter gasoline-range petroleum hydrocarbons, VOCs, and methane, this technology would not be effective for diesel and motor oil-range petroleum hydrocarbons and SVOCs. However, increased air flow induced by an operating vapor extraction system might promote microbial degradation of longer-chain hydrocarbons and, over the long term, could potentially reduce concentrations of these non-volatile compounds.

3.2 ISCO Bench-Scale Testing

A preliminary feasibility evaluation for ISCO was conducted at the time the Pilot Test Work Plan was prepared (URS and Geosyntec, 2011). The preliminary feasibility evaluation concluded that sodium persulfate and ozone had greater potential for treatment of COCs than other oxidants considered, and laboratory bench-scale testing was conducted using sodium persulfate and ozone.

Sodium persulfate was found not to be effective for treatment of TPH and PAHs, despite relatively high doses of sodium persulfate application. Based on the bench-scale test results, Geosyntec concluded that hydrocarbon treatment using high doses of sodium persulfate would not be effective for Site soils, and field-scale tests were therefore not conducted.

ISCO pilot testing using ozone was conducted in two phases. The first phase is documented in the Technical Memorandum prepared by Geosyntec dated July 16, 2012 (Geosyntec, 2012a). The second expanded bench-testing phase is documented in the Phase II Bench-Scale Report (Geosyntec, 2013b).

The results from the Phase I studies indicated that ozone treatment could be effective on Site soils (at the bench-scale level); however, the dose required for achieving greater than 90% treatment was very high and an excessive quantity of ozone would be required for field application. Additionally, ozone consumption rates were slow, presenting the potential for fugitive ozone emissions. As a result, field-scale pilot testing was not recommended based on feasibility analysis and modeling that was reported the Technical Memorandum summarizing Phase I results (Geosyntec, 2012a).

Phase II ozone treatment bench-scale soil column tests were designed to evaluate the impact of varying ozone concentrations and flow rates, and thus doses, on the treatment of TPH in Site soils, and to provide additional insight into the feasibility of in-situ chemical oxidation using ozone. The Phase II test results indicated that higher ozone utilization could be achieved using lower flow rates and lower applied ozone dose per

mass of soil; however, less than approximately 50% reduction in TPH concentrations was observed in the Phase II tests.

As with the Phase I findings, Geosyntec concluded that effective field applications would require an excessive quantity of ozone to treat a single injection location, and that full-scale treatment would require an excessive quantity of ozone to achieve greater than 50% reduction in hydrocarbon mass. Therefore, field pilot testing of ISCO using ozone was not recommended based on both Phase I and Phase II findings, and will not be considered as a possible remedial alternative in the RAP.

3.3 Bioventing Pilot Testing

Bioventing pilot testing was conducted at six locations at the Site: four locations used vertical bioventing wells and two locations used horizontal wells installed in a trench. At each location a series of monitoring probes was installed to monitor fixed gases with field instruments during the tests. Individual tests ran for one to two weeks, followed by a week of respirometry measurements. Results from the bioventing pilot tests are summarized in the final *Bioventing Pilot Test Summary Report* (Geosyntec, 2012b).

Evidence of degradation of petroleum hydrocarbons was observed during the pilot tests, indicating that bioventing is a potential technology to remediate residual petroleum hydrocarbons. The bioventing pilot test results indicate that relatively low flow rates are necessary to deliver sufficient oxygen to the subsurface meet the bioventing oxygen demand. Because the horizontal wells affect a larger volume of soils, higher flow rates are required when using the horizontal well configuration. Results of the fan technology testing indicated that required flow rates theoretically can be achieved using commercially available fans; however, radon fans were shown to be more effective than the other two fan technologies tested.

The time frame required for bioventing system operation was estimated using biodegradation rates calculated from respirometry tests conducted at the extraction wells and vapor monitoring probes during the bioventing tests. The mean initial biodegradation rate from the six bioventing tests is 6.6 mg/kg/day and the mean average biodegradation rate is 0.31 mg/kg/day.

The bioventing time frame for hydrocarbon reduction is dependent on the biodegradation rates as well as initial TPH concentration and remedial objectives. To calculate bioventing time frame, Geosyntec assumed an initial soil TPH concentration of 10,000 mg/kg, which is representative of the midrange of the concentrations measured during the pilot tests. The calculated time frame for bioventing system

operations ranged from approximately 1 to 4 years, assuming the higher initial biodegradation rate, to several decades assuming the average biodegradation rate.

Based on the pilot test results, the following conclusions were reached regarding application of bioventing at the Site:

- Oxygen delivery is generally more effective using horizontal wells than vertical wells.
- No benefit was observed from using the vapor monitoring probes as passive vents to enhance subsurface flow.
- The radon fans evaluated during the pilot testing provide sufficient air flow to meet the bioventing oxygen demands.
- Radius of influence for the bioventing extraction wells ranged from less than 5 feet to 20 feet with an average radius of influence of approximately 10 feet.

3.4 Excavation Pilot Testing

Excavation pilot testing was conducted to evaluate the feasibility of excavating impacted soils to a depth of 10 feet bgs and removing the concrete reservoir bases (slabs) located at approximately 8 to 10 feet bgs beneath portions of the former oil storage reservoirs, and also to evaluate smaller "surgical" excavation. The excavation pilot tests were conducted in accordance with the *Pilot Test Work Plan* (URS and Geosyntec, 2011).

A slot-trench excavation was completed to approximately 10 feet bgs, including removal of the concrete slab, in the front yard of a property, and a surgical excavation was done to approximately 6 feet bgs in the back yard of a property to evaluate the ability to conduct hot spot removal. The scope of pilot test excavations at these two locations was expanded to include excavation of the remaining portions of the front and back yards, respectively, to a depth of 2 feet throughout the entire non-hardscape covered portions of the yards. Details are provided in the individual excavation pilot test reports (URS, 2013a and 2013d).

Engineering controls and mitigation measures were implemented during excavation activities to mitigate impacts to the community, including:

- Establishing an exclusion zone around work areas to limit access to essential personnel;
- Installing sound attenuation panels around noise-generating equipment operating onsite to lessen noise impacts associated with equipment operations;

- Use of ground protection mats and/or plywood sheeting to prevent damage to hardscape flatwork and adjacent structures;
- Implementing traffic control, as approved by the City of Carson, to manage traffic in the vicinity of excavation operations;
- Offsite staging of trucks to minimize idling of trucks within the neighborhood;
- Application of water mist to control fugitive dust;
- Use and pilot testing of different vapor and odor suppressants to mitigate fugitive vapors; and
- Providing for site security during non-working hours.

Monitoring conducted during pilot excavation activities included:

- Monitoring of existing cracks in hardscape near excavation areas for changes potentially associated with excavation activities (none were noted);
- Monitoring of ground stability in the vicinity of the excavations (no indications of instability were noted);
- Vibration monitoring for potential structurally-damaging vibration levels associated with excavation activities (no potentially damaging vibrations were noted);
- Real-time monitoring of the worker's breathing zone for worker health and safety and collection of time-weighted samples to monitor worker VOC exposure (no worker health and safety issues were identified);
- VOC emissions monitoring in compliance with South Coast Air Quality Management District (SCAQMD) Rule 1166 (compliance with the Rule 1166 permit was maintained);
- Meteorological monitoring for wind speed and direction and ambient temperature;
- Monitoring for VOCs upwind and downwind of the work area for laboratory analysis for VOCs (no downwind impacts were observed);
- Dust monitoring surrounding the work area for SCAQMD Rule 403 compliance (dust control measures were implemented periodically in accordance with monitoring results);
- Odor monitoring within the exclusion zone, at the property boundary, and within the adjacent neighborhood (odor control measures were implemented periodically in accordance with monitoring results); and
- Noise monitoring at multiple locations adjacent to and across the street from excavation operations.

Based upon setbacks from existing structures, a slot-trench excavation 12 feet wide by 26 feet long was completed in the front yard of a selected property. A medium-sized