18,000-pound track-mounted excavator with rubber tracks was used to excavate three approximately 4-foot-wide unshored slot trenches to 10+ feet bgs. The exposed portion of the underlying concrete reservoir base was successfully removed from each trench. The excavator was also used to directly load excavated soil and concrete rubble into dump trucks staged at curbside.

In addition to the pilot excavation to 10 feet bgs, the upper 2 feet of soils were excavated from the remaining part of the front yard and side yard north of the driveway. The additional 2-foot excavation extended to the edge of hardscape walkways, the driveway, and a low fence along the southern property boundary. The shallow excavation was done using a combination of mechanized excavation with the excavator and hand excavation using small hand tools.

The slot-trench excavation pilot test yielded the following findings and conclusions:

- Excavation of impacted soils to a depth of 10 feet bgs and the concrete slab at the former reservoir base was accomplished without the need for installation of shoring.
- Excavation to 10 feet bgs using slot trenching is technologically feasible in geotechnically similar site soils, subject to allowable setback distances from structures and hardscape, and absence of underground utilities that cannot be interrupted. The presence of utilities in excavation areas would significantly complicate deep excavations. Utilities are present in the front yards of many of the residential properties at the Site.
- Allowing for setbacks from structures and hardscape, the overall area of the excavation was approximately 12 feet wide by 26 feet long. Soils were excavated to a depth of 10 feet bgs over approximately 40% of the non-hardscaped area of the yard in front of the property.
- Setbacks will limit the area of yards where excavation can be accomplished to 10 feet bgs to a varying degree based on site-specific geotechnical properties and the area of the yards. This property was selected for pilot testing due to its relatively large front yard without complex landscaping or hardscape configuration. Smaller yards or those with complex hardscape configuration will complicate deep excavations.
- It is technologically feasible to remove most of the exposed concrete reservoir base within the excavation using the slot-trenching method; however, some concrete around the margins of the trenches cannot effectively be removed due to logistical constraints. The concrete base was removed over approximately 75 to 80% of the excavated area, which represents approximately 5% of the total area of the lot at this property.

- Soils within the remaining portion of the front yard and the side yard were readily excavated to a depth of 2 feet bgs using a combination of excavating equipment and hand tools.
- Induced vibrations associated with excavation activities and removal of the reservoir base were well below established damage threshold curves.
- Sound attenuation panels reduced noise levels during the majority of excavation activities to less than the maximum allowable noise level of 75 decibels (dBA) per the City of Carson noise ordinance; however, noise levels associated with some excavation and transportation activities exceeded this level for short periods of time. With sound attenuation panels removed, it was not possible to stay below the 75 dBA maximum.
- Testing of different odor control methods indicated that application of long-acting vapor suppression foam provided the best mitigation of vapor and odors, significantly reducing odors at the source immediately after application.

A surgical excavation was conducted in the back yard of a second property to evaluate the ability to conduct "hot spot" excavation of defined areas in back yards of properties using appropriately-sized equipment. Surgical excavation at this location accomplished a secondary purpose of providing an interim remedy to remove impacted soils that resulted in an elevated risk index from a small, well-defined area of the yard.

The surgical excavation was 9 feet x 9 feet in diameter and 6 feet deep and was conducted using an approximately 3,500-pound rubber track-mounted mini-excavator that was sufficiently narrow to access the back of the property via the side yard. A Bobcat skid-steer mini-loader was used to move the excavated material to the front yard and load soil into covered roll-off bins staged in front of the driveway for transport and disposal. The Bobcat was also used to shuttle clean backfill material from the driveway to the backyard for placement as fill.

In addition to the surgical excavation, the remaining non-hardscaped part of the back yard and the northern side yard were excavated to a depth of 2 feet bgs. The additional 2-foot excavation was done using the mini-excavator and manually using hand tools and wheel barrows.

The surgical excavation yielded the following findings and conclusions:

- Surgical excavation to 6 feet bgs is technologically feasible in geotechnically similar site soils, subject to allowable setback distances from structures and hardscape, and absence of underground utilities that cannot be interrupted. At other locations with less favorable soil conditions, shoring or slot-trenching methods may be required. The presence of utilities in excavation areas could significantly complicate excavations.

- Setbacks from structures or fences may limit the area of some yards where surgical excavation can be accomplished to a varying degree based on site-specific geotechnical properties, depth of planned excavations, and proximity of features that must be protected.
- It is technologically feasible to perform surgical excavations and yard-wide excavations to shallow depths in back yards of properties using a mini-excavator and hand tools, given a sufficiently wide unobstructed access route along a side yard.
- Induced vibrations associated with excavation activities were well below established damage threshold curves.
- Use of sound attenuation panels placed along the fence line of the back yard reduced noise levels during the majority of excavation activities to less than the maximum allowable noise level of 75 dBA per the City of Carson noise ordinance; however, noise levels associated with some excavation and transportation activities exceeded this level. Where it was not feasible to erect sound attenuation panels, it was not possible to stay below the 75 dBA maximum.

4.0 CONSTITUENTS OF CONCERN AND REMEDIAL ACTION OBJECTIVES

As a first step in developing cleanup goals for the Site, the COCs and remedial action objectives (RAOs) must be established. As discussed in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300), which is incorporated into the California Hazardous Substances Account Act (HSAA) by reference), RAOs describe in general terms what a remedial action should accomplish in order to be protective of human health and the environment. RAOs are narrative statements that specify the chemicals and environmental media of concern, the potential exposure pathways to be addressed by remedial actions, and the receptors to be protected. According to USEPA (USEPA, 1988), "RAOs for protecting human receptors should express both a contaminant level and an exposure route, rather than contaminant levels alone, because protectiveness may be achieved by reducing exposure (such as capping an area, limiting access, or providing an alternate water supply) as well as by reducing contaminant levels." The RAOs are used to help develop specific response actions for each media in the remedial action process.

This section presents the COCs and RAOs for the Site. In Sections 6 through 8, the RAOs are discussed in the context of each medium to identify Site-specific Cleanup Goals (SSCGs) for the Site.

4.1 Constituents of Concern

Property-specific HHSREs have been conducted for the majority of properties at the Site to evaluate the analytical results of soil and sub-slab soil vapor samples using a screening evaluation. The HHSRE is a preliminary, conservative evaluation of potential human health risks associated with detected organic chemicals (whether or not they are Site-related COCs). The results of the HHSREs have been used throughout the characterization phase to evaluate whether interim action is warranted in advance of the full HHRA that will be performed for submission with the RAP. The results of the full HHRA will be used to focus further evaluations in the RAP on those media and constituents that pose the majority of potential risk.

The Site-specific cleanup goals presented in this Revised SSCG Report will be used in the full HHRA. In response to the Regional Board's directive, Site-specific clean-up goals have been developed for both Site-related and non-Site-related COCs.[8] In addition to potential human exposure pathways, migration to groundwater through the leaching pathway will be considered. Recommendations for corrective actions for COCs will be presented in the RAP for the Site and will consider the SCM, results of the upcoming HHRA, pilot test results, and the economic and technological feasibility evaluation.

COC screening was conducted using risk-based screening levels (RBSLs) that were calculated assuming potential residential exposures to COCs in soil and soil vapor; the RBSLs were calculated as a part of the HHSRE process and are presented in the approved HHSRE Work Plan (Geosyntec, 2009). The RBSLs address the exposure pathways presented in the SCM in Section 2 and represent the chemical concentrations in the relevant environmental media that would be consistent with a target risk level for the current land use under conservative (i.e., protective) exposure conditions. For the carcinogenic PAHs and metals, a background comparison value was used along with the calculated RBSLs for COC selection. For the selection of soil COCs to address the leaching to groundwater pathway, chemicals that were detected in groundwater above the MCL or notification level (NL) were carried forward into the SSCG derivation process. Based on the SCM presented in Section 2 and the age of potential petroleum releases at the Site, groundwater impacts from leaching from Site soils are expected to decrease through time. This is discussed further in Section 8 and supported by the age of the release and the plume stability analysis. As a result, the inclusion of only chemicals that have been detected above MCLs and NLs in groundwater is considered appropriate for soil COC selection for the leaching to groundwater pathway. As an additional screening criterion for soil, if the chemical was detected in five or less samples it was excluded from the SSCG derivation. Given the large number of soil samples collected (over 10,000) this equates to less than or equal to 0.05% of soil samples.

In the first step of COC selection, a list of detected chemicals in each medium was identified. Tables 4-1 through 4-4 present the prevalence and range of concentrations of all chemicals that were detected at least once in soil, soil vapor, indoor air, and groundwater, respectively, across the Site.

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[8] While Site-specific clean-up goals have been developed for non-Site-related COCs, the Regional Board has previously made clear that Shell is not responsible for addressing contamination not related to Shell's former use of the Site. Regional Board's Response to Comments to Tentative CAO, Response Nos. 8.45, 8.51 (January 27, 2011),

To identify COCs for soil and soil vapor, the maximum concentration was compared to one-tenth of its respective RBSL. If the maximum concentration was greater than one-tenth of the RBSL it was selected as a COC for the Site. One-tenth of the RBSL (i.e., 1×10^{-7} for carcinogenic effects and 0.1 for noncancer effects) was used as a conservative adjustment to screen chemicals for further analysis and to address potential cumulative effects. In addition to the RBSL screen, background concentrations for metals and carcinogenic PAHs (cPAHs as benzo(a)pyrene equivalents[9]) were considered. For groundwater, chemicals present above their respective MCLs or notification levels were identified as COCs. These same groundwater COCs were evaluated for the soil leaching to groundwater pathway with the exception of those chemicals that were detected in five or less soil samples.

Tables 4-5 through 4-6 present the COCs that have been identified for soil and soil vapor. Groundwater COCs are presented in Section 8.

4.2 Remedial Action Objectives

Medium-specific RAOs have been developed based on Site investigations completed to date. Numerical SSCGs for the COCs, where applicable, have been developed to achieve the medium-specific RAOs. It is anticipated that the medium-specific RAOs and SSCGs along with the analysis of Applicable or Relevant and Appropriate Requirements (ARARs) will be presented and used in the RAP to identify the final response actions for each medium.

Various demarcations of acceptable risk have been established by regulatory agencies. The NCP (40 CFR 300) indicates that lifetime incremental cancer risks posed by a site should not exceed a range of one in one million (1×10^{-6}) to one hundred in one million (1×10^{-4}) and that noncarcinogenic chemicals should not be present at levels expected to cause adverse health effects (i.e., a Hazard Quotient [HQ] greater than 1). In addition, other relevant guidance (*The Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*, USEPA, 1991c) states that sites posing a cumulative cancer risk of less than 1×10^{-4} and hazard indices less than unity (1) for noncancer endpoints are generally not considered to pose a significant risk warranting remediation. The California Hazardous Substances Account Act (HSAA) incorporates the NCP by

[9] Benzo(a)pyrene equivalents are calculated following methods recommended by Cal-EPA (Cal-EPA DTSC 2009c). Additional details regarding calculation of benzo(a)pyrene equivalents are provided in Appendix A.

reference, and thus also incorporates the acceptable risk range set forth in the NCP. In California, the Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) regulates chemical exposures to the general population and is based on an acceptable risk level of 1×10^{-5}. The California Department of Toxic Substances Control (DTSC) considers the 1×10^{-6} risk level as the generally accepted point of departure for risk management decisions for unrestricted land use. Cumulative cancer risks in the range of 1×10^{-6} to 1×10^{-4} may therefore be considered to be acceptable, with cancer risks less than 1×10^{-6} considered *de minimis*. The risk range and target hazard index has been considered in developing RAOs based on human health exposures to soil and soil vapor. For groundwater and the soil leaching to groundwater pathway, water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply, have been considered.

The following RAOs are proposed for the Site based on the above and site-specific considerations:

- 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 NCP risk range of 1×10^{-6} to 1×10^{-4} and noncancer hazard indices are less than 1 or 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/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.
- 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.
- 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 the designated beneficial uses, including municipal supply.

The RAOs are addressed for each specific medium in Sections 6 through 8.

5.0 GUIDANCE DOCUMENTS AND POLICIES CONSIDERED

Per the CAO, the following guidance documents and Policies were considered in establishing SSCGs for the Site[10]:

- LARWQCB Interim Site Assessment and Cleanup Guidebook (LARWQCB, 1996).
- USEPA Regional Screening Levels (Formerly Preliminary Remediation Goals) (USEPA, 2012b).
- Use of Human Health Screening Levels (CHHSLS) in Evaluation of Contaminated Properties (Cal-EPA DTSC, 2005a).
- TPHCWG Series (TPHCWG, 1997a,b, 1998a,b, 1999).
- Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of MADEP VPH/EPH Approach (MADEP, 2002).
- Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology (MADEP, 2003).
- Air-Phase Petroleum Hydrocarbons (APH) Final (MADEP, 2009).
- Advisory-Active Soil Gas Investigations (Cal-EPA DTSC, 2012).
- Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Cal-EPA DTSC, 2011).
- Risk Assessment Guidance for Superfund (RAGS) Parts A-F.
- USEPA User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings (2004).
- USPEA Supplemental Guidance for Developing Soil Screening Levels (2002b).
- USEPA Supplemental Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, (2002a).

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[10] Information contained in some documents may be in conflict (e.g., toxicity factors). Nevertheless, the SSCGs presented in this report are consistent with the listed documents.

- Cal-EPA Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Wastes Sites and Permitted Facilities (Cal-EPA DTSC, 1997).

- Cal-EPA use of the Northern and Southern California Polynuclear Aromatic Hydrocarbons (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process (Cal-EPA DTSC, 2009b).

- California's Maximum Contaminant Levels (MCLs), Notification Levels (NLs), or Archived Action Levels (AALs) for drinking water as established by the California Department of Public Health.

- State Water Resources Control Board's "Antidegradation Policy" (State Board Resolution No. 68-16).

- The Regional Board's Basin Plan.

- Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304 (State Board Resolution No. 92-49).

Additional publications and agency guidance documents considered in establishing SSCGs for the Site include:

- Dichlorobenzenes ToxFAQ, Division of Toxicology and Environmental Medicine, (Agency for Toxic Substances and Disease Registry [ATSDR], 2006).

- Heavy Metals in Soils, Glasgow, Blackie and Son, – As cited by Duverge, D., 2011, Establishing Background Arsenic in Soil of the Urbanized San Francisco Bay Region, Masters Thesis, San Francisco State University. (Alloway, 1990).

- Advisory on Methane Assessment and Common Remedies at School Sites, School Property Evaluation and Cleanup Division, (Cal-EPA DTSC, 2005b).

- Arsenic Strategies: Determination of Arsenic Remediation, Development of Arsenic Cleanup Goals for Proposed and Existing School Sites (March 21, 2007). (Cal-EPA DTSC, 2007).

- Interim Guidance: Evaluating Human Health Risks from Total Petroleum Hydrocarbons. URL: www.dtsc.ca.gov/AssessingRisk/upload/TPH-Guidance-6_16_09.pdf (Cal-EPA DTSC 2009c).

- Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soils, (Cal-EPA, Office of Environmental Health Hazard Assessment [OEHHA]. 2005).

- Air Toxics Hot Spots Program Risk Assessment Guidelines Technical Support Document for Exposure Assessment and Stochastic Analysis. (Cal-EPA, OEHHA. 2012).

- Harbor Community Monitoring Study (HCMS) Saturation Monitoring, Final Report. (Desert Research Institute, 2009).

- Emissions of 1,2-Dichloroethane from Holiday Decorations as a Source of Indoor Air Contamination, (Doucette, W.J., A.J. Hall, and K.A. Gorder, 2010).

- Polycyclic aromatic hydrocarbons (PAH's) in the terrestrial environment—a review. (Edwards, N.T., 1983).

- Proposed Regulatory Framework for Evaluating the Methane Hazard due to Vapor Intrusion, (Eklund, B., 2010).

- A Methodology for using Background PAHs to Support Remediation Decisions, (Environ, 2002).

- Human Health Screening Evaluation Work Plan, Former Kast Property, Carson, California. (Geosyntec, 2009).

- Data Evaluation and Decision Matrix, Former Kast Property, Carson, California. April 6, 2010 (Geosyntec, 2010a).

- Addendum to the HHSE Work Plan, Former Kast Property, Carson, California. (Geosyntec, 2010b).

- Volatile Organic Compounds in Indoor Air: A Review of Concentrations Measured in North America Since 1990. (Hodgson and Levin, 2003).

- A Critical Review of Naphthalene Sources and Exposures Relevant to Indoor and Outdoor Air. (Jia, C. and S. Batterman, 2010).

- Polycyclic aromatic hydrocarbons in the atmosphere-soil-plant system. The root uptake role and consequences. (Kaliszova, R., Javorska, H., Tlustos, P., and Balik, J., 2010).

- Bioconcentration of polycyclic aromatic hydrocarbons in vegetables grown in an industrial area. (Kipopoulou, A. M., Manoli, E., and Samara, C., 1999).

- Polycyclic aromatic hydrocarbons in water, sediment, soil, and plants of the Aojiang River waterway in Wenzhou, China. (Li, J., Shang, X., Zhao, Z., Tanguay, R. L., Dong, Q., and Huang, C., 2010).

- Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand. (New Zealand Ministry for the Environment, 2011).

- Comparison of Personal, Indoor, and Outdoor Exposures to Hazardous Air Pollutants in Three Urban Communities. (Sexton, K., Adgate, J.L., Ramachandran, G., Pratt, G.C., Mongin, S.J., Stock, T.H., and Morandi, M.T., 2004).

- Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES-III), Final Report. (South Coast Air Quality Management District, 2008).

- Uptake of organic contaminants from soil into vegetables and fruits. (Trapp, S., and Legind, C. N., 2011).

- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, ((USEPA, 1988).

- The Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. (USEPA, 1991c).

- Exposure Factors Handbook. Volumes I-III. An Update to Exposure Factors Handbook (USEPA, 1997).

- Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990-2005): A Compilation of Statistics for Assessing Vapor Intrusion, (USEPA, 2011).

- EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings, (USEPA, 2012c).

References for these guidance documents and policies are included in Section 11.

6.0 SOIL

The RAOs for soil are to prevent human exposures to concentrations of COCs in soil such that total (i.e., cumulative) lifetime incremental carcinogenic risks are within the NCP risk range of 1×10^{-6} to 1×10^{-4} and noncancer hazard indices are less than 1 or concentrations are below background, whichever is higher. Potential human exposures include onsite residents and construction and utility maintenance workers. For derivation of individual chemical SSCGs, a lifetime incremental cancer risk of 1×10^{-6} was used for residential land use and a lifetime incremental cancer risk of 1×10^{-5} was used for construction and utility worker exposures consistent with the NCP risk management ranges and common practice within the State of California. A target hazard quotient (HQ) of 1 was used for noncarcinogens.

For the soil leaching to groundwater pathway, water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply, have been considered. Therefore, MCLs and NLs were used as the target groundwater concentration. For TPH, risk-based values were used as no MCL or NL is available.

Because background concentrations for some COCs detected in soil exceed risk-based levels, the evaluation of background concentrations is a critical element in identifying cleanup goals. The background concentration evaluations are detailed in Appendix A and background values used in the SSCG selection process are presented in Table 6-1.

As of August 31, 2013, soil sampling has been conducted at 266 residential properties and in the streets within the Site. Soil samples have been collected within the 0-10 foot bgs range to assess potential exposures to shallow soils as defined in the CAO and were typically collected at a minimum of six locations per property in accessible areas at four depths (0.5, 2, 5, and 10 feet bgs). Samples were collected at alternate depths if impacts were observed or if refusal was met due to subsurface obstructions that prevented collection of the deeper samples. The site investigations have detected soil impacts by primarily petroleum-related constituents. Petroleum-related constituents detected in over 50% of the samples include TPHd and TPHmo; the PAHs pyrene, phenanthrene, chrysene, benzo(a)anthracene, fluoranthene, 2-methylnaphthalene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(b)fluoranthene; and the VOCs naphthalene and benzene. Of these, chrysene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, and benzo(b)fluoranthene are considered cPAHs for purposes of evaluating benzo(a)pyrene equivalents. In addition, metals have been detected in soils, with arsenic and lead detected at concentrations above background.

To evaluate potential human health exposures to these constituents in soil and the need for interim actions, a screening level risk assessment (HHSRE) was conducted for each property where soil sampling was completed and the results were included in the Interim and Follow-up Residential Sampling reports. Potential exposures were initially evaluated for a depth interval of 0-2 feet bgs, the depth interval where there is a higher potential for residential exposure during recreational activities, landscaping, and yard maintenance. In addition, the full depth interval of 0-10 feet bgs was evaluated to address the more unlikely scenario that contact with deep soils would occur during a major renovation project (e.g., pool installation or underground utility work). Because the Site is completely developed, this deep soil exposure scenario is considered unlikely for residents. However, exposures to these deeper soils could occur during construction or utility maintenance work at the Site.

As presented in Section 4, the Site-related COCs (those COCs associated with the historic use of the Site as an oil storage facility) consist of the petroleum hydrocarbon derived constituents, and some metals. In addition, other chemicals have been detected in Site soils that are unrelated to the Site's use as an oil storage facility and are considered non-Site-related COCs. In response to the Regional Board's directive, SSCGs are established for Site-related and non-Site-related COCs identified for the Site.

The Site-related and non-Site-related COCs are presented below based on human health exposures to soil and the COC selection process described in Section 4.1. Those COCs also detected in groundwater above an MCL or NL and evaluated in the soil leaching to groundwater analysis are noted with an asterisk. For TPH constituents, no MCL or NL is available but given their prevalence in Site soils they are included in the evaluation of leaching to groundwater and are also noted with an asterisk. Figures 6-1 through 6-3 summarize the soil results for the primary Site-related COCs for human exposure to Site soils: cPAHs (as defined by benzo(a)pyrene equivalents), TPH-diesel, and TPH-motor oil.

Site-related Soil COCs	
1,2,4-Trimethylbenzene	Chrysene
1,3,5-Trimethylbenzene	Dibenz(a,h)anthracene
1-Methylnaphthalene	Ethylbenzene
2-Methylnaphthalene	Indeno(1,2,3-c,d)pyrene
Arsenic *	Lead
Benzene *	Naphthalene *
Benzo(a)anthracene	Pyrene
Benzo(a)pyrene	TPH as Diesel *

Benzo(b)fluoranthene Benzo(k)fluoranthene	TPH as Gasoline * TPH as Motor Oil *

Non-Site-related Soil COCs	
1,1,2,2-Tetrachloroethane 1,2,3-Trichloropropane * 1,2-Dichloropropane 1,4-Dichlorobenzene * 2,4-Dinitrotoluene Antimony * Bis(2-Ethylhexyl) Phthalate Bromodichloromethane Bromomethane Cadmium	Chromium VI Cobalt Copper Methylene Chloride Tetrachloroethene * Thallium * Trichloroethene * Vanadium Vinyl Chloride * Zinc

* COCs also detected in groundwater above an MCL or NL and evaluated in the soil leaching to groundwater evaluation. TPH also noted due to being primary COC for Site.

Once the COCs and potentially exposed populations are identified, the complete exposure pathways by which individuals may contact chemicals must be determined. A complete exposure pathway requires a source and mechanism of chemical release, a point of potential human contact within the impacted medium, and an exposure route (e.g., ingestion) at the contact point. These source-pathway-receptor relationships provide the basis for the quantitative exposure assessment.

The following table summarizes the exposure pathways that are relevant for potential residential exposures, potential construction and utility maintenance worker exposures, and groundwater at the Site.

Receptor	Sample Medium	Potentially Complete Exposure Pathway
Onsite Resident (Child and Adult)	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

Receptor	Sample Medium	Potentially Complete Exposure Pathway
Onsite Construction/Utility Maintenance Worker	Surface and Subsurface Soil (0-10 feet bgs)	• Incidental Ingestion • Dermal Contact • Outdoor Air Inhalation
Groundwater	Surface and Subsurface Soil (0-10 feet bgs)	• Leaching to Groundwater

6.1 Residential Receptor

The SSCGs for the residential scenario are based on frequent and infrequent exposure assumptions. Surface soils (e.g. 0-2 feet bgs) are considered for more frequent typical residential exposures whereas subsurface soils (e.g. >2-10 feet bgs) are considered for infrequent contact; the likelihood of a resident contacting soils at deeper depths is extremely low given the developed nature of the Site and typical residential activities where exposure to soil could occur (e.g., recreational activities, lawn care, landscaping). In addition, it is unlikely that soils from a deeper excavation (such as during a major renovation or utility repair work) would be placed at the surface due to the lack of area to place excavated soils. It is assumed for the infrequent contact scenario that institutional controls (e.g., a notification trigger added to the existing excavation permitting process, a soil management plan) to prevent redistribution of deep soils at the surface would be required. The potential for nuisance (e.g., odor) due to the presence of TPH-impacted soils that may be infrequently contacted is addressed in the discussion of soil vapor SSCGs in Section 7.

SSCGs were developed considering the exposure pathways identified above using the same methodology and approach presented in the RWQCB and OEHHA-approved HHSRE Work Plan and addenda. Development of SSCGs also considered background conditions (both natural and non-site-related anthropogenic sources) for metals and PAHs. The consideration of background concentrations is important in risk assessment and remedial planning as it is infeasible to clean up to lower concentrations than background.

As discussed in Section 2.2, evidence from the literature suggests that for the chemicals related to crude oil, PAHs, and BTEX, which are primary COCs for the Site, uptake from soil into plants and fruit does not play a significant role. A number of studies suggest that air deposition is the major pathway for plant uptake of PAHs. For BTEX, either rapid degradation or volatilization to the atmosphere would occur, preventing effective uptake by plant roots. Volatile contaminants in general have a low potential to accumulate by root uptake from soil because they quickly escape to air. 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). Based on this information, this exposure scenario was not considered in the derivation of the SSCGs. Rather, the pathways that have the most exposure potential, incidental soil ingestion and dermal contact, were included in the SSCG calculation along with particulate and VOC exposure in outdoor air.

Metals may be associated with petroleum hydrocarbons, but are also naturally occurring in the environment. According to DTSC (Cal-EPA DTSC 2009c), an evaluation of background concentrations for naturally occurring materials such as metals is important to evaluate whether the metals concentrations at the Site are consistent with naturally occurring or ambient levels in the area, and whether they should be included in the risk assessment. If concentrations of a metal are within background, the metal is not considered a COC and is not evaluated further. For each metal, an Upper Tolerance Limit (UTL) has been developed based on local background (Appendix A). These values are used with upper-bound Site concentration estimates to determine if a metal is above background and should be considered further. For arsenic, the DTSC background concentration of 12 mg/kg for southern California sites (Cal-EPA DTSC, 2007) or a more detailed statistical evaluation will be used for this Site as presented in Appendix A. For lead, a background comparison is not made but rather the California Human Health Screening Level (CHHSL) of 80 mg/kg is used for surface soil for residential land-use.

PAHs can also be naturally occurring or present at ambient levels not associated with former site activities. A background data set and methodology has been developed to evaluate the presence of PAHs in soil (Cal-EPA DTSC, 2009c). Consistent with agency-approved risk assessment practice in California, the DTSC-developed background concentration of 0.9 mg/kg benzo(a)pyrene equivalents (Bap-eq) (see Appendix A) will be used to evaluate cPAHs results. Benzo(a)pyrene equivalents are calculated following methods recommended by Cal-EPA (*Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process.* Cal-EPA DTSC, 2009b). Additional details regarding calculation of benzo(a)pyrene equivalents are provided in Appendix A.

Table 6-1 presents the SSCGs for Site-related and non-Site-related COCs using the target risk levels of 1×10^{-6} and a target hazard quotient of 1 for residential land use. Appendix A presents the methodology that was used to derive the SSCGs.

Because of the developed nature of the Site and the reduced exposure potential to soil at depth, SSCGs are calculated separately for surface soil (soils from 0-2 feet bgs) and subsurface soil (>2-10 feet bgs). Residential reasonable maximum exposure (RME) assumptions that are equivalent to frequent exposure (350 days per year) are used to calculate SSCGs for surface soils (soils from 0-2 feet bgs) within the residential property areas. This is consistent with the focus on exposure potential stated in USEPA for conducting feasibility studies [USEPA, 1988]. "RAOs for protecting human receptors should express both a contaminant level and an exposure route, rather than contaminant levels alone, because protectiveness may be achieved by reducing exposure (such as capping an area, limiting access, or providing an alternate water supply) as well as by reducing contaminant levels." The application of cleanup levels to surface soils (0-2 feet bgs) based on frequent contact is considered protective and would meet the RAO for the Site.

To address the unlikely infrequent exposure to subsurface soils (>2-10 feet bgs), SSCGs have been developed assuming a lower frequency of exposures (see Appendix A) based on an exposure frequency of 4 days per year assuming a resident may want to dig deeper than 2 feet to plant a tree as part of gardening. The exposure frequency of 4 days per year is based on $1/10^{th}$ of the USEPA recommended event frequency of 40 events per year for an adult resident gardening outdoors on a more routine basis (USEPA, 1997). Since the value of 40 days per year is based on routine gardening, an adjustment to this value was made to account for infrequent contact to account for instances where a resident may contact deeper soil (e.g., planting a tree).

In addition, it is unlikely that residents would contact soils from a deeper excavation (such as during a major renovation or utility repair work) as these soils could not be placed on site due to the developed nature of the neighborhood and lack of area to place the excavated soils. The conceptual model for this assumption is consistent with existing institutional controls (e.g., requirement for a permit for excavation) to prevent redistribution of deep soils at the surface. A soil management plan will be prepared either as a part of, or subsequent to, the RAP to provide the detailed approach to preventing residential exposure to subsurface soils impacted by COCs.

The chemical-specific SSCGs will be used in the HHRA along with the exposure point concentration for each property and depth interval being evaluated to estimate chemical-specific risks and noncancer hazards. The 95% Upper Confidence Limit

(95UCL) of the arithmetic mean concentration is commonly used as the exposure point concentration when sufficient data are available (Cal-EPA, 2005; Cal-EPA, 1996; USEPA, 2002). The adequacy of the data as it relates to the use of the 95UCL will be described in the HHRA. Cumulative estimates of cancer risk and noncancer hazard will be calculated by summing the chemical-specific estimates presented in the HHRA. In addition, for metals and cPAHs, a parcel-specific comparison to background will be conducted as discussed in Appendix A. Note the SSCGs are independent of the site data and are not based on average concentrations or the 95UCL (i.e. the site concentration data is not used in the SSCG calculation).

6.2 Construction Worker and Utility Maintenance Worker

The soil cleanup goals for the construction and utility maintenance worker scenario apply to the soil data results from 0-10 feet bgs. This is considered an interval where exposure is more likely should utility maintenance work be required at the Site.

Soil cleanup goals were developed considering the exposure pathways identified previously using the same methodology and approach presented in the HHSE Work Plan and HHSE Work Plan Addendum (Geosyntec, 2009, 2010b), modified to account for the different exposure assumptions used for construction workers in risk assessment. In addition, because utility workers may need to conduct subsurface utility repair or maintenance, the potential exists for worker exposure within a trench and this exposure scenario was also included.

Soil cleanup goals were developed considering background conditions (both natural and non-site-related anthropogenic sources) for metals and PAHs as discussed for residential cleanup goals. As mentioned earlier, consideration of background concentrations is important in risk assessment and remedial planning as it is infeasible to cleanup to lower concentrations than background.

Table 6-1 presents cleanup goals for the Site-related COCs using the target risk levels of 1×10^{-5} and a target hazard quotient of 1 for construction and utility maintenance worker exposures. Appendix A presents the methodology that was used to derive the cleanup goals.

While it is unlikely that utility repair will be conducted to depths of 10 feet bgs, this depth interval was included to address that potential. A soil management plan will be prepared either as a part of, or subsequent to, the RAP to provide the detailed approach to preventing unacceptable construction and utility worker exposure to COCs.

The chemical-specific SSCGs will be used in the HHRA with the 95UCL chemical concentrations calculated for each property, as appropriate, for the depth interval being evaluated to estimate chemical-specific risks and noncancer hazards. Data collected from the streets will be evaluated separately in a similar manner. Cumulative estimates of cancer risk and noncancer hazard will be calculated by summing the chemical-specific estimates. In addition, for metals and cPAHs, a comparison to background will be conducted as discussed in Appendix A.

6.3 Soil Leaching to Groundwater

As discussed in Section 2.0, some COCs may have migrated through the vadose zone to groundwater. However, as discussed in more detail in Section 8.0, based on groundwater data collected at and adjacent to the Site, it appears that the extent of the COCs in groundwater related to the Site is stable and decreasing. Furthermore, COC values in the downgradient wells near the Site boundary are below or very close to the MCLs and NLs. Based on these facts and the age of the releases of COCs in the vadose zone (>~45 years), it is unlikely that significant additional groundwater impacts will result from the remaining shallow soil contamination. Constituents of Concern currently present in the vadose zone at the Site which are also present in Site groundwater may theoretically represent a continuing source of potential groundwater contamination.

In general, infiltration of rainwater and irrigation in open areas of the Site has the potential to mobilize COCs present in the vadose zone and continue to transport those COCs to groundwater. This transport is expected to occur at a declining rate through time as the compounds degrade in the vadose zone and they are depleted through leaching. To address this migration pathway cleanup goals for the leaching to groundwater pathway were established for COCs present in both Site soils and groundwater that are protective of groundwater quality, consistent with the Basin Plan and the State's anti-degradation policy.[11]

For groundwater, chemicals present above their respective MCLs or NLs were identified as COCs. These same groundwater COCs were evaluated for the soil

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[11] As noted below in Section 8.4.2, because groundwater conditions at the time the Basin Plan was adopted in 1994 likely did not meet the water quality objectives set forth in the Basin Plan, State Water Board Resolution No. 68-16 may not be applicable. *Asociacion de Gente Unida por el Agua v. Cent. Valley Reg'l Water Quality Control Bd.*, 210 Cal.App.4th 1255, 1270 (2012). Accordingly, the MCLs set forth in the Basin Plan have been used to develop cleanup goals for soil and groundwater.

leaching to groundwater pathway with the exception of chemicals that were detected in five or less soil samples out of the over 10,000 samples collected for the Site. The chemicals not evaluated are the non-Site-related COCs 1,1-dichloroethane, 1,1-dichloroethene, and trans-1,2-dichloroethene.

For the soil leaching to groundwater pathway, water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply, have been considered. MCLs or NLs were used as the target groundwater concentrations for the COCs evaluated. For TPH constituents, no MCL or NL is available but, given their prevalence in Site soils, they are included in the evaluation of leaching to groundwater. The Site-related and non-Site-related COCs are presented below based on potential leaching to groundwater.

Site-related Soil COCs for Leaching to Groundwater Evaluation	
Arsenic Benzene Naphthalene	TPH as Diesel TPH as Gasoline TPH as Motor Oil

Non-Site-related Soil COCs for Leaching to Groundwater Evaluation	
1,2-Dichloroethane cis-1,2-Dichloroethene 1,2,3-Trichloropropane 1,4-Dichlorobenzene Antimony	Thallium Tert-Butyl Alcohol Tetrachloroethene Trichloroethene Vinyl Chloride

6.3.1 Methodology

To estimate cleanup goals for protection of groundwater quality, the migration of COCs to groundwater was simulated as a two-step process: leaching from soil particles to soil moisture, and mixing of the soil leachate with groundwater. The leaching step was modeled by using the 1996 California Regional Water Quality Control Board "Interim Site Assessment & Cleanup Guidebook" approach (the Water Board approach, LARWQCB, 1996) for organic chemicals. For metals, the USEPA Regional Screening Level methodology was used (USEPA, 2012b). The leachate-groundwater mixing step was modeled by the Soil Attenuation Model (SAM) (Connor et al., 1997). To establish soil cleanup goals, a "backward" calculation was needed, i.e., leachate criteria were first calculated based on regulatory groundwater quality standards and dilution attenuation factors (DAF, obtained from the SAM). A soil concentration (the cleanup goal) which would result in the target leachate criterion was then calculated.

When available, the California MCLs were used as the regulatory groundwater quality standards. In the case where an MCL was not available for a given COC, the California Department of Public Health NL was used. For TPH, the San Francisco Bay Regional Water Quality Control Board Environmental Screening Level (ESL) based on noncancer health-effects was used.

A simple box model approach, proposed in the SAM model (Connor et al., 1997), was used to estimate the mixing of dissolved COCs when soil leachate mixes with lateral groundwater flow. Site-specific weather conditions were accounted for by using Site area precipitation data to quantify the infiltration rate. The mixing zone height was calculated based on the thickness of the aquifer and the relative magnitudes of the infiltration rate and lateral groundwater flow rate. Using the regulatory groundwater quality standard and the DAF, SSCGs for soil leaching to groundwater for specific COCs were obtained.

Waste Extraction Tests (WET) were conducted on site soil samples to quantify the site-specific leachability of soil COCs. The WET extraction method uses a citric acid buffered solution and is intended to simulate acid rain conditions; use of this extraction method is considered conservative. When WET data were available, a sample-specific soil/water partitioning coefficient (Kd) value was calculated (NJDEP, 2013). The geometric mean of the sample-specific Kd values was used as the site-specific Kd.

When WET data were not available, Kd values were calculated from the site-specific fraction organic carbon (foc) data and the chemical-specific organic carbon/water partitioning coefficients (K_{oc}). Based on soil physical property data, the vadose zone soil was classified as 100% sand. The average soil bulk density, total porosity, water-filled porosity, and fraction organic content (f_{oc}) from the site soil physical property measurements were used as model input; and organic carbon/water partitioning coefficients (K_{oc}) and Henry's Law Constants (K_H) were obtained from the USEPA Regional Screening Level (USEPA RSL) database.

6.3.2 Cleanup Goals for Soil Leaching to Groundwater

Using the methodology described above, cleanup goals for Site-related and non-Site-related COCs found in the vadose zone were calculated for leaching to groundwater.

Table 6-2 lists the SSCGs for soil leaching to groundwater. The details of the SAM model calculation, site-specific Kd determinations, and the Water Board and USEPA RSL approach are presented in Appendix A.

7.0 SOIL VAPOR, INDOOR AIR, AND OUTDOOR AIR

The RAOs for soil vapor and indoor and outdoor air are to limit human exposures to COCs: (1) to concentrations that are at or below background levels[12], or (2) to concentrations such that total lifetime incremental carcinogenic risks are within the NCP risk range and target hazard level (i.e., cancer risk of 1×10^{-6} to 1×10^{-4} and noncancer hazard index less than 1). As described in this section, the SSCGs for soil vapor have been calculated to meet the RAOs for indoor air for residents and outdoor air for construction and utility maintenance workers. The lower end of the NCP risk range (i.e., 1×10^{-6}) and a noncancer hazard index less than 1 is used for the residential exposure scenario and a target risk of 1×10^{-5} and a noncancer hazard index less than 1 is used for the construction and utility maintenance worker exposure scenario. Additionally, the soil vapor SSCGs also consider nuisance-based screening levels for TPH that are presented in the San Francisco Bay Regional Water Quality Control Board Environmental Screening Level (ESL) document.

The RAOs for methane in soil vapor are (1) to 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, and (2) eliminate methane in the subsurface to the extent technologically and economically feasible.

Soil vapor cleanup goals for residential and construction worker scenarios are presented in the following subsections.

7.1 Residential Receptor

This section addresses soil vapor SSCGs for VOCs and methane for the residential scenario. For VOCs, the vapor intrusion exposure pathway is evaluated. This is the most sensitive pathway for potential residential exposures to soil vapor; and therefore, SSCGs for the vapor intrusion to indoor air pathway are also protective of potential outdoor air exposures. Fire and explosion risks are considered for methane. The soil vapor cleanup goals for the residential scenario are based on the sub-slab soil vapor sample analytical results and a multiple-lines-of-evidence vapor intrusion pathway analysis including indoor air data collected on Site (Appendix B). Site data are used to

[12] 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). More details on characterization of background in indoor air are provided in Appendix B.

develop a conservative upper-bound estimate for a site-specific vapor intrusion attenuation factor which is used to calculate SSCGs for sub-slab soil vapor. These sub-slab soil vapor SSCGs may be used in the RAP.

Data collected at the Site indicate significant natural attenuation of VOCs in the vadose zone that mitigates the potential migration of vapors detected in soil vapor samples collected at depth to reach the atmosphere. Based on the multiple-lines-of-evidence evaluation, soil vapor samples collected at depth are not considered in the residential receptor analysis. This approach is consistent with Cal-EPA DTSC vapor intrusion guidance (Cal-EPA DTSC, 2011) which states "In general, the closer the sampled medium is to the receptor, the more relevant the data are for estimating exposure and greater its weight of evidence."

7.1.1 Vapor Intrusion to Indoor Air

The sub-slab soil vapor and indoor air data were used to evaluate the vapor intrusion pathway for potential exposure to residents at the Site. As of August 31, 2013, sub-slab soil vapor and indoor/outdoor air sampling events have been conducted at 241 residential properties at the Site, and 147 of these properties have had two sub-slab soil vapor and indoor/outdoor air sampling events. In order to address the temporal and spatial variability of the vapor intrusion data, sampling has been conducted across the Site and on multiple dates. As discussed below, spatial variability in the sub-slab soil vapor and indoor air data is evident; however, the vapor intrusion pathway is evaluated for each property (as reported in the Interim, Follow-up, and Final Interim Phase II reports) to address questions concerning spatial variability. Additionally, indoor air samples have been (or will be) collected two times, at least 3 months apart, at each property to assess temporal variability. Furthermore, indoor air samples have been collected at the Site on more than 220 sampling dates over a period of more than 3 years. As discussed in Appendix B, sub-slab soil vapor and indoor air samples have been collected throughout this sampling period and these data provide a basis for assessing temporal variability across the Site, supplementing the temporal variability assessment for each property based on the two sampling events for each residence.

7.1.1.1 Sub-Slab Soil Vapor Data

As of August 31, 2013, sub-slab soil vapor samples have been collected at 265 properties. Sub-slab soil vapor samples were typically collected at three locations, and multiple sampling events have been conducted at most properties. Through August 31, 2013, more than 2,000 sub-slab soil vapor samples have been collected and the results compared to risk-based screening levels in the HHSREs. The sub-slab soil vapor results for the two primary Site-related sub-slab soil vapor COCs, benzene and naphthalene, are summarized on Figures 7-1 and 7-2. Figures 7-3 and 7-4 show the sub-slab soil vapor results for non-Site-related sub-slab soil vapor COCs, TCE and PCE. The sub-slab soil vapor screening results for COCs that exceed the RBSLs are summarized below.

COC	Number of Samples	# of Samples Above RBSL	# Properties Sampled	# Properties With a Single Exceedance	# Properties With Multiple Exceedances
1,2,4-Trichlorobenzene	2074	1	265	1	0
1,2,4-Trimethylbenzene	2074	2	265	2	0
1,2-Dichloroethane	2074	1	265	1	0
1,3,5-Trimethylbenzene	2074	1	265	1	0
1,3-Butadiene	2074	1	265	1	0
1,4-Dichlorobenzene	2074	1	265	1	0
1,4-Dioxane	2074	11	265	11	0
2,2,4-Trimethylpentane	2074	1	265	1	0
Benzene	2074	79	265	45	15
Bromodichloromethane	2074	28	265	19	4
Carbon Tetrachloride	2074	6	265	6	0
Chloroform	2074	81	265	31	18
Dibromochloromethane	2074	6	265	4	1
Ethylbenzene	2074	7	265	5	1
Methylene Chloride	2074	3	265	1	1
Naphthalene	2074	62	265	41	10
Tetrachloroethene	2074	50	265	16	11
Trichloroethene	2074	3	265	1	1

Note that comparison to RBSLs is a preliminary evaluation of potential human health risks associated with COCs detected at the property. These results are used to evaluate if further action is warranted as data are being collected and processed and does not necessarily indicate that remedial actions are needed.

As shown above and on Figures 7-1 through 7-4, exceedances of sub-slab soil vapor screening levels from the HHSREs for benzene, naphthalene, TCE, and PCE are infrequent. When an exceedance at a property is identified, this is often a result of a single soil vapor sample and is not representative of the bulk of the sub-slab data collected at a property. Sub-slab soil vapor sampling has been conducted throughout the Phase II investigation; consequently, potential variability in concentrations due to seasonal or other effects has been evaluated. Because the majority of exceedances of sub-slab soil vapor screening levels at a specific property are not reproducible, corrective action decisions based on the maximum concentration at that property likely will lead to implementation of mitigation or remedial measures that do not result in a quantifiable reduction of risk. Consequently, the complete data set for each property should be reviewed during the corrective action decision-making process.

7.1.1.2 Background Concentrations in Indoor Air

Background indoor air concentrations for some COCs frequently exceed risk-based levels, making an evaluation of background indoor air concentrations a critical element in identifying cleanup goals. Details of the background indoor air evaluation as well as the statistical evaluation of the vapor intrusion pathway at the Site are provided in Appendix B.

A variety of background sources can contribute to concentrations of VOCs in indoor air, including (1) outdoor air, (2) products used indoors, (3) residential building materials (e.g., paint, carpet, vinyl flooring.), (4) materials brought into the home (e.g., dry cleaned clothing), (5) emissions from municipal water, and (6) sources within attached garages (including vehicles, lawnmowers, paints, etc.).

Outdoor vapors can migrate indoors through open doors and/or windows. Concentrations of VOCs in indoor air are often associated with indoor product use, occupant activities (e.g., hobbies, smoking), and building materials (Van Winkle and Scheff, 2001). Trihalomethanes, such as chloroform and bromodichloromethane, are disinfection byproducts in municipal water that may be emitted to indoor air. Vapors from attached garages may be present in living spaces as a result of poor seals between the garage and the house (CARB, 2005). Common sources of background vapors include cigarette and cigar smoke, gasoline- or diesel-powered equipment, paints, glues, solvents, cleaners, and natural gas leaks. Table 7-1 summarizes potential background sources and the associated VOC concentrations detected in indoor air.

Consideration of household activities and indoor sources of VOCs is a critical element in background evaluations because indoor air background levels commonly exceed outdoor air concentrations (Van Winkle and Scheff, 2001; Hodgson and Levin, 2003; Sexton et al., 2004; CARB, 2005). On average, indoor concentrations reported in literature studies were one (Jia and Batterman, 2010) to five (CARB, 2005) orders of magnitude higher than measured outdoor concentrations. This trend likely is due to the various: indoor sources discussed above, and lower indoor ventilation compared to outdoor dispersion (Sexton et al., 2004). Studies have also shown that background levels in indoor air are building-specific due to household use and occupant activities (Van Winkle and Scheff, 2001; CARB, 2005).

7.1.1.3 Indoor Air Results

The residential air sampling conducted at the Site included indoor, outdoor, and garage air samples collected to evaluate indoor air quality and potential background contributions due to outdoor air and materials present in the garages, which are frequently attached to the living area of the residence. Chemical inventories conducted prior to indoor air sampling are also in the assessment of the contributions of background sources due to household product use.

As of August 31, 2013, more than 780 indoor air samples have been collected at the Site and the results compared to risk-based screening levels in the HHSREs and background concentrations. The indoor air results for benzene, naphthalene, and PCE[13] are summarized on Figures 7-5 through 7-7. As shown in these figures, and discussed below, indoor air concentrations detected at the Site are reflective of background levels. These findings were discussed in the Interim, Follow-up, and Final Interim Phase II reports which have been reviewed by the Regional Board and OEHHA. Overall, the regulatory agency reviews of the Interim, Follow-up, and Final Interim Phase II Site Characterization reports have concurred that the VOCs detected in indoor air appear to be due to background sources.

Appendix B includes a comparison of the measured Site indoor air concentrations to the literature values summarized by USEPA (USEPA, 2011). A comparison of the two data sets also is shown on Figure 7-8. Box and whisker plots are provided for the ten compounds detected most frequently in indoor air samples (detection frequencies greater than 95%). The boxes in this figure show the interquartile range (i.e., 25^{th} to 75^{th} percentile) and the bar in the middle of the box is the median value. The whiskers of the plots show the 10^{th} and 90^{th} percentile concentrations, and outlier results are plotted to illustrate the range of detected concentrations. The colored symbols on this plot show the ranges of median, 90th percentile, and maximum indoor air concentrations reported in the USEPA report (USEPA, 2011). Open and closed symbols show the lower and upper end of the ranges for these statistics, respectively.

[13] A figure summarizing the indoor air results for TCE is not included, because TCE was infrequently detected in indoor air.

With the exception of 1,2-dichloroethane (1,2-DCA), the concentrations of constituents in samples collected from the Site are within the background range reported by USEPA (which included data collected between 1990 and 2005). Although 1,2-DCA was outside of the background range reported in the USEPA study, more current studies (Doucette et al., 2010 and Kurtz et al., 2010) conclude that this compound has been detected in increasing frequency and higher concentrations since 2004.

The comparison of Site data with literature background values demonstrates that VOCs detected in indoor air are reflective of background concentrations. As a result, the Site indoor air data cannot be used to calculate an empirical vapor intrusion attenuation factor[14] that is not biased high due to the effect of background sources on indoor air quality. Exclusion of data where background concentrations have a significant effect on the indoor air concentrations is an approach that has been used by USEPA in evaluation of empirical attenuation factors for sites across the United States (USEPA, 2012c).

7.1.1.4 Statistical Analysis of Vapor Intrusion Data

To further investigate the relationship between indoor air and sub-slab soil vapor concentrations, single and multiple linear regression analysis methods (as described in Appendix B) were applied to the Site data. A multiple linear regression statistical analysis (in which the potential effects of more than one factor is assessed) evaluated the relationships between VOC concentrations measured in indoor air and VOC concentrations from (1) indoor sources, (2) garage air, (3) outdoor air, and (4) sub-slab soil vapor (i.e., vapor intrusion). The single regression analysis evaluated the relationship between (1) the indoor air concentrations above outdoor levels and (2) sub-slab soil vapor concentrations.

The multiple linear regression results showed that that the correlations for garage air to indoor air and outdoor air to indoor air are statistically significant[15]. This indicates that the indoor air concentrations are related to the garage and outdoor air concentrations. The analysis calculated statistically significant relationships between sub-slab soil vapor and indoor air for chloroform and naphthalene. However, an inverse correlation was calculated for naphthalene (i.e., the contribution to indoor air would be lower for cases

[14] The vapor intrusion attenuation factor is the ratio of indoor and sub-slab soil vapor concentrations for constituents measured in both media assuming that the contributions from background sources are insignificant.

[15] Note that the outdoor air to garage air coefficient estimate for 1,2-dichloroethane is not statistically significant.

with higher sub-slab soil vapor concentrations) which is not consistent with the vapor intrusion conceptual model. Additionally, the variability in indoor air concentrations was due to indoor sources and not concentrations in sub-slab soil vapor, outdoor air, or garage air. Consequently, the multiple linear regression analysis indicated that sub-slab soil vapor concentrations do not have a significant effect on indoor air quality. In other words, homes with higher indoor air concentrations for a given COC are not any more likely to have higher soil vapor concentrations than homes with low indoor air concentrations.

In summary, the results of this vapor intrusion pathway evaluation at the Site indicate:

- 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.

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

Although the literature background comparison and the multiple linear regression analysis indicate that the indoor concentrations are due to background sources, sub-slab soil vapor SSCGs have been calculated for corrective action planning as directed by the Regional Board. Based on the findings presented above, remediation to the SSCGs will not result in a measureable reduction in indoor air risks. These soil vapor SSCGs have not been developed to address indoor air risks, which are equivalent to background risks, but may be used to identify properties where higher concentrations of COCs were detected in sub-slab soil vapor for further evaluation.

To calculate SSCGs for sub-slab soil vapor, a single regression analysis was conducted to evaluate the relationship between (1) indoor air concentrations above outdoor levels, and (2) sub-slab soil vapor concentrations. Based on the single regression analysis, an upper-bound vapor intrusion attenuation factor was identified. This attenuation factor was based on evaluation of the vapor intrusion data set for cases where higher sub-slab soil vapor concentrations (i.e., greater than 100 $\mu g/m^3$) were observed at residential properties. Although the effect of background sources was still apparent in this data set, the data analysis indicates that the vapor intrusion attenuation factor observed at the Site was less than 0.001. This conservative upper-bound vapor intrusion attenuation factor is used to calculate sub-slab soil vapor SSCGs to address the Regional Board's directive.

7.1.1.5 Sub-Slab Soil Vapor SSCGs

SSCGs for sub-slab soil vapor at the Site are presented in Table 7-2. These SSCGs are based on levels that will not theoretically result in an incremental indoor air concentration above risk-based levels. As discussed in Appendix B, indoor sources have a significant effect on the measured indoor air concentrations, and the empirical attenuation factor will overestimate the potential for vapor intrusion at the Site. Additionally, as indoor air data continue to be collected as part of each Phase II property investigation, the data will be reviewed to assess whether indoor air concentrations are representative of background conditions.

7.1.2 Vapor Migration to Outdoor Air

Appendix B summarizes the results of the outdoor air concentrations measured at the Site. These data were compared to literature values for studies conducted in the region (SCAQMD, 2008; DRI, 2009). A comparison of the two data sets is shown on Figure 7-9. The box and whisker plot for each chemical shows the outdoor air concentration distributions for eleven compounds reported in the regional studies. The boxes in this figure show the interquartile range (i.e., 25^{th} to 75^{th} percentile) and the bar in the middle of the box is the median value. The whiskers of the plots show the 10^{th} and 90^{th} percentile concentrations, and outlier results are plotted to illustrate the range of detected concentrations. The colored symbols on this plot show the ranges of mean and maximum outdoor air concentrations reported in the regional studies (SCAQMD, 2008; DRI, 2009). Open and closed symbols show the lower and upper end of the ranges for these statistics, respectively.

The concentrations of these constituents detected in samples collected from the Site are within the reported background ranges. The results of the comparison of Site data with literature background values indicates that VOCs detected in outdoor air are reflective of background concentrations.

A community outdoor air sampling program was also conducted to evaluate concentrations of contaminants detected in outdoor air and to assess whether outdoor air contaminant concentrations within the Site boundary are statistically similar to upwind and downwind locations (Geosyntec, 2010b). Results were used to assess whether or not volatile subsurface contamination is contributing to concentrations of contaminants detected in outdoor air at the Site. Four outdoor air sampling events were conducted between July 31 and September 17, 2010. Outdoor air samples were collected at four locations west of the Site boundary, four locations east of the Site boundary, and four locations within the interior of the Site. Based on the data evaluation, all statistical tests (ANOVA, t-test, and Mann-Whitney) show that air concentrations within the Site boundary are not significantly different from concentrations from areas to the east (generally downwind) and west (generally upwind) of the Site. Consequently, soil vapor to outdoor air screening levels have not been developed for the soil vapor to outdoor air pathway.

7.2 Methane

Methane screening has been conducted in indoor structures on the Site and utility vaults, storm drains, and sewer manholes at and surrounding the Site. The screening assessments have not identified methane concentrations in enclosed spaces that indicate a potential safety risk. Additionally, over 2000 sub-slab soil vapor samples have been collected at 265 properties at the Site and analyzed for methane. Through August 31, 2013, methane concentrations above the interim action levels of 0.1% and 0.5% resulting from biodegradation of residual petroleum hydrocarbons have been identified at one location at one property[16]; however, no methane exceedances were found at this property during the indoor air screening and sampling. Engineering controls have been installed to mitigate potential risks due to methane detected at this location.

Proposed SSCGs for methane are the same as those presented in the Data Evaluation and Decision Matrix (Geosyntec, 2010a). These SSCGs are consistent with DTSC guidance for addressing methane detected at school sites (Cal-EPA DTSC, 2005b). These methane SSCGs are applicable to concentrations measured in soil vapor, in vaults, or above ground.

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

[16] Sub-slab soil vapor methane concentrations exceeding interim action levels have been identified 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

7.3 Construction and Utility Maintenance Worker Receptor

The conceptual exposure scenario for the construction and utility maintenance worker receptor is the same as that considered for soils: exposure to volatiles during excavation. The volatilization factor for soil vapor migration to a trench was calculated using the same relationships as those used for soil, with an additional factor to relate soil and soil vapor source concentrations. Worker exposure due to the dermal and ingestion pathways was not considered in the soil vapor source term (Appendix A). For derivation of individual chemical SSCGs, a lifetime incremental cancer risk of 1×10^{-5} was used for construction and utility worker exposures consistent with the NCP risk range and common practice within the State of California. A target hazard quotient (HQ) of 1 was used for noncarcinogens. Table 7-2 presents the SSCGs for VOCs in soil vapor. Potential worker safety concerns associated with methane detected at the site are addressed by occupational safety and health laws.

The chemical-specific soil vapor SSCGs will be used in the HHRA to estimate chemical-specific risks and noncancer hazards. Data collected from the streets will be evaluated separately in a similar manner. Cumulative estimates of cancer risk and noncancer hazard will be calculated by summing the chemical-specific estimates.

8.0 GROUNDWATER

8.1 Introduction

The proposed RAOs listed in Section 3.0 relevant to groundwater are:

- 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 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.

This section contains a summary of:

- Overall occurrence of groundwater at the Site, including information relevant to establishing cleanup goals for the Site.
- Groundwater quality, including identification of COCs exceeding California MCLs or other relevant action levels, COC migration from off-Site sources, plume configuration, and plume stability analysis.
- Issues relevant to establishing Site-specific cleanup goals.

The proposed Site-specific cleanup goals for groundwater, based on technological and economic feasibility and the Basin Plan, are presented in Section 9.0.

8.2 Groundwater Occurrence

Groundwater beneath the Site has been extensively investigated (URS, 2010a and 2011), including quarterly monitoring reports which have been prepared and submitted to the LARWQCB since initial well installation in 2009. The most recent monitoring event, the 3rd quarter 2013 event, was conducted in August 2013 (URS, 2013h). Key findings of the previous investigations related to groundwater are highlighted below.

<u>Shallow Zone Groundwater</u>

- Uppermost (or first) groundwater occurs at variable depths of approximately 51-68 feet bgs, depending on well location and timing of sampling, within sandy deposits of the Bellflower aquitard. This zone is referred to as the "Shallow Zone." A cross section (Figure 8-1) depicting the Bellflower aquitard and underlying units is presented in URS (2011).

- There are currently 17 monitoring wells associated with the Site which are used to monitor Shallow Zone groundwater on a quarterly basis (Figure 8-2).
- Groundwater flow direction in the Shallow Zone is to the northeast (Figure 8-2) with a gradient of approximately 0.002 feet per foot, which has remained generally consistent since monitoring began.
- There is no documented use of groundwater within the Shallow Zone.
- As of September 2013, LNAPL was present in two wells, MW-3 and MW-12. These two wells are located 40 feet apart. Active recovery of LNAPL through pumping currently occurs monthly in MW-3 and LNAPL recovery in MW-12 is scheduled to begin in October 2013.

Gage Aquifer

- The Gage aquifer is interpreted to underlie the Site at a depth of approximately 80-90 feet bgs (Figure 8-1). The base of the unit is estimated to occur at a depth of approximately 163-176 feet. The Gage aquifer is underlain by low permeability materials which separate the Gage aquifer from the underlying Lynwood aquifer.
- Four monitoring wells were installed in the upper portion of the Gage aquifer, and these are paired spatially with four monitoring wells completed in the lower portion of the Gage (Figures 8-3 and 8-4). These well pairs are also co-located near Shallow Zone wells.
- In the shallow Gage wells, the recent groundwater flow direction is reported to be east-northeast with a gradient of approximately 0.0018 feet per foot (3rd Quarter 2013). The groundwater flow direction has varied from east-southeast to northeast over the monitoring period.
- In the deep Gage wells, the recent groundwater flow direction is reported to be east-northeast with an approximate gradient of 0.0019 feet per foot (3rd Quarter 2013). The groundwater flow direction has varied from east-northeast to east over the monitoring period.
- The vertical gradient varies from slightly downward from the Shallow Zone to the Upper Gage to the Lower Gage, to slightly upward in the same zones.
- There is no documented use of groundwater within the Gage aquifer near the Site. The nearest production well to the Site (CWS Well 275 located 435 feet west of the western Site boundary) produces water from the underlying Lynwood and Silverado aquifers. The drinking water supplied to the Carousel

community by the water provider is tested according to state standards and is safe to drink (California Water Service Company, 2013).

8.3 Groundwater Quality[17]

Quarterly monitoring of both Shallow Zone and Gage wells has been conducted since well installation. Wells are sampled quarterly for VOCs and TPH. Additionally, the wells have been sampled for metals, SVOCs, and general mineral parameters, although not on a quarterly basis. Table 4-4 summarizes the on-Site groundwater sampling data[18].

Several compounds have been detected above their respective MCL or NL. Compounds detected in one or more sampling rounds in on-Site monitoring wells which exceed their respective MCL or NL are summarized below.

[17] Note that Site versus Non-Site related COCs are identified herein. SSCGs for all compounds regardless of their source are provided in accordance with RWQCB directives.
[18] Data in Table 4-4 do not include off-Site monitoring well data.

	Chemical	MCL (µg/L)	NL (µg/L)	Maximum detected concentration (µg/L)*
VOCs and Hydro-carbons	1,1-Dichloroethane	5		22
	1,1-Dichloroethene	6		33
	1,2,3-Trichloropropane		0.005	27
	1,2-Dichloroethane	0.5		6.1
	Benzene	1		680
	cis-1,2-Dichloroethene	6		510
	Naphthalene		17	82
	tert-Butyl Alcohol (TBA)		12	250
	Tetrachloroethene	5		260
	trans-1,2-Dichloroethene	10		120
	Trichloroethene	5		400
	Vinyl Chloride	0.5		0.71
	1,4-Dichlorobenzene	5		11
Metals and General Minerals	Antimony	6		19.3
	Arsenic	10		900
	Thallium	2		4.24J
	Iron	300		67,000
	Manganese	50		2550
	Chloride	500 mg/L		1400 mg/L
	Nitrate (as N)	10000		14000
	Total Dissolved Solids	1000 mg/L		3320 mg/L
	Specific Conductance	1600 µS/cm		4200 µS/cm

* Unless noted
J : Estimated
Note: MCLs for iron, manganese, chloride, Total Dissolved Solids, and Specific Conductance are secondary MCLs. MCLs shown for chloride, Total Dissolved Solids, and Specific Conductance are the "upper" secondary MCLs.

Of the compounds listed, only benzene, naphthalene, and arsenic are considered Site-related COCs in groundwater. TPH is also considered a Site-related COC in groundwater. Although MCLs or NLs do not exist for TPH, concentrations in Site groundwater exceed San Francisco Regional Water Quality Control Board Risk Based Environmental Screening Levels (SFRWQCB ESLs). Additional discussion of non-Site and Site-related COCs is presented in Sections 8.3.1 and 8.3.2.

8.3.1 Non Site-Related COCs

8.3.1.1 Tert-Butyl Alcohol (TBA)

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).

TBA is widely detected in groundwater at the Site, both in Shallow Zone and Gage wells. It has been detected in 11 of the 17 Shallow Zone wells including the upgradient well MW-7. It has also been detected in 3 of the 4 shallow Gage wells and one of the deep Gage wells. The highest recorded (i.e., historical) concentration (250 µg/L) is in the shallow Gage well MW-G04S located in the northwestern portion of the Site. Its presence at the Site clearly demonstrates the migration of impacted groundwater onto the Site from off-Site sources. Potential sources are described in Section 2.1.2.

8.3.1.2 Chlorinated Compounds

Chlorinated compounds which exceed their respective MCLs in one or more Site monitoring wells include: 1,1-dichloroethane; 1,1-dichloroethene; cis-1,2-dichloroethene; trans-1,2-dichloroethene; 1,2-dichloroethane; 1,4 dichlorobenzene; tetrachloroethene; trichloroethene; and vinyl chloride. The presence of these chlorinated compounds in Site groundwater is attributed to off-Site sources and further demonstrates the migration of impacted groundwater onto the Site (as with TBA). Off-

Site sources for these compounds are clearly indicated by the observed distribution of TCE and PCE in shallow groundwater. Figures summarizing recent TCE and PCE concentrations in shallow groundwater for the Site and for upgradient off-Site locations, including the Turco Facility, OTC Facility (Monterey Pines), and Fletcher Oil site, are presented in Appendix E (Figures E-4 and E-5). In addition, maximum historical TCE and PCE detections are depicted in Appendix E (Figures E-6 and E-7). The following are salient points regarding the observed TCE and PCE distribution in groundwater.

- There are numerous upgradient monitoring wells located on the adjacent former Turco Facility and OTC facility sites that contain significant concentrations of TCE and PCE. TCE and PCE have recently been detected as high as 660 μg/L and 480 μg/L in the Turco site monitoring wells screened in the Shallow Zone (MW-13S/D nested location). In the past, prior to ongoing remedial efforts at Turco, TCE and PCE were detected as high as 5,500 μg/L and 9,200 μg/L in Turco monitoring wells (Leymaster, 2013). The off-Site Turco monitoring wells containing these elevated TCE and PCE concentrations are located directly adjacent to and upgradient of the Site (Figures E-6 and E-7). Based on the northeasterly groundwater flow direction, groundwater in the vicinity of these impacted off-Site wells has flowed and continues to flow onto the Site.

- The highest concentrations of dissolved TCE and PCE on the Site are present in shallow monitoring wells MW-01 and MW-05; these are both located on the western boundary of the Site immediately downgradient of the former Turco and OTC sites. In August 2013 TCE and PCE were detected at 380 μg/L and 260 μg/L, respectively, in MW-1 and at 310 and 3.5 μg/L, respectively, in MW-05 (URS, 2013h).

  MW-1 is located in the very southwest corner of the Site immediately downgradient of the former clarifier and wash area at the OTC site (Figures E-4 and E-5). As discussed previously in Section 2.0, investigations conducted during the clarifier removal indicated PCE and TCE impacts in underlying soil (PIC Environmental Services, 1995 and 1995a). PCE and TCE concentrations as high as 1,840 μg/kg and 7,850 μg/kg, respectively, were detected in soil samples collected during soil excavation operations in the former OTC wash/clarifier area (PIC, 1995a). Although the PIC report notes the soil concentration data, it is unclear whether groundwater samples were collected. Given the elevated soil impacts at OTC and the lack of deeper vadose zone impacts at the Site (see below), it is likely that groundwater impacts occurred at OTC and migrated downgradient to the Site. MW-05 is located in the northwestern portion of the Site immediately adjacent to the former Turco facility site where high TCE and PCE concentrations have been detected in shallow groundwater (Figures E-4 through E-7).

- Data do not support the Site as a source of the TCE and PCE found in groundwater. No historical evidence for solvent use on-Site was found during extensive research associated with Site investigations over the past several years. Analysis of more than 400 Site soil samples collected in the deeper vadose zone (10 feet to groundwater) contained no detectable TCE or PCE, while these constituents were detected in deeper vadose zone samples collected at the adjacent OTC and Turco sites. TCE and PCE concentrations in Site shallow groundwater are observed to rapidly attenuate across the Site from west (near the off-Site Turco and OTC sources) to east (generally in the downgradient direction of groundwater flow).

- The highest recorded detections of the chlorinated solvents 1,1-dichloroethane, 1,1-dichloroethene, and vinyl chloride in monitoring wells installed during this investigation has occurred in the upgradient and off-Site MW-7 monitoring well. MW-7 is located in the former OTC facility area.

Based on the preponderance of data and information regarding sources of chlorinated solvents, including information presented in Section 2.1.2, the presence of chlorinated compounds in Site groundwater is attributed to off-Site sources.

1,2,3-trichloropropane (1,2,3-TCP) has been previously detected in two Shallow Zone monitoring wells (Shallow Zone well MW-06 located in the northeast portion of the Site and MW-7 located west and hydraulically upgradient of the Site) and shallow Gage well MW-G02S located in the west central portion of the Site. During the most recent 3rd quarter 2013 monitoring event, 1,2,3-TCP was only detected in MW-06 at a concentration of 8.7 μg/L. 1,2,3-TCP is an emerging chemical of concern with no MCL, but a relatively low NL of 5 parts per trillion. 1,2,3-TCP is commonly associated with agricultural soil fumigation activities or industrial solvent use. The chemical is not considered a Site-related COC, but has been detected at the adjacent upgradient Turco site.

8.3.1.3 General Minerals

The general mineral quality of groumdwater in nearly all Shallow Zone Site wells exceeds State Secondary MCLs for total dissolved solids (TDS) and electrical conductivity (Table 4-4)[19]. Chloride also exceeds the Secondary MCL in the wells with the highest TDS. Iron and manganese exceed the Secondary MCL in nearly all wells. This is typical of shallow water in the general area.

The most-recently reported TDS concentrations in the Shallow Zone wells ranged from 745 mg/L to 9,700 mg/L (URS, 2013i). The TDS in the underlying Gage aquifer is generally less than 1,000 mg/L and is of better quality than the Shallow Zone groundwater. Elevated concentrations of TDS (and electrical conductivity) are common in groundwater in much of the LA Basin (Water Replenishment District [WRD], 2008), particularly in shallow groundwater and near the coast where aquifers have been affected by seawater intrusion. WRD (2013) indicates that TDS concentrations in the West Coast Basin have been elevated due to seawater intrusion, and the secondary MCL of 1,000 mg/L has been exceeded in areas along the coast and in the Dominguez Gap area. As an illustration of the high background of general mineral concentrations in the area, the highest reported TDS, specific conductance, and chloride in a Site monitoring well have been measured in the upgradient MW-7 well. TDS, specific conductance, and chloride in MW-7 were measured at 9,700 mg/L, 10,000 μmhos/cm, and 4,700 mg/l, respectively, during the 2nd quarter 2013 monitoring event (URS, 2013i). The very high TDS in MW-7 may be also related to historic oil brine disposal on the former OTC site (PIC, 1995b).

Iron and manganese are also elevated in the upgradient well MW-7; these were detected at 15.4 mg/L and 3.3 mg/L, respectively, during the 2nd quarter 2013 event (URS, 2013i). The elevated detection of manganese is higher than any detections in on-Site monitoring wells. The dissolved iron and manganese in groundwater is likely derived primarily from native Site soils (i.e., soils contain a large amount of iron and manganese). WRD (2013) indicates that iron and manganese in groundwater are naturally occurring and that their concentrations in WRD West Coast Basin monitoring wells often exceed their respective secondary MCLs.

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[19] Electrical Conductivity or EC is a generally related and proportional to Total Dissolved Solid concentrations.

The elevated TDS, specific conductance, chloride, iron, and manganese concentrations at the Site are considered to be regional in nature or from natural or upgradient sources and are not attributed to previous Site activities prior to the late 1960s.

Nitrate exceeds the MCL in one Shallow Zone Site well (MW-01). Detected nitrate (as nitrogen) concentrations have ranged between 12 mg/L and 14 mg/L in the well. The source of the nitrate is not known, but is not expected to be related to previous Site activities prior to the late 1960s. Furthermore, the extremely limited distribution of impact in the Site groundwater indicates that nitrate is unlikely to be related to Site activities.

8.3.1.4 Metals

Antimony and thallium exceed the MCL in several Site wells (Table 4-4). In the most recent monitoring event that sampled and analyzed for these metals (4^{th} quarter 2012), antimony slightly exceeded the MCL in only one shallow monitoring well, and thallium slightly exceeded the MCL in three shallow monitoring wells and three Gage wells (URS, 2013c). Thallium concentrations were reported above the MCL in only the 4^{th} quarter 2012 event and were reported as estimates because of the low levels detected (i.e., 3-4 µg/L).

These metals can be present in trace concentrations in crude oil, but also occur naturally in the environment. Given the very limited distribution of impact in Site groundwater, they are unlikely to be related to crude oil impacts and are not considered Site-related COCs.

8.3.2 <u>Site-Related COCs</u>

Site-related COCs in groundwater exceeding State MCLs or NLs are benzene, naphthalene, and arsenic. TPH also exceeds ESLs. These compounds are discussed below.

8.3.2.1 Benzene

As discussed in Section 2.1.2, benzene is widespread beneath the Site and in upgradient areas. Benzene in Site groundwater is attributed to one or more of the following potential sources:

- Leaching of benzene from hydrocarbon-impacted Site soils,

- Leaching of benzene from LNAPL locally present at or near the water table beneath the Site, and

- Migration onto the Site from upgradient sources, including Turco.

The distribution of benzene in Site groundwater is depicted on Figures 8-2, 8-3, and 8-4; these figures are based on data in the 3rd quarter 2013 groundwater monitoring report (URS, 2013h). As shown on Figure 8-2, benzene is present beneath much of the Site in the Shallow Zone. The highest concentrations of benzene detected in the Shallow Zone during the 3rd quarter 2013 were in wells MW-13 and MW-06 (440 μg/L and 150 μg/L, respectively). Both monitoring wells are located in the northeast portion of of the Site. Off-Site to the northeast (downgradient), benzene was detected in one downgradient well, MW-10, at a concentration of 3.6 μg/L (URS, 2013h).

Concentrations of benzene attenuate markedly in the underlying Gage aquifer. Figure 8-3 shows recent data for the shallow Gage (URS, 2013h). Benzene concentrations in wells MW-G01S, -G02S, -G03S, and -G04S are ND, 0.19 μg/L, 0.31 μg/L, and 130 μg/L, respectively. The benzene concentration of 130 μg/L in MW-G04S is anomalous because that concentration is significantly higher than the overlying Shallow Zone concentration of 4.9 μg/L in MW-17. Furthermore, the elevated benzene concentration in this shallow Gage well MW-G04S is also associated with the highest TBA concentrations at the Site: 210 μg/L in the 3rd quarter 2013 and up to 250 μg/L historically. As described previously, TBA was introduced as a gasoline additive in 1979 and is associated with relatively recent gasoline impacts. Thus, TBA in MW-G04S is unrelated to Site activities prior to the late 1960s. The association of the anomalous elevated benzene concentration in MW-G04S with the elevated TBA concentration in the same well indicates that benzene impacts in this well are attributable to refined gasoline from an off-Site source and not to former Site operations. Elevated benzene concentrations have been detected in off-site Turco monitoring wells MW-8 and MW13D, which are directly upgradient of MW-G04S (Figure E-3). Benzene concentrations in Turco monitoring wells MW-8 and MW-13D were recently detected at 210 μg/L and 130 μg/L, respectively. Historically, benzene has been detected as high as 4,600 μg/L in Turco MW-8 and 190 μg/L in Turco MW-13D (Leymaster, 2013).

Benzene was not detected in samples collected in the deeper portion of the Gage aquifer during the most recent monitoring event (Figure 8-4).

As shown on Figures 8-2 through 8-4, the lateral and vertical distributions of benzene at the Site are generally well defined. Benzene concentrations in downgradient, off-Site wells (MW-09, MW-10, and MW-11) ranged from ND to 3.6 μg/L in the 3rd quarter 2013 and are significantly lower than in on-Site wells. The Gage aquifer wells define the vertical benzene distribution, with the exception of the anomalously high benzene detection in shallow Gage well MW-G04S which, as discussed above, is attributed to an off-Site source.

To characterize the stability of the benzene groundwater plume at the Site, two public-domain software packages, Monitoring and Remediation Optimization System (MAROS) and Bioscreen, were used to analyze the temporal trends of the plume (AFCEE, 2004 and USEPA, 1996). Details of these analyses are presented in Appendix C.

The results of the MAROS analysis are summarized as follows.

- Based on statistical analysis of the data collected to date from the 23 on-Site and off-Site wells with dissolved phase data (MW-07 was not included because it is an upgradient off-Site well), benzene concentrations in most wells are non-detect or have either No Trend, or Stable or Decreasing trends.
- Overall the MAROS trend analysis indicates that the dissolved benzene plume located beneath the Site is Potentially Decreasing and that benzene concentrations in the "tail area" or downgradient (off-Site) areas are Decreasing.
- The moment analysis shows that the total dissolved mass of the benzene plume displays a Probably Decreasing trend. Four wells display statistically increasing trends. Overall, the MAROS analysis shows the plume is Potentially Decreasing in size.

Given these overall trends provided by the MAROS analysis, it is likely that the benzene in Site groundwater is being attenuated through natural biodegradation processes and is a stable or decreasing plume. This conclusion is supported by the current observed distribution of benzene in the plume, which shows significant attenuation (to non-detect or near non-detect concentrations) at the downgradient plume edge near the property boundary). The conclusion is also supported by the significant age of the plume source (more than ~45years).

Additional modeling was performed using the Bioscreen model (USEPA, 1996) to further evaluate plume stability and to estimate the migration and biodegradation of the benzene groundwater plume. Bioscreen simulates key fate and transport processes of hydrocarbons such as advection, dispersion, sorption, and biodegradation. A description of the model, information on selection of parameters, and simulation results are presented in Appendix C.

Two source-zone scenarios were modeled with the Bioscreen model: (1) a source zone (LNAPL) without reduction, and (2) a source zone assuming 80% reduction (i.e., source removal). Simulation results show that without source zone reduction, the benzene concentration at the source zone will decrease to below the MCL (1 µg/L) in over 300 years, but also that no noticeable down-gradient migration of the benzene plume is predicted. The second simulation (assuming 80% benzene source zone mass removal) predicts that the benzene concentrations in groundwater will be degraded to below the MCL in approximately 70 years, also with no discernible down-gradient migration of the benzene plume.

8.3.2.2 Naphthalene

Naphthalene is detected in groundwater from the majority of Site wells. However, concentrations that exceed the NL of 17 µg/L have been detected in only two wells. Naphthalene has been detected at a maximum concentration of 82 µg/L in well MW-13, located in the northern portion of the Site (detected at 60 µg/L in the 3rd Quarter 2013). MW-13 is the monitoring well with the highest detected concentration of benzene at the Site. Naphthalene is also present above the NL (detected at 30 µg/L during the 3rd Quarter 2013) in well MW-14, located in the southern portion of the Site. Concentrations of naphthalene exceeding the NL are limited to these two areas and the extent is relatively well delineated.

8.3.2.3 TPH

TPH has been detected in Site monitoring wells at concentrations exceeding SFRWQCB groundwater ESLs. TPH-gasoline, TPH-diesel, and TPH-motor oil in Site groundwater have historically been detected as high as 3,200 µg/L, 3,000 µg/L, and 1,700 µg/L, respectively. In the most recent groundwater monitoring event (3rd quarter 2013), TPH-gasoline concentrations above the ESL of 410 µg/L were detected in three Site monitoring wells: MW-02, MW-06 and MW-13 (URS, 2013h). The highest TPH-gasoline concentration, 1,400 µg/L, was detected in MW-13 located in the northern portion of the Site. In the same monitoring event TPH-diesel concentrations above the ESL (200 µg/L) were detected in three wells: MW-06, MW-08, and MW-13 (URS, 2013h). The highest TPH-diesel concentration, 2,400 µg/L, was also detected in MW-13. The TPH-diesel ESL was also exceeded in the off-site upgradient monitoring well MW-07. The TPH-motor oil ESL was not exceeded in samples collected during the 3rd quarter 2013 monitoring event.

8.3.2.4 Arsenic

Arsenic has been detected in most of the Site monitoring wells. During the most recent groundwater monitoring event in which arsenic was sampled (2nd quarter 2013), arsenic concentrations exceeding the MCL of 10 µg/L were detected in several wells MW-4, 5, 6, 7, 8, 10 11, 13, 14, 15, 16, 17, G-04S, and G-03D (URS, 2013i). Dissolved arsenic was relatively elevated (above 100 µg/L) in three Shallow Zone wells located in the west central portion of the Site (MW-05, MW-08, and MW-15) and in one downgradient well (MW-10). The highest historical arsenic concentration, 900 µg/L, was reported in a sample collected from MW-08. Arsenic was not detected in the three off-Site Shallow Zone downgradient wells.

Dissolved arsenic concentrations in the deeper Gage wells are significantly lower and are only slightly above the MCL of 10 µg/L. The highest reported arsenic concentration in the Gage aquifer was 17.1 µg/L in MW-G04S.

Although arsenic is identified as a COC (Section 2.2), it is likely that a portion, if not all, of the arsenic present in groundwater is derived from native Site soils. Arsenic is a natural trace element that occurs in soils. Under reducing conditions, iron oxides that can bind with natural arsenic tend to dissolve. Arsenic can then be freed and will be in a more soluble and, thus, mobile phase. The relatively high dissolved iron and manganese concentrations in many of the Site wells may be indicative of reducing conditions beneath the Site; the relatively low field oxidation reduction potential (ORP) measurements in the field during sampling also indicate reducing conditions. These reducing conditions in the Site subsurface may be natural, but may also be enhanced by the presence of petroleum hydrocarbon compounds that consume oxygen during aerobic biodegradation. Welch et al. (2000) indicates that arsenic in the iron oxides of natural aquifer materials may be an important source of dissolved arsenic at sites contaminated with VOCs.

Because arsenic is naturally soluble, dissolved arsenic is a common contaminant in southern California groundwater. Out of all wells sampled by WRD in the West and Central Groundwater Basins in the Los Angeles area, arsenic exceeds its MCL more than any other constituent (WRD, 2008). WRD (2008) reports that arsenic concentrations as high as 205 µg/L were detected in the wells they monitor. Groundwater immediately upgradient of the Site has elevated arsenic. In the 2nd quarter 2013 event, arsenic was detected above the MCL at a concentration of 38.8 µg/L in the upgradient well MW-7.

In summary, it is known that arsenic is a regional contaminant in southern California. It is likely that at least a portion, if not all, of the dissolved arsenic beneath the Site is derived from natural sediments beneath the Site. Petroleum hydrocarbon impacts at the Site may enhance the solubility of arsenic by lowering oxygen levels in the subsurface, thus increasing the mobility of arsenic in soils beneath the Site. Based on monitoring well data, relatively elevated arsenic concentrations are localized in the central western portion of the Site and are attenuated significantly in the downgradient direction.

8.4 Proposed Cleanup Goals for Groundwater

8.4.1 Site Conditions Relevant to Establishing Cleanup Goals

As described in Section 8.2, groundwater beneath the Site is impacted with various chemicals including petroleum hydrocarbons, chlorinated hydrocarbons, metals, and general minerals. Of these, COCs which exceed an MCL or NL in groundwater are benzene, naphthalene, arsenic, trace metals (antimony and thallium), various chlorinated compounds and 1,2,3-TCP, and general minerals. TPH exceeds ESLs. Key factors in establishing cleanup goals for these compounds are discussed below for these COCs. Selection of the appropriate SSCGs for Site groundwater is addressed in Section 9.

8.4.1.1 Benzene

- Benzene is the most significant of the COCs in groundwater because it is widespread in the Shallow Zone as well as in soil and soil vapor.

- The distribution of benzene in groundwater is generally well defined, both laterally and vertically. The downgradient limit of the benzene plume is at or near the northeastern property boundary. Benzene concentrations are low to non-detect in the Gage aquifer with the exception of one well that is likely being affected by an off-Site source given the co-located elevated concentrations of TBA.

- The benzene groundwater plume at the Site appears to be stable or decreasing in volume and size as shown by statistical analysis and modeling. Statistical analysis indicates that the plume concentrations are decreasing and model simulations predict a reduction of benzene concentrations to MCLs in 70 to over 300 years depending on the level of source removal. The observed current distribution of dissolved benzene in Site monitoring wells demonstrates attenuation of benzene to MCLs or near MCLs at the downgradient end of the plume on the northeastern Site boundary. The presence of relatively low levels of dissolved oxygen in groundwater samples suggests the benzene plume (and other TPH compounds) in groundwater is degrading through microbial activity.

- It is expected that the benzene sources have declined over time and will continue to do so in the future. Based on the SCM and the age of potential petroleum releases at the Site, groundwater impacts from leaching from Site soils are expected to decrease through time. Crude oil present in the vadose zone above the groundwater table and in a limited area at or below the water table has been subject to biological degradation and leaching over a period of more than 45-years. It is expected that benzene concentrations in soils will be further reduced over time by degradation and/or continued, but reduced leaching, as the sources diminish. The diminishing concentrations of benzene in the vadose zone are expected to result in continued declining benzene levels in groundwater in the future.

- The technological and economic feasibility of groundwater remediation of benzene is largely dependent on the ability to remove potential sources in the vadose zone, in LNAPL, in the higher concentration areas of the plume, and in upgradient areas (see above discussion of upgradient sources). This is discussed in detail in Section 9).

8.4.1.2 Naphthalene

- Naphthalene is not expected to be naturally occurring in shallow groundwater beneath the Site and exceeds the NL in two wells on-Site, both of which are already impacted by benzene.

8.4.1.3 TPH

- TPH is not expected to be naturally occurring in shallow groundwater beneath the Site and, based on recent quarterly monitoring results (URS, 2013h), exceeds TPH-gasoline ESLs in three on-site monitoring wells and TPH-diesel ESLs in three on-site monitoring wells. These locations are also impacted by benzene.

- The technological and economic feasibility of groundwater remediation of TPH is largely dependent on the ability to remove potential sources in the vadose zone, LNAPL in groundwater, and in upgradient areas (see Section 9).

8.4.1.4 Arsenic

- The source of arsenic is likely naturally occurring, although the concentrations may be locally enhanced due to the presence of reducing conditions related to the degradation of petroleum hydrocarbon compounds). Once petroleum hydrocarbons are depleted, elevated arsenic would be expected to return to background concentrations.

- Arsenic is recognized as a regional issue in southern California groundwater. Arsenic has been reported by WRD as the constituent that exceeds its MCL more than any other constituent in the West and Central Groundwater Basins (WRD, 2008).

8.4.1.5 Trace Metals

- Dissolved antimony and thallium have been detected at low concentrations above their respective MCLs in groundwater from several Site wells. These metals are present in natural soils and in trace concentrations in crude oil. They are present at very low concentration and have limited distribution in Site groundwater.

8.4.1.6 TCE, PCE and other Chlorinated Compounds

- Based on the lack of detections of TCE and PCE in vadose zone soils below 10 feet and their presence at significant concentrations in groundwater in upgradient areas, the source of these compounds in Site groundwater is considered to be off-Site.

- The technological and economic feasibility of groundwater remediation of all chlorinated compounds will be dependent on the ability to remediate upgradient sources. Cleanup of chlorinated solvents to MCLs at the Site will not be technologically feasible without cleanup of off-Site sources. A groundwater remedy that reduces the concentrations of these compounds in groundwater without source reduction will have limited success (see Section 9).

8.4.1.7 General Minerals

- General minerals or parameters exceeding secondary MCLs include TDS, electrical conductivity, chloride, iron, and manganese. These compounds are observed to be highly elevated in the one upgradient monitoring well (MW-7) and elevated concentrations of these dissolved compounds are common in LA Basin groundwater, particularly near the coast. However, in general, the sources of these general mineral compounds are not thought to be related to previous Site activities prior to the late 1960s.

- Nitrate exceeds the primary MCL in one well. The source of the nitrate is not known, but is not expected to be related to previous Site activities prior to the late 1960s.

8.4.1.8 Other Factors

- Although groundwater beneath the Site is designated for municipal use, groundwater in both the Shallow Zone and the Gage aquifer in the Site vicinity is not currently used for drinking or other purposes. Because groundwater extractions from the area are strictly controlled (the West Coast Basin is adjudicated), there is no foreseeable future use of water from the Shallow Zone and Gage aquifer in the area.

8.4.2 Regulatory Standards Relevant to Establishing Cleanup Goals

CAO # R4-2011-0046 (LARWQCB, 2011) included a discussion of the Basin Plan and State Water Board Resolution Nos 68-16 and 92-49. As stated in the CAO:

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

> "The SWRCB's 'Antidegradation 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, and not unreasonably affect present and anticipated beneficial uses of the water, and not result in exceedance of water quality objectives in the LARWQCB's Basin Plan."

It is not clear that State Water Board Resolution No. 68-16 is triggered here. Resolution No. 68-16 was implemented to regulate "the granting of permits and licenses for unappropriated waters and the disposal of wastes into the waters of the State" where groundwater conditions are better than water quality levels. In such cases, new discharges may only be permitted where certain findings are made. The establishment of SSCGs for the Site does not include a request for approval for disposal of wastes into the groundwater beneath the Site; to the contrary the proposed SSCGs, the future submission of the RAP and the other steps Shell is taking to comply with the CAO are all aimed at addressing the effects of existing Site-related COCs.

Also, Resolution No. 68-16 was implemented to maintain water quality conditions where such conditions are better than water quality levels established in a policy, such as the Basin Plan, at the time of its adoption. Given the historical nature of the Site conditions, it appears unlikely that water quality at the Site (with respect to the COCs in groundwater) was better than the standards set forth in the Basin Plan when it was adopted in 1994. "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." *Asociacion de Gente Unida por el Agua v. Cent. Valley Reg'l Water Quality Control Bd.*, 210 Cal.App.4th 1255, 1270 (2012).

In its comments to the original SSCG Report, the Regional Board provided the following discussion concerning State Water Board Resolution No. 92-49:

> "The SWRCB's 'Resolution No. 92-49' requires the Regional Board to assure that waste is cleaned up to background conditions, or if that is not reasonable, to an alternative level that is the most stringent level that is economically and technologically feasible. Resolution 92-49 does not require, however, that the requisite level of water quality be met at the time of site closure. Even if the requisite level of water quality has not yet been attained, a site may be closed if the level will be attained within a reasonable period."

We generally agree with this summary but note that Resolution No. 92-49 does not mandate cleanup of soil, soil vapor, or indoor air to background levels for each of those media. Instead, Resolution No. 92-49 requires that waste is cleaned up and abated:

> "in a manner that promotes attainment of either background water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those

> waters and the total values involved, beneficial and detrimental, economic, social, tangible and intangible."

The focus in Resolution No. 92-49 with respect to remedial activity is on water quality and not on all media. Waste in non-water media (such as soil) should be addressed through remediation to promote the attainment of background water quality (not, for example, background levels in soil) or the best water quality that is reasonably feasible given the considerations listed.

8.4.3 Proposed Site-specific Cleanup Goals for Groundwater

To reiterate, the proposed RAOs listed in Section 3.0 relevant to groundwater are:

- 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 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.

There are several possible SSCGs that could be applied to the Site to meet the RAOs for groundwater, as described in general below. Table 8-1 summarizes possible SSCGs for the COCs in groundwater at the Site. Section 9.0 addresses selection of the most appropriate SSCG for the Site, based on the RWQCB directive to "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" as well as levels that are "economically and technologically feasible."

8.4.3.1 LNAPL

The SSCG for LNAPL is to 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. The technological and economic feasibility of implementing this SSCG is discussed in Section 9.0.

8.4.3.2 Background Water Quality

One possible SSCG for the Site is background water quality. Background would generally be considered non-detect for most organic compounds (TPH and chlorinated compounds). Background for metals is much more difficult to assess considering that

Shallow Zone groundwater data for metals from non-impacted sites in the Site vicinity are very limited, metals occur naturally in soils), and naturally elevated concentrations can occur in groundwater due to localized geochemical conditions. For similar reasons, background for general mineral compounds is also difficult to assess. Background levels for several of the metals and general mineral compounds, including arsenic, iron, manganese, TDS, chloride, and specific conductance, are well documented to be elevated in the West Coast Basin.

SSCGs based on background concentrations would be highly protective considering that the groundwater is not used as a water source, nor would be used as a water source in the foreseeable future. As discussed in Section 9.0, cleanup to background levels over a relatively short time period is not technologically or economically feasible given the need to remove all sources both on- and off-Site in order to achieve background water quality.

8.4.3.3 Maximum Contaminant Levels

Given that all groundwater beneath the Site is designated for municipal use in the Basin Plan, MCLs, NLs, and ESLs are possible SSCGs for the Site. MCLs would meet the requirements of the Basin Plan and are protective of hypothetical municipal use, although there is no reasonably anticipated use of the Shallow Zone groundwater in the future given its elevated general mineral content and the adjudicated nature of the basin which effectively restricts future well installation and pumping.

COCs above their MCLs, NLs, or ESLs are presented in Section 8.3 and Table 8-1. The major site-related COC is benzene. As noted in Section 8.3.2.1, based on modeling results for current conditions, the benzene plume will reduce to MCL concentrations in approximately 70 to over 300 depending on While this time frame could be reduced through source removal, it is difficult to quantify the reduction in time to reach MCLs given the potential contribution from off-Site sources.

The Low Threat Closure Policy (SWRCB, 2012e) currently allows closure of sites with up to 1 mg/L or 3 mg/L benzene (based on plume length) where certain criteria are met. Although the Site is not an UST site and does not meet all the criteria for closure under the Low Threat Closure Policy, there are several general criteria which the Site does meet including: (1) the release is located within the service area of a public water system, (2) the unauthorized release consists only of petroleum, (3) the unauthorized release has been stopped, (4) a site conceptual model that assesses the nature, extent, and mobility of the release has been developed, and (5) soil and groundwater has been tested for MTBE and results have been reported. The benzene plume beneath the Site appears be more than 250 feet in length but less than 1,000 feet in length, so the specific criterion of benzene concentrations being less than 1,000 µg/L is met. However, other specific criteria, such as the requirement of the nearest water supply well being located greater than 1,000 feet away is not met, although the one well located within 1,000 feet of the Site is in a hydraulically upgradient area and is completed below the Shallow zone and Gage aquifers.

Cleanup of TPH-related compounds (including benzene) to MCLs will eventually occur due to natural biodegradation; however the length of time needed to meet MCLs will be long and the length of time to meet background levels even longer. The time could be expedited through removal of some source material, such as LNAPL removal, targeting high benzene areas in the vadose zone for SVE, and/or conducting "hot spot" remediation of elevated concentration areas in groundwater. Reduction of TPH-related compounds to the MCL or low-level range is expected to cause arsenic to decrease to background levels as well.

9.0 EVALUATION OF TECHNOLOGICAL AND ECONOMIC FEASIBILITY OF SSCGs AND SELECTION OF SSCGs (SCREENING FEASIBILITY STUDY)

9.1 Introduction

This section provides a preliminary evaluation of remedial alternatives (Screening Feasibility Study [Screening FS]) for the residential properties and the selection of SSCGs[20].

As directed in the CAO and comments from RWQCB and others, SSCGs selected for the Site must be technologically and economically feasible. In order to evaluate the technological and economic feasibility of the SSCGs, possible SSCGs were first defined for soil, soil vapor, and groundwater. These were discussed in Sections 6, 7, and 8 of this report. Next, a series of representative potential remedial alternatives to achieve the various SSCGs were selected and compared against one another using criteria including implementability; environmental considerations; reduction of toxicity, mobility and volume of COCs; social considerations; other issues; and cost. The SSCGs selected for the Site are those SSCGs associated with the recommended remedial alternatives that are identified in this comparative analysis. This process, the Screening FS, is described in this Section and summarized in Table 9-1. The selected SSCGs for the Site are listed in Tables 9-2 through 9-4. It is envisioned that a detailed evaluation of the recommended remedial alternatives will be conducted and presented in the forthcoming RAP.

Remedial alternatives consist of groupings of treatment technologies selected to achieve a specified cleanup goal or set of goals. Remedial alternatives were assembled for evaluation to the extent practical at this level of project development based on the following process:

1. Define possible cleanup goals (Sections 6, 7 and 8).

[20] The technical and economic feasibility evaluation focuses on remediation of the residential properties located on the Site. This evaluation does not include an assessment of remediation to meet construction and utility maintenance workers goals, because we anticipate that a soil management plan will be put in place to address these exposures. The soil management plan will be prepared either as a part of or subsequent to the RAP.

2. Identify technologies that may be used to meet those goals and screen out technologies that are not effective or are not suitable for the site based on site-specific information and tests conducted on the technologies (Section 9.2).
3. Assemble the technologies into remedial alternatives (Section 9.3).
4. Perform a preliminary evaluation of alternatives based on implementability; environmental considerations; reduction of toxicity, mobility and volume of COCs; social considerations; other issues; and cost. This preliminary evaluation results in a set of alternatives for which a comparative evaluation is performed (Section 9.4).
5. Perform a comparative evaluation (Section 9.5).
6. Recommend an alternative or alternatives and associated SSCGs (Section 9.6).

Steps 2 through 6 are described in the sections that follow.

9.2 Identification and Screening of Remedial Technologies

Technologies implemented in remedial actions mitigate exposure either through elimination of exposure pathways or through removal of COC mass in one or more of the affected media (i.e., soil, soil vapor, or groundwater). In this section, potential technologies are screened on the basis of effectiveness and feasibility.

9.2.1 Remedial Technologies that Interrupt the Human Health Exposure Pathway

The following technologies interrupt the human health exposure pathway:

- Sub-slab vapor mitigation, which may include the installation of vapor barriers, venting, or sub-slab depressurization;
- Capping portions of the Site, which involves the placement of synthetic fibers, clays, and/or concrete; and
- Institutional controls, which restrict access to contaminated media.

Each of these technologies is discussed below with respect to their potential for inclusion in remedial alternatives.

Sub-slab Vapor Mitigation: This technology is proven effective at interrupting the human health exposure pathway to subsurface vapor sources. Although there does not appear to be a measurable contribution of COCs from sub-slab vapor to indoor air, sub-slab vapor mitigation is technologically feasible to implement at the Site and it has been retained for inclusion in remedial alternatives.

Capping Portions of the Site: As a technology, capping is quite effective at interrupting the human health exposure pathway at a site. Various types of site caps may be employed to accommodate future site uses. Types of site caps include soil, asphalt, concrete, marker beds or layers, and chemical or other types of sprays that can solidify a site surface. Capping is technologically feasible to implement at the Site and it has been retained for inclusion in remedial alternatives.

Institutional Controls: Institutional controls consist of administrative steps that may be used, in conjunction with other technologies or as a stand-alone approach, to minimize the potential for exposure and/or protect the integrity of a response action. Institutional controls are commonly utilized at sites to achieve cleanup objectives, and can take many forms (USEPA, 2012d). At this Site, Institutional Controls may include some form of deed notification to ensure current and future residents are aware of any residual contamination. They would also likely involve establishing a process, possibly through existing building and grading permit reviews, general plan overlay or footnote, area plan, or the like, to ensure that if a property owner plans to conduct activities such as building renovation, installation of a pool or deeper landscape alterations, Shell is notified so that the company can arrange for sampling and proper handling of any impacted soils that may be present. As such, it is not expected that Institutional Controls would interfere with the resident's use and enjoyment of his or her property. Institutional controls are technologically feasible to implement at the Site and they have been retained for inclusion in remedial alternatives.

9.2.2 Remedial Technologies that Remove COC Mass and Interrupt the Human Health Exposure Pathway

Technologies that remove COC mass in addition to interrupting the human health exposure pathway can operate through physical removal processes, such as excavation, as well as through chemical or biological processes. The following technologies have been evaluated for their capacity to remove COC mass from the Site in addition to interrupting the human health exposure pathway:

- Excavation;
- Soil vapor extraction (SVE);
- Bioventing;
- In-situ chemical oxidation (ISCO);
- LNAPL/source removal;
- Other removal or remediation of groundwater; and
- Monitored natural attenuation (MNA).

Each of these technologies is discussed below with respect to its relevance for inclusion in remedial alternatives.

Excavation: As discussed in Section 3, selective excavation of the Site around existing structures is feasible. Selective excavation could remove most of the contaminated soils for which a human exposure pathway is complete. Excavation of the entire Site would involve the removal of Site features, such as homes, roads, and utilities. While that may be technologically feasible, it is not considered feasible due to social and other considerations. In addition, excavation of the entire Site is likely not economically feasible especially in light of the limited reduction of risk that would be achieved by razing of the homes and removal of the streets given that the data collected indicate an incomplete pathway from soils beneath the homes and street. Moreover, any marginal improvement to groundwater resulting from Site-wide removal of structures would be greatly outweighed by the tremendous economic and social costs involved. Nevertheless, because excavation in some form is technologically and economically feasible, it is retained for inclusion in remedial alternatives.

Soil Vapor Extraction (SVE): Based on pilot tests conducted onsite, SVE may be able to remove lighter petroleum hydrocarbons, VOCs, and methane (Section 3). However, SVE would not effectively extract diesel, other heavier petroleum hydrocarbons, or SVOCs. SVE was retained for inclusion in remedial alternatives because it is feasible and it appears to be effective at removing some of the COCs.

Bioventing: As discussed in Section 3, bioventing appears to enhance the degradation of petroleum hydrocarbons. However, based on the average rate of biodegradation, the systems would have to be in place for several decades. Additionally, the average radius of influence of bioventing pilot test extraction wells was estimated to be approximately 10 feet. This translates to 15 to 20 extraction points that would have to be installed on each property to use bioventing at this Site, which would is considered to be prohibitive. Therefore, although a bioventing system may be capable of degrading some of the COCs, it would not be technologically and economically feasible to implement and is therefore eliminated from consideration for inclusion in remedial alternatives.

In-situ Chemical Oxidation (ISCO): Oxidants with a relatively high potential for site treatment were tested to assess the technological feasibility of treating Site soils using ISCO, as discussed in Section 3. These tests indicated that sodium persulfate was not effective and that an excessive quantity of ozone would be required for treatment. Based on these results, ISCO is not retained as a treatment technology and is therefore eliminated from consideration for inclusion in remedial alternatives.

LNAPL/Source Removal: Direct LNAPL removal, such as through pumping as is currently done or through direct excavation, is feasible in some areas and can be an effective treatment. Therefore, it is retained for inclusion in remedial alternatives.

Other Remediation or Removal of Groundwater: There are several technologies that may be used to treat the groundwater contaminants. Many of them involve pumping the groundwater to the surface to treat, which increases the probability of exposure. There are also in-situ remedies for some COCs. It is unlikely that widespread active remediation of all compounds in groundwater can be achieved effectively because the sources of the COCs will persist in the vadose zone and/or are located off-Site. Even assuming active remediation could remove all COCs in Site groundwater, the groundwater would become "re-contaminated" in time unless all sources were removed in the vadose zone as well as upgradient sources. Given that natural degradation of the petroleum hydrocarbon COCs is occurring and will continue to occur through time, "hot-spot" remediation of certain COCs in localized areas of groundwater (e.g. where COCs exceed 100x MCLs) may shorten the time over which the concentrations will return to background or MCL levels. Thus, "hot-spot" remediation of certain COCs in localized Site areas is retained for inclusion in the remedial alternatives. It is important to note that there is no complete human health exposure pathway for groundwater currently or in the foreseeable future.

Monitored Natural Attenuation (MNA): MNA relies on naturally occurring processes to decrease concentrations of chemical constituents in soil and groundwater. Natural processes include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of constituents in media of concern. Monitoring is performed to confirm that the concentrations of COCs are decreasing or to show that they are not. Hot spot remediation of groundwater could reduce the time needed for conditions to reach remedial objectives. MNA, with or without hot spot remediation, was retained for inclusion in remedial alternatives because its implementation is highly feasible and it is anticipated to be effective.

In summary, the following technologies were retained for inclusion in remedial alternatives:

- Sub-slab vapor mitigation,
- Capping,
- Institutional controls,
- Excavation,

- Soil vapor extraction (SVE),
- Hot-spot remediation of groundwater,
- LNAPL/source removal, and
- Monitored natural attenuation (MNA).

9.3 Assembly of Remedial Alternatives for Consideration in Developing SSCGs

In order to assist in the consideration and selection of SSCGs, technologies retained from the screening process were combined into representative preliminary remedial alternatives, as shown in Table 9-1. These remedial alternatives can achieve various SSCGs as discussed in Sections 6 through 8 and shown in Table 9-1. The remedial alternatives consider Site features, such as homes, roads, utilities, residential hardscape, and landscaping. "Residential hardscape" includes driveways, city sidewalks, patios, and walkways on residential properties. Remedial alternatives that involve excavating or capping the entire Site would involve the removal of all Site features, including homes, roads, utilities, residential hardscape, and landscaping.

The representative preliminary remedial alternatives that were assembled for the Screening FS and selection of the cleanup goals are as follows:

1. Excavation of impacted soils over the entire Site, LNAPL removal as feasible, groundwater MNA, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

2. Excavation of the upper 10 feet of the entire Site, LNAPL removal as feasible, groundwater MNA, institutional controls on soil deeper than 10 feet, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

3. Excavation of exposed soils and soils under residential hardscape to 2 feet bgs where human health goals based on 350 days of exposure per year (HH350) or soil leaching to groundwater goals are exceeded, installation of sub-slab mitigation at homes where sub-slab vapor concentrations exceed the screening value, LNAPL removal as feasible, groundwater MNA, institutional controls on soil deeper than 2 feet beneath homes, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

3A. Excavation of exposed soils and soils under residential hardscape to 5 feet bgs where HH350 goals or soil leaching to groundwater goals are exceeded, installation of sub-slab mitigation at homes where sub-slab vapor concentrations exceed the screening value, LNAPL removal as feasible, groundwater MNA, and institutional controls on soil deeper than 5 feet beneath homes, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

3B. Excavation of exposed soils and soils under residential hardscape to 10 feet bgs where HH350 goals or soil leaching to groundwater goals are exceeded, installation of sub-slab mitigation at homes where sub-slab vapor concentrations exceed the screening value, LNAPL removal as feasible, groundwater MNA, institutional controls on COCs in soil deeper than 10 feet beneath homes, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

4. Excavation of exposed soils to 2 feet bgs where HH350 goals or soil leaching to groundwater goals are exceeded, installation of sub-slab mitigation at homes where sub-slab vapor concentrations exceed screening value, LNAPL removal as feasible, groundwater MNA, institutional controls on residual COCs in soils deeper than 2 feet beneath homes and hardscape, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

4A. Excavation of exposed soils to 5 feet bgs where HH350 goals or soil leaching to groundwater goals are exceeded, installation of sub-slab mitigation at homes where sub-slab vapor concentrations exceed screening value, LNAPL removal as feasible, groundwater MNA, institutional controls on residual COCs in soils deeper than 5 feet beneath homes and hardscape, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

4B. Excavation of exposed soils to 10 feet where HH350 goals or soil leaching to groundwater goals are exceeded, installation of sub-slab mitigation at homes where sub-slab vapor concentrations exceed screening value, LNAPL removal as feasible, groundwater MNA, institutional controls on residual COCs in soils deeper than 10 feet beneath homes and hardscape, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

5. Capping over the entire Site, removal of LNAPL as feasible, institutional controls onsite soils, and hot spot remediation of groundwater to reduce the time needed to achieve cleanup goals.

6. Capping exposed soils, installation of sub-slab mitigation at homes where sub-slab concentrations exceed screening value, LNAPL removal as feasible, groundwater MNA, institutional controls on residual COCs in soils and hot spot

remediation of groundwater to reduce the time needed to achieve cleanup goals.

7. The addition of limited SVE to Alternatives 2 through 6 for VOC/TPH mass reduction.

9.4 Preliminary Screening of Remedial Alternatives

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

f) Implementability;
g) Environmental costs;
h) Reduction of toxicity, mobility, and volume;
i) Social costs; and
j) Cost.

The considerations associated with the various criteria for each of the alternatives are summarized in Table 9-1, which also indicates the areas and depths for which each cleanup goal is achieved. Site investigation data collected at the Site (e.g., data reported in the Phase II Interim, Follow-up, and Final Interim Reports, and quarterly groundwater monitoring reports) were used to develop preliminary estimates of the scope of the different remedial technologies for the alternatives considered in the Screening FS. Conceptual costs for each alternative were estimated (approximately +50%/-30%) for the purposes of comparison between the alternatives and are provided in Table 9-5. It is envisioned that proposed remedial actions and costs for the selected alternative will be evaluated in more detail in the forthcoming RAP.

Assumptions used in screening of alternatives are:

- The soil SSCGs were developed assuming that residents would be exposed to surface soils (e.g., <2 feet bgs, <5 feet bgs, or <10 feet bgs) more frequently (350 days/year) than deeper subsurface soils (4 days/year) (see Section 6). These exposure periods are considered typical for residents. Based on the data presented in the Phase II Interim, Follow-up, and Final Interim Reports, the assumed numbers of properties that exceed the HH350 goals that are considered in the Screening FS are: 100 properties for the less than 2 feet bgs interval, 190 properties for the less than 5 feet interval, and 210 properties for the less than 10 feet interval.
- The soil vapor SSCGs were calculated based on the vapor intrusion analysis and assume a vapor intrusion attenuation factor of 0.001. Although the vapor

intrusion evaluation concluded that the indoor air concentrations are reflective of background concentrations, the sub-slab soil vapor data collected at the Site were used to identify potential properties for vapor intrusion mitigation systems Based on the results presented in the HHSREs, the number of properties that exceed the soil vapor SSCGs that are considered in the Screening FS is 30 properties.

- With respect to groundwater, the possible SSCGs are MCLs/NLs/background for metals; or, background for all compounds. The only appreciable difference in these SSCGs is the length of time needed to achieve the SSCGs which is approximately 70-100 years for the petroleum compounds to meet MCLs/NLs, and longer to meet background.

9.4.1 Alternative 1

Alternative 1 would involve the removal of all Site features, including homes, roads, and utilities in order to remove impacted soils through excavation. This would achieve all soil goals, soil vapor goals, and nuisance goals. Assuming sources of COCs are successfully addressed through LNAPL removal and possibly hot spot groundwater remediation, LNAPL goals would be achieved, groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g., where concentrations exceed 100x MCLs) would reduce the time to achieve the cleanup goals.

a) This alternative would be very difficult to implement. Every resident within the Site would have to agree to relocate and all 285 houses would be razed. If some homeowners declined to move, the presence of some residents would make it untenable to remove all of the surrounding homes, streets and utilities. Permits for this removal action would be difficult to obtain. Approximately 250,000 truckloads of COC-impacted and non-impacted soil, as well as other construction debris from the razed structures (including asbestos), would be hauled to and/or from the Site via Lomita Avenue. It is very unlikely that this alternative would be allowed to proceed due to the need for complete participation from the all homeowners and residents, the anticipated public reactions from residential and commercial areas proximate to the Site, environmental effects, traffic impacts and permitting difficulties. The active remedial action is estimated to take approximately 4-½ years.

b) In the long term, RAOs would be met for the Site. However, in the short term, significant and possibly unmitigateable air quality, noise, and traffic impacts would occur. It is very unlikely that this remedial action would be permitted under California Environmental Quality Act (CEQA).

c) Alternative 1 would remove a high volume of COCs from the Site. Soil and soil vapor COCs would be removed, and source removal would facilitate the faster restoration of groundwater. The time for groundwater restoration is difficult to quantify, but is likely to be shorter than other alternatives that utilize SVE to reduce VOC mass in the Site vadose zone. The limited additional reduction in risk and modest impact to groundwater quality when compared with other alternatives is substantially outweighed by the high additional economic and social (including environmental) costs it would impose on the City, the surrounding residents and business owners and others, as well as the difficulties associated with implementation and the substantial costs required for implementation.

d) The removal of this housing development would have significant long-term impacts to the community. All of the current Site residents would be displaced. Residents in the surrounding neighborhoods would experience the disruption of the community and the City would experience a loss of tax revenue.

e) The cost of this alternative would be in the range of $290MM to $630MM. It is the most costly of the alternatives listed.

Alternative 1 is not considered technologically and economically feasible due to the very difficult degree of implementability; and very high social, environmental, and economic costs. The benefit of more substantial reduction in COC mass throughout the Site compared to other alternatives is outweighed by the high social, environmental, and economic costs of this alternative. Consequently, this remedial alternative is not retained for additional evaluation.

Alternative 2

Alternative 2 would involve the removal of all Site features, including homes, roads, and utilities, in order to excavate the upper 10 feet of Site soils. As a result of this action, all soil goals would be met in the upper 10 feet of Site soils, including leaching to groundwater and HH350. The remaining Site soils would achieve the human health goals for infrequent exposure (4 days per year), and nuisance goals. Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the unexcavated soils. The soil vapor SSCGs would also be met. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved, groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g. where concentrations exceed 100x MCLs) would reduce the time to achieve the cleanup goals.

a) As with Alternative 1, Alternative 2 would be very difficult to implement. Every resident within the Site would have to agree to relocate and all 285 homes would be razed. If some homeowners declined to move, the presence of some residents would make it untenable to remove all of the surrounding homes, streets and utilities. Permits for this removal action would be difficult to obtain. Approximately 130,000 truckloads of COC-impacted and non-impacted soil, as well as other construction debris from the razed structures (including asbestos), would be hauled to and/or from the Site via Lomita Avenue. It is very unlikely that this alternative would be allowed to proceed due to the need for complete participation from the all homeowners and residents, the anticipated public reactions from residential and commercial areas proximate to the Site, environmental effects, traffic impacts, and permitting difficulties. The active remedial action is estimated to take approximately 2-½ years. Despite the implementation of comprehensive soil removal from the Site, institutional controls would be required to limit access to soils below 10 feet.

b) In the long term, RAOs would be met for the Site. However, in the short term, significant air quality, noise, and traffic impacts would occur. It is very unlikely that this remedial action would be permitted under CEQA.

c) Alternative 2 would remove a high volume of COCs from the Site. Soil and soil vapor COCs would be removed, and source removal would facilitate the faster restoration of groundwater through MNA. The time for groundwater restoration is difficult to quantify, but will be similar to other alternatives that utilize SVE to reduce VOC mass in the Site vadose zone. The limited additional reduction in risk when compared with other alternatives is substantially outweighed by the insignificant impact to groundwater quality, high additional economic and social (including environmental) costs it would impose on the City, the surrounding residents and business owners and others, as well as the difficulties associated with implementation and the substantial costs required for implementation.

d) The removal of this housing development would have significant long-term impacts to the community. All of the current Site residents would be displaced. Residents in the surrounding neighborhoods would experience the disruption of the community and the City would experience a loss of tax revenue.

e) Alternative 2 costs are anticipated to be between \$190MM and \$410MM, which would make it the second most expensive alternative.

Alternative 2 is not considered technologically and economically feasible due to very difficult degree of implementability, and very high social, environmental, and economic costs. The benefit of greater reduction in COC mass in soil throughout the Site compared to alternatives 3 through 6 is outweighed by the high social, environmental, and economic costs of this alternative. Consequently, this remedial alternative is not retained for additional evaluation.

The elimination of Alternatives 1 and 2 indicates that remedial actions to achieve the HH350 goals throughout the upper 10 feet of all Site soils are infeasible.

9.4.2 Alternative 3

Alternative 3 would involve excavation to 2 feet bgs in open areas and areas beneath hardscape where human health goals for 350 days of exposure per year or soil leaching to groundwater goals are exceeded. However, soil will not be excavated in areas where soil concentrations are below background levels. Excavated areas and residential hardscape would be replaced in kind with clean soils and new hardscape. Under this alternative, the upper 2 feet of excavated and filled areas would achieve all soil goals. The unexcavated soils would meet the residential human health goal (assuming infrequent exposure) and nuisance goals. Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the unexcavated soils. The soil vapor goals would be addressed by installation of a sub-slab depressurization system for homes where SSCGs are exceeded for sub-slab soil vapor. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g. where concentrations exceed 100x MCLs) would reduce the time to achieve the cleanup goals.

a) Implementation of Alternative 3 would be moderately difficult. Although it would not displace the existing community, it would disrupt it in the short term to excavate landscaped and hardscaped areas. Permission from property owners and tenants at approximately 100 residences would have to be obtained to excavate parts of their property. On the order of 4,000 truckloads of impacted and non-impacted soil would be hauled to and from the Site. Sub-slab mitigation would be installed at approximately 30 homes. The active remedial action is estimated to take approximately 2-½ years. Institutional controls would be used to address residual COCs beneath homes, and to limit access to soils below 2 feet.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would be anticipated. Based on pilot testing, these impacts are expected to be able to be mitigated.

c) Alternative 3 would remove a high volume of COCs from the upper 2 feet of soils. COCs below 2 feet would not be removed through excavation. There would be a moderate to high reduction in the mobility of soil vapor, with vapor intrusion (VI) potential reduced through sub-slab mitigation (although the data collected do not indicate a measurable impact to indoor air from sub-slab soil vapor). Depending on the use of hot spot remediation, there may be limited COC removal in groundwater.

d) The excavation activities may have a significant impact on the community in the short term, as their driveways, sidewalks, and other hardscape would be removed. Because those features would be replaced in kind following excavation and fill placement, those impacts would not be long term. Surrounding neighborhoods would be impacted in the short term to a lesser extent by heavy truck traffic.

e) Alternative 3 costs are anticipated to be between $22MM and $46MM. This is moderate relative to the costs of other alternatives.

Alternative 3 meets the human health goal for exposure to soils for 350 days per year in the upper 2 feet. Groundwater goals (MCLs) are achievable through MNA in the long term. Background groundwater goals are achievable through MNA in the longer term. Use of hot spot remediation of groundwater will hasten the restoration of groundwater through MNA. Alternative 3 is considered potentially technologically and economically feasible due to the moderate degree of implementability, and moderate social, environmental, and economic costs. Consequently, this remedial alternative is retained for additional evaluation.

9.4.3 <u>Alternative 3A</u>

Alternative 3A would involve excavation to 5 feet bgs in open areas and areas beneath hardscape where human health goals for 350 days of exposure per year or soil leaching to groundwater goals are exceeded. However, soil will not be excavated in areas where soil concentrations are below background levels. Excavated areas and residential hardscape would be replaced in kind with clean soils and new hardscape. Under this alternative, the upper 5 feet of excavated and filled areas would achieve all soil goals. The unexcavated soils would meet the residential human health goal (assuming infrequent exposure) and nuisance goals. Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the unexcavated soils. The soil vapor goals would be addressed by installation of a sub-slab depressurization system for homes where SSCGs are exceeded for sub-slab soil vapor. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g. where concentrations exceed 100x MCLs) would reduce the time to achieve the clean-up goals.

a) Implementation of Alternative 3A would be moderately difficult. Although it would not displace the existing community, it would disrupt it in the short term to excavate landscaped areas and residential hardscape. Permission from property owners and tenants at approximately 190 residences would have to be obtained. Excavation would need to be conducted around public water supply lines. which are located about 3 feet inside the sidewalks in the front yards of approximately one-half of the properties in the Carousel Tract. These water pipes are of asbestos-cement (transite) construction. Implementation of excavation to depths of 5 feet or greater in the vicinity of the transite water main piping will be very difficult to achieve without damaging the pipes, potentially resulting in interruption of water supply to the community. On the order of 18,000 truckloads of impacted and non-impacted soil would be hauled to and from the Site. Sub-slab mitigation would be installed at approximately 30 homes. This alternative is estimated to take approximately 7-½ years to implement. Institutional controls would be used to address residual COCs beneath homes, and to limit access to soils below 5 feet.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would be anticipated. Based on pilot testing, these impacts are expected to be able to be mitigated.

c) Alternative 3A would remove a moderate to high volume of COCs from the upper 5 feet of soils. Not all soils would be able to be removed to 5 feet due to setback and sloping requirements and the need to avoid and protect in place certain underground utilities (water mains). COCs below 5 feet would not be removed through excavation. There would be a moderate to high reduction in the mobility of soil vapor, with VI potential reduced through sub-slab mitigation (although the data collected do not indicate a measurable impact to indoor air from sub-slab soil vapor). Depending on the use of hot spot remediation, there would be low COC removal in groundwater.

d) The excavation activities may have a significant impact on the community in the short term, as their driveways, sidewalks, and other hardscape would be removed. Surrounding neighborhoods would be impacted to a lesser extent by heavy truck traffic. Impacts to the community would be somewhat higher for this alternative than for Alternative 3 because a larger soil volume would be excavated and the remedy would take longer to implement.

e) Alternative 3A costs are anticipated to be between $60MM and $130MM. This is high relative to the costs of other alternatives.

This alternative meets the human health goal for exposure to soils for 350 days per year in the upper 5 feet. Groundwater goals (MCLs) are achievable through MNA in the long term. Background groundwater goals are achievable through MNA in the longer term. Use of hot spot remediation of groundwater will hasten the restoration of groundwater through MNA. Alternative 3A is considered potentially technologically and economically feasible due to the moderately difficult degree of implementability, moderate to high social and environmental, and high economic costs. Consequently, this remedial alternative is retained for additional evaluation.

9.4.4 Alternative 3B

Alternative 3B would involve excavation to 10 feet bgs in open areas and areas beneath hardscape where human health goals for 350 days of exposure per year or soil leaching to groundwater goals are exceeded. However, soil will not be excavated in areas where soil concentrations are below background levels. Excavated areas and residential hardscape would be replaced in kind with clean soils and new hardscape. Under this alternative, the upper 10 feet of excavated and filled areas would achieve all soil goals. The unexcavated soils would meet the residential human health goal (assuming infrequent exposure) and nuisance goals. Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the unexcavated soils. The soil vapor goals would be addressed by installation of a sub-slab depressurization system for homes where SSCGs are exceeded for sub-slab soil vapor. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g. where concentrations exceed 100x MCLs) would reduce the time to achieve the clean-up goals.

a) Implementation of Alternative 3B would be very difficult. Although it would not displace the existing community, it would disrupt it in the short term to excavate landscaped areas and hardscape. Permission from property owners and tenants at approximately 210 residences would have to be obtained. Excavation would need to be conducted around public water supply lines, which are located about 3 feet inside the sidewalks in the front yards of approximately one-half of the properties in the Carousel Tract. These water pipes are of asbestos-cement (transite) construction. Implementation of excavation to depths of 5 feet or greater in the vicinity of the transite water main piping will be very difficult to achieve without damaging the pipes, potentially resulting in interruption of water supply to the community. On the order of 38,000 truckloads of impacted and non-impacted soil would be hauled to and from the Site. Sub-slab mitigation would be installed at approximately 30 homes. It is estimated that this alternative would be implemented over approximately 14 years. Institutional controls would be used to address residual COCs beneath homes, and to limit access to soils below 10 feet.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would be anticipated. Based on pilot testing, these impacts are expected to be able to be partially mitigated.

c) Alternative 3B would remove a moderate volume of COCs from the upper 10 feet of soils. Not all soils under residential hardscape and landscaping would be able to be removed to 10 feet due to setback and sloping requirements and the need to avoid and protect in place certain underground utilities (water mains).

COCs below 10 feet would not be removed through excavation. There would be a moderate to high reduction in the mobility of soil vapor, with VI potential reduced through sub-slab mitigation (although the data collected do not indicate a measurable impact to indoor air from sub-slab soil vapor). Depending on the use of hot spot remediation in groundwater, there would be low COC removal in groundwater.

d) The excavation activities may have a significant impact on the community in the short term, as their driveways, sidewalks, and other hardscape would be removed. Surrounding neighborhoods would be impacted to a lesser extent by heavy truck traffic. Impacts to the community would be higher for this than for Alternatives 3 and 3A because a larger soil volume would be excavated and the remedy would take substantially longer to implement.

e) Alternative 3B costs are anticipated to be between $110MM and $240MM. This is a very high cost relative to the costs of other alternatives.

Alternative 3B is not considered technologically and economically feasible due to very difficult degree of implementability, high social and environmental costs, and very high economic costs. The benefit of greater reduction in COC mass in soil throughout the Site compared to alternatives 3, 3A, 4, 4A, 4B, 5, and 6 is outweighed by the high social, environmental, and economic costs of this alternative. Consequently, this remedial alternative is not retained for additional evaluation.

9.4.5 Alternative 4

Alternative 4 would involve excavation to 2 feet bgs in open and landscaped areas where human health goals for 350 days of exposure per year or soil leaching to groundwater goals are exceeded. However, soil will not be excavated in areas where soil concentrations are below background levels. Excavated areas would be replaced in kind with clean soils and new landscaping. Under this alternative, the upper 2 feet of excavated and filled areas would achieve all soil goals. The unexcavated soils would meet the residential human health goal (assuming infrequent exposure) and nuisance goals. Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the unexcavated soils. The soil vapor goals would be addressed by installation of a sub-slab depressurization system for homes where SSCGs are exceeded for sub-slab soil vapor. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g. where concentrations exceed 100x MCLs) would reduce the time to achieve the clean-up goals.

a) Implementation of Alternative 4 would be moderately difficult. Although it would not displace the existing community, it would disrupt it in the short term to excavate and backfill landscaped areas. Permission from property owners and tenants at approximately 100 residences would have to be obtained to carry out excavation in their yards. On the order of 1,700 truckloads of impacted and non-impacted soil would be hauled to and from the Site. Sub-slab mitigation would be installed at approximately 30 homes. It is estimated that this alternative could be implemented over approximately 2 years. Institutional controls would be used to address residual COCs beneath homes, and to limit access to soils below 2 feet.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would be anticipated. Based on pilot testing, these impacts are expected to be able to be mitigated.

c) Alternative 4 would remove a moderate to high volume of COCs from the upper 2 feet of soils. COCs below 2 feet would not be removed through excavation. There would be a moderate to high reduction in the mobility of soil vapor, with VI potential reduced through sub-slab mitigation (although the data collected do not indicate a measurable impact to indoor air from sub-slab soil vapor). Depending on the use of hot spot remediation, there would be low COC removal in groundwater.

d) The excavation activities may have a significant impact on the community in the short term due to excavation activities and truck traffic. Surrounding neighborhoods would be impacted to a lesser extent by heavy truck traffic.

e) Alternative 4 costs are anticipated to be between $15MM and $32MM. This is moderate relative to the costs of other alternatives.

Alternative 4 meets the human health goal for exposure to soils for 350 days per year in the upper 2 feet. Groundwater goals (MCLs) are achievable through MNA in the long term. Background groundwater goals are achievable through MNA in the longer term. Use of hot spot remediation of groundwater will hasten the restoration of groundwater through MNA. Alternative 4 is considered potentially technologically and economically feasible due to the moderate degree of implementability, and moderate social, environmental, and economic costs. Consequently, this remedial alternative is retained for additional evaluation.

9.4.6 Alternative 4A

Alternative 4A would involve excavation to 5 feet bgs in open and landscaped areas where human health goals for 350 days of exposure per year or soil leaching to groundwater goals are exceeded. However, soil will not be excavated in areas where soil concentrations are below background levels. Excavated areas and residential landscape would be replaced in kind with clean soils and new landscape. Under this alternative, the upper 5 feet of excavated and filled areas would achieve all soil goals. The unexcavated soils would meet the residential human health goal (assuming infrequent exposure) and nuisance goals. Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the unexcavated soils. The soil vapor goals would be addressed by installation of a sub-slab depressurization system for homes where screening levels are exceeded for sub-slab soil vapor. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g., where concentrations exceed 100x MCLs) would reduce the time to achieve the clean-up goals.

a) Implementation of Alternative 4A would be moderately difficult to difficult. Although it would not displace the existing community, it would disrupt it in the short term to excavate and backfill landscaped areas. Permission from property owners and tenants at approximately 190 residences would have to be obtained to carry out excavation in their yards. Excavation would need to be conducted around public water supply lines, which are located about 3 feet inside the sidewalks in the front yards of approximately one-half of the properties in the Carousel Tract. These water pipes are of asbestos-cement (transite) construction. Implementation of excavation to depths of 5 feet or greater in the vicinity of the transite water main piping will be very difficult to achieve without damaging the pipes, potentially resulting in interruption of water supply to the community. On the order of 8,100 truckloads of impacted and non-impacted soil would be hauled to and from the Site. Sub-slab mitigation would be installed at approximately 30 homes. This alternative could be implemented over 7 years. Institutional controls would be used to address residual COCs beneath homes, and to limit access to soils below 5 feet.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would be anticipated. Based on pilot testing, these impacts are expected to be able to be mitigated.

c) Alternative 4A would remove a moderate to high volume of COCs from the upper 5 feet of soils. COCs below 5 feet would not be removed through excavation. Not all soils would be able to be removed to 5 feet due to setback and sloping requirements and the need to avoid and protect in place certain underground utilities (water mains). There would be a moderate to high reduction in the mobility of soil vapor, with VI potential reduced through sub-slab mitigation (although the data collected do not indicate a measurable impact to indoor air from sub-slab soil vapor). Depending on the use of hot spot remediation, there would be low COC removal in groundwater.

d) The excavation activities may have a significant impact on the community in the short term due to excavation activities and truck traffic. Surrounding neighborhoods would be impacted to a lesser extent by heavy truck traffic. Impacts to the community would be higher than for Alternative 4 because a larger soil volume would be excavated, and the remedy would take longer to implement.

e) Alternative 4A costs are anticipated to be between $42MM and $90MM. This is moderate to high relative to the costs for other alternatives.

This alternative meets the human health goal for exposure to soils for 350 days per year in the upper 5 feet. Groundwater goals (MCLs) are achievable through MNA in the long term. Background groundwater goals are achievable through MNA in the longer term. Use of hot spot remediation of groundwater will hasten the restoration of groundwater through MNA. Alternative 4A is considered potentially technologically and economically feasible due to the moderately difficult degree of implementability, moderate to high social and environmental, and moderately high economic costs. Consequently, this remedial alternative is retained for additional evaluation.

9.4.7 Alternative 4B

Alternative 4B would involve excavation to 10 feet bgs in open and landscaped areas where human health goals for 350 days of exposure per year or soil leaching to groundwater goals are exceeded. However, soil will not be excavated in areas where soil concentrations are below background levels. Excavated areas and residential landscape would be replaced in kind with clean soils and new landscape. Under this alternative, the upper 10 feet of excavated and filled areas would achieve all soil goals. The unexcavated soils would meet the residential human health goal (assuming infrequent exposure) and nuisance goals. Soil cleanup levels for groundwater protection (leaching to groundwater) may not be met in all the unexcavated soils. The soil vapor goals would be addressed by installation of a sub-slab depressurization system for homes where screening levels are exceeded for sub-slab soil vapor. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g., where concentrations exceed 100x MCLs) could reduce the time to achieve the clean-up goals.

a) Implementation of Alternative 4B would be very difficult. Although it would not displace the existing community, it would disrupt it in the short term to excavate and backfill landscaped areas. Permission from property owners and tenants at approximately 210 residences would have to be obtained to carry out excavation in their yards. Excavation would need to be conducted around public water supply lines, which are located about 3 feet inside the sidewalks in the front yards of approximately one-half of the properties in the Carousel Tract. These water pipes are of asbestos-cement (transite) construction. Implementation of excavation to depths of 5 feet or greater in the vicinity of the transite water main piping will be very difficult to achieve without damaging the pipes, potentially resulting in interruption of water supply to the community. On the order of 18,000 truckloads of impacted and non-impacted soil would be hauled to and from the Site. Sub-slab mitigation would be installed at approximately 30 homes. It is estimated that this alternative would be implemented over approximately 10 years. Institutional controls would be used to address residual COCs beneath homes, and to limit access to soils below 10 feet.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would be anticipated. Based on pilot testing, these impacts are expected to be able to be partially mitigated.

c) Alternative 4B would remove a moderate to high volume of COCs from the upper 10 feet of soils. COCs below 10 feet would not be removed through excavation. Not all soils would be able to be removed to 10 feet due to setback and sloping requirements and the need to protect in place certain underground utilities (water mains). There would be a moderate to high reduction in the mobility of soil vapor, with VI potential reduced through sub-slab mitigation (although the data collected do not indicate a measurable impact to indoor air from sub-slab soil vapor). Depending on the use of hot spot remediation, there would be low COC removal in groundwater.

d) The excavation activities may have a significant impact on the community in the short term due to excavation activities and truck traffic. Surrounding neighborhoods would be impacted to a lesser extent by heavy truck traffic. Impacts to the community would be higher than for Alternatives 4 and 4A because a larger soil volume would be excavated, and the remedy would take longer to implement.

e) Alternative 4B costs are anticipated to be between $87MM and $190MM. This is very high relative to the costs of other alternatives.

Alternative 4B is not considered technologically and economically feasible due to very difficult degree of implementability, high social and environmental costs, and very high economic costs. The benefit of greater reduction in COC mass in soil throughout the Site compared to alternatives 3, 3A, 4, 4A, 5, and 6 is outweighed by the high social, environmental, and economic costs of this alternative. Consequently, this remedial alternative is not retained for additional evaluation.

9.4.8 Alternative 5

Alternative 5 would involve the removal of all Site features, including homes, roads, and utilities, in order to cap the entire Site. This would achieve the human health goal for infrequent exposure to soils and meet nuisance goals by limiting contact with soil, but would not achieve the other soil goals. The soil vapor nuisance goal would be met, but the soil vapor goals for methane and vapor intrusion may not be met in some areas. However, the exposure pathway would be eliminated because there would be no receptors. Assuming sources of COCs are successfully addressed through LNAPL removal and groundwater remediation, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g., where concentrations exceed 100x MCLs) would reduce the time to achieve the clean-up goals.

a) This alternative would be very difficult to implement. Every resident would have to agree to relocate, all 285 homes would be razed, and approximately 12,500 truckloads of import fill and construction debris from the razed structures (including asbestos) would be hauled to/from the Site via Lomita Avenue. It is very unlikely that this alternative would be allowed to proceed due to anticipated public reactions, reactions from residential and commercial areas proximate to the Site, environmental effects, traffic impacts and permitting difficulties. Moreover, if some homeowners declined to move, the presence of some residents would make it potentially untenable to remove all of the surrounding homes. The active remedial action is estimated to take less than approximately 1 year. Institutional controls would be used to address residual COCs.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would occur. It is very unlikely that this remedial action would be permitted under CEQA.

c) Alternative 5 would result in little removal of COCs from the Site; it would only act to eliminate the exposure pathways. COCs would be less likely to leach into groundwater due to the large reduction in stormwater and irrigation water passing through the soil. The limited additional reduction in risk and minimal impact to groundwater quality when compared with other alternatives is substantially outweighed by the high additional economic and social (including environmental) costs it would impose on the City, the surrounding residents and business owners and others, as well as the difficulties associated with implementation and the substantial costs required for implementation.

d) The removal of this housing development would have significant long-term impacts to the community. All of the current Site residents would be displaced. Residents in the surrounding neighborhoods would experience the disruption of the community and the City would experience a loss of tax revenue.

e) The cost of Alternative 5 would be in the range of $91MM to $200MM, a very high cost relative to the other alternatives.

Alternative 5 is not considered technologically and economically feasible due to very difficult degree of implementability, very high social and economic costs, and moderate environmental costs. Consequently, this remedial alternative is not retained for additional evaluation.

9.4.9 Alternative 6

Alternative 6 would involve the capping of exposed soils and landscaped areas of the Site with hardscape or equivalent. This would achieve the human health goal for infrequent exposure to deep soils and for nuisance, but would not achieve the other soil goals. The soil vapor goals would be addressed by installation of a sub-slab depressurization system for homes where SSCGs are exceeded for sub-slab soil vapor. Assuming sources of COCs are successfully addressed through LNAPL removal, LNAPL goals would be achieved. Groundwater goals (MCLs) would be met in the long term, and background levels for groundwater would be achieved in the longer term, both through MNA. Hot-spot remediation of groundwater (e.g. where concentrations exceed 100x MCLs) would reduce the time to achieve the clean-up goals.

a) Implementation of Alternative 6 would be moderately difficult. Permission from property owners and tenants at all 285 residences would have to be obtained. Sub-slab mitigation would be installed at approximately 30 homes. This alternative is estimated to take approximately 1-½ years to implement. Institutional controls would be used to address residual COCs.

b) In the long term, RAOs would be met for the Site. However, in the short term, air quality, noise, and traffic impacts would be anticipated. Potentially significant increases in stormwater runoff could occur. This may require implementation of additional stormwater best management practices.

c) Alternative 6 would result in little removal of COCs from the Site; it would only act to eliminate the exposure pathways. COCs would be less likely to leach into groundwater due to the large reduction in stormwater and irrigation water passing through the soil.

d) The remedial activities may have a significant impact on the community in the short term during landscape removal and hardscape placement. Residents would lose existing landscaping, and future landscaping would have to be done above the cap in planter boxes.

e) Alternative 6 costs are anticipated to be between $13MM and $28MM. This is moderate relative to the costs of other alternatives.

Groundwater goals (MCLs) are achievable through MNA in the long term. Background groundwater goals are achievable through MNA in the longer term. Use of hot spot remediation of groundwater will hasten the restoration of groundwater through MNA. Alternative 6 is considered potentially technologically and economically feasible due to the moderately difficult degree of implementability and moderate social, environmental, and economic costs. Consequently, this remedial alternative is retained for additional evaluation.

9.4.10 Alternative 7 Addition

Alternative 7 consists of the addition of SVE systems to Alternatives 2 through 6. The following summarizes the impact of this additional technology.

a) The implementability of SVE would depend on the number and location of extraction wells and treatment systems. Assuming one to three treatment systems would be installed, each with 5 to 25 associated extraction wells, this would be moderately difficult to difficult to implement. According to the SCAQMD, it will be difficult to obtain the necessary permits from SCAQMD in this residential area.

b) The installation of SVE systems would assist in meeting the RAOs for the Site. There would be some additional short-term impacts to the community during system installation. There may also be long-term impacts from noise.

c) The addition of SVE would decrease the concentrations of VOCs and more volatile fractions of TPH in soil vapor directly, and in soil and groundwater indirectly in the areas where it is applied. However, it is not likely to achieve cleanup goals, particularly for medium- and long-chain hydrocarbons. Methane concentrations would decrease slightly. The mass reduction of VOCs and TPH would reduce the time for groundwater restoration.

d) The addition of SVE would add some short-term disruption to the community during system installation due to well drilling and trenching for pipe installation.

There would also be a need to displace residents from one to two properties for each treatment system installed for this alternative.

e) The addition of SVE would add $7MM to $15MM to the alternative cost.

The addition of SVE to the alternatives would result in the following ratings for implementability; reduction of toxicity, mobility, and volume; and cost. We indicate the addition of Alternative 7 to another alternative by using a "+" sign between the base alternative and Alternative 7.

Alternative	Implementability	Reduction in Toxicity, Mobility, and Volume	Cost	
2+7	Very Difficult	High	Very High	$200MM to $420MM
3+7	Moderate	High for upper 2 ft	Moderate	$29MM to $61MM
3A+7	Moderately Difficult	Moderate for upper 5 ft	High	$67MM to $140MM
3B+7	Very Difficult	Moderate for upper 10 ft	Very High	$120MM to $260MM
4+7	Moderate	High for upper 2 ft	Moderate	$22MM to $47MM
4A+7	Moderately Difficult	Moderate for upper 5 ft	High	$49MM to $110MM
4B+7	Very Difficult	Moderate for upper 10 ft	Very High	$94MM to $210MM
5+7	Very Difficult	Low-Moderate	Very High	$97MM to $210MM
6+7	Moderate	Low	Moderate	$20MM to $43MM

Alternatives 3+7, 3A+7, 4+7, 4A+7, and 6+7 were retained with moderate to moderately-difficult implementability, moderate to high costs, and moderate or low to moderate reduction in toxicity, mobility, and volume.

9.5 Comparative Evaluation of Retained Alternatives

The following alternatives were retained for comparative evaluation to determine technologically and economically feasible SSCGs:

- Alternative 3;
- Alternative 3+7;
- Alternative 4;
- Alternative 4+7;
- Alternative 4A;
- Alternative 4A+7;
- Alternative 6; and
- Alternative 6+7.

The retained alternatives, with the exception of Alternatives 6 and 6+7, meet the soil cleanup goals and soil vapor cleanup goals to some depth. Alternatives 6 and 6+7 have the lowest reduction in toxicity, mobility, and volume. They would also require the most restrictive institutional controls, which would prohibit any future landscaping at the Site. Therefore, although Alternatives 6 and 6+7 have moderate degrees of implementability and moderate costs, they are not recommended.

Alternatives 3, 3+7, 4, and 4+7 have moderate degrees of implementability, while Alternatives 3A, 3A+7, 4A, and 4A+7 have moderately difficult degrees of implementability. However, Alternatives 3+7 and 4+7 are more difficult to implement than Alternatives 3 and 4, because of the addition of SVE (including difficulties associated with AQMD permitting). If the installation of SVE were permitted, it would reduce the COC volume in the soil and soil vapor below the 2 feet of excavated soil. In contrast, Alternatives 3A, 3A+7 4A and 4A+7 would be moderately difficult to implement due to an increase in soil excavated and replaced and increased time required to carry out the remedial action, both of which would negatively affect the community. The improvement in mass reduction for these alternatives is small and provides little additional social or environmental benefit over Alternatives 3, 3+7, 4, and 4+7. Consequently, Alternatives 3A, 3A+7 4A and 4A+7 are not recommended.

9.6 Recommendation of Remedial Alternative that Are Technologically and Economically Feasible Alternatives

The alternatives that remain after preliminary screening are Alternatives 3, 3+7, 4, and 4+7. Each of these four alternatives meets all soil goals (i.e., HH350 and soil leaching to groundwater goals) in the upper 2 feet of soils. The unexcavated soils would meet the residential human health goal assuming infrequent exposure and nuisance goals. These alternatives meet the soil vapor goals, and the groundwater goals in the long term. Each of these alternatives scores well for the other evaluation criteria:

implementability; environmental considerations; reduction of toxicity, mobility and volume; social considerations; and cost.

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, and eventually, to background levels. This conclusion is based on the stable to declining plume already present at the Site, the age of the source materials (considerable 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). Thus, it is proposed that the SSCGs for groundwater be set at MCLs/NLs for petroleum hydrocarbons and background levels for metals. These SSCGs are considered technologically and economically feasible to achieve in the long term (70-100 years) through MNA assuming the measures noted for further source reduction are implemented (hot spot groundwater remediation – e.g. in areas where concentrations exceed 100x MCLs - and SVE in limited areas of the Site) and that off-Site sources are reduced or eliminated. It is also noted that there is no use of the impacted groundwater in the foreseeable future. SSCGs are also proposed at MCLs for other COCs in Site groundwater including CVOCs and TBA, but meeting these SSCGs will require remediation of upgradient sources.

The requirement established in the RWQCB's comment letter to identify cleanup goals that are technologically and economically feasible has been met through this evaluation process. Remedial alternatives have been identified and screened relative to both technological and economic feasibility. Alternatives 3, 3+7, 4, and 4+7 have been found to be technologically and economically feasible and, as such, these four alternatives and their associated SSCGs are recommended and will be further evaluated in the RAP. The SSCGs associated with these alternatives are detailed in Tables 9-2 through 9-4 and are the SSCGs proposed for the Site.

10.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR), 2006. Dichlorobenzenes ToxFAQ, Division of Toxicology and Environmental Medicine, August.

AFCEE, 2004. Monitoring and Remediation Optimization System Software and User's Guide, Air Force Center for Environmental Excellence. http://www.gsi-net.com/en/software/free-software/maros.html

California Air Resource Board (CARB), 2005. Indoor Air Pollution in California, Report to the California Legislature. July 2005.

Cal/EPA, 1996. Supplemental Guidance For Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities: California Department of Environmental Protection, Department of Toxics Substances Control, August, 1996, www.dtsc.ca.gov/ScienceTechnology/ index.html.

California Environmental Protection Agency, Department of Toxic Substances Control (Cal-EPA DTSC), 1997. Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities. February 1997.

Cal-EPA DTSC, 2005a. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties, January 2005.

Cal-EPA DTSC, 2005b. Advisory on Methane Assessment and Common Remedies at School Sites, School Property Evaluation and Cleanup Division, June 16,2005.

Cal-EPA DTSC, 2007. Arsenic Strategies. Determination of Arsenic Remediation, Development of Arsenic Cleanup Goals for Proposed and Existing School Sites (March 21, 2007). Prepared by Human and Ecological Risk Division, Department of Toxic Substances Control. Cal-EPA.

Cal-EPA DTSC, 2008. Environmental Cleanup Plan Available for Review Fact Sheet for the former Turco Products/Purex facility, April 2008. Retrieved 7/11/10 from http://www.dtsc.ca.gov/HazardousWaste/Projects/upload/Turco_FS_Cleanup_Plan.pdf

Cal-EPA DTSC, 2009a. Site Screening Assessment, Oil Transport Company, Carson, Prepared by Majed Al Shami on 2/17/2009.

Cal-EPA DTSC, 2009b. Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process. Draft. May 8, 2009. Retrieved 7/13/10 from http://www.dtsc.ca.gov/assessingrisk/humanrisk2.cfm

Cal-EPA DTSC 2009c. Interim Guidance: Evaluating Human Health Risks from Total Petroleum Hydrocarbons. URL: www.dtsc.ca.gov/AssessingRisk/upload/TPH-Guidance-6_16_09.pdf

Cal-EPA DTSC, 2011. Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance), October 2011.

Cal-EPA DTSC, 2012. Advisory, Active Soil Gas Investigation, Department of Toxic Substances Control, Los Angeles Regional Water Quality Control Board, San Francisco Regional Water Quality Control Board. April, 2012.

Cal-EPA Office of Environmental Health Hazard Assessment (OEHHA). 2005. Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soils, Integrated Risk Assessment Section, Revised January 2005.

Cal-EPA OEHHA. 2012. Air Toxics Hot Spots Program Risk Assessment Guidelines Technical Support Document for Exposure Assessment and Stochastic Analysis. August 2012.

California Water Services Co., 2013. Statement for customers residing in the Carousel Tract in Carson: Your Water Not Impacted by Soil Contamination, August 1, 2013. Retrieved from Calwater website: Https://www.calwaer.com/hot _topics/2013-0801_rd_carousel.php

Connor, J.A., Bowers, R.L., Paquette, S.M., and Newell, C.J., 1997. Soil Attenuation Model for Derivation of Risk-Based Soil Remediation Standards.

Desert Research Institute, 2009. Harbor Community Monitoring Study (HCMS) Saturation Monitoring, Final Report. Prepared for State of California Air Resources Board Research Division, May 15, 2009.

Doucette, W.J., A.J. Hall, and K.A. Gorder, 2010. Emissions of 1,2-Dichloroethane from Holiday Decorations as a Source of Indoor Air Contamination, Groundwater Monitoring & Remediation, 30(1), Winter 2010. pp 65-71.

Ecology and Environment, Inc., 2013. Site Assessment Report, Monterey Pines Development Site, Carson, California. August 2013.

Edwards, N.T., 1983. Polycyclic aromatic hydrocarbons (PAH's) in the terrestrial environment—a review. Journal of Environmental Quality, 12(4), 427-441.

Eklund, B., 2010. Proposed Regulatory Framework for Evaluating the Methane Hazard due to Vapor Intrusion, Air and Waste Management Association Vapor Intrusion Specialty Conference, Chicago, IL, October.

Environ, 2002. A Methodology for using Background PAHs to Support Remediation Decisions, January 24, 2002.

ERM, 2010. RCRA Facility Investigation and Human Health Risk Assessment Report, Former Turco Facility, Carson, California.

Geosyntec, 2009. Human Health Screening Evaluation Work Plan, Former Kast Property, Carson, California. October 30, 2009.

Geosyntec, 2010a. Data Evaluation and Decision Matrix, Former Kast Property, Carson, California. April 6, 2010.

Geosyntec, 2010b. Community Outdoor Air Sampling and Analysis Report, Former Kast Property, Carson, California. November 5, 2010.

Geosyntec, 2010c. Addendum to the HHSE Work Plan, Former Kast Property, Carson, California. December 17, 2010.

Geosyntec, 2012a. Memorandum: Revised In-Situ Chemical Oxidation Pilot Test – Bench-scale Evaluation. Former Kast Property, Carson, California. July 16, 2012.

Geosyntec, 2012b. Bioventing Pilot Test Summary Report. Former Kast Property, Carson, California. December 6, 2012.

Geosyntec, 2013a. Site-Specific Cleanup Goal Report. Former Kast Property, Carson, California. February 22, 2013.

Geosyntec, 2013b. Phase II ISCO Bench-Scale Test Report. Former Kast Property, Carson, California. August 30, 2013.

Hodgson and Levin, 2003. Volatile Organic Compounds in Indoor Air: A Review of Concentrations Measured in North America Since 1990., Lawrence Berkeley National Laboratory Report LBNL-51715. April 21, 2003.

Jia, C. and S. Batterman, 2010. A Critical Review of Naphthalene Sources and Exposures Relevant to Indoor and Outdoor Air. Int. J. Environ. Res. Public Health. Vol. 7, 2903-2939.

Kaliszova, R., Javorska, H., Tlustos, P., and Balik, J., 2010. Polycyclic aromatic hydrocarbons in the atmosphere-soil-plant system. The root uptake role and consequences. Fresenius Environmental Bulletin, 10(3), 406-416.

Kipopoulou, A. M., Manoli, E., & Samara, C., 1999. Bioconcentration of polycyclic aromatic hydrocarbons in vegetables grown in an industrial area.Environmental Pollution, 106(3), 369-380.

Kurtz, J.P., Wolfe, E.M., Woodland, A.K., and Foster, S.J., 2010. Evidence for increasing indoor sources of 1,2-dichloroethane since 2004 at two Colorado residential vapor intrusion sites. Ground Water Monitoring & Remediation: 30(3):107-112.

Leymaster Environmental Consulting (Leymaster), 2009. Vapor Extraction/Air Sparging and Groundwater Monitoring Report, Fletcher Oil and Refining Company (FORCO) Site, 24721 South Main Street, Carson, California.

Leymaster, 2010. Quarterly Monitoring Report, Fourth Quarter 2009. Former Turco Facility, 24700 Main Street, Carson, California, Report dated April 2, 2010.

Leymaster, 2012. Report of Additional Subsurface Investigation, Fletcher Oil and Refining Company, 24721 South Main Street, Carson California, Report dated March 20, 2012.

Leymaster, 2013. Semi_Annual Monitoring Report-Second Half 2012, Former Turco Facility, 24700 Main Street, Carson, California, Report dated January 31, 2013.

LARWQCB, 2011. Cleanup and Abatement Order No. R4-2011-0046, issued on March 11, 2011.

LARWQCB, 2013. Review of Site-Specific Cleanup Goal Report, Former Kast Property Tank Farm, Carson, California, August 21, 2013.

Li, J., Shang, X., Zhao, Z., Tanguay, R. L., Dong, Q., & Huang, C., 2010. Polycyclic aromatic hydrocarbons in water, sediment, soil, and plants of the Aojiang River waterway in Wenzhou, China. Journal of hazardous materials,173(1), 75-81.

Los Angeles Regional Water Quality Control Board (LARWQCB), 1996. Interim Site Assessment & Cleanup Guidebook., May 1996.

MADEP, 2003. Final Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology, Office of Research and Standards, November 2003.

MADEP, 2009. Method for the Determination of Air-Phase Petroleum Hydrocarbons, Office of Research and Standards, December 2009.

Massachusetts Department of Environmental Protection (MADEP), 2002. Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of the MADEP VPH/EPH Approach, Final Policy. Policy #WSC-02-411. October 31, 2002.

Nakajima, D., Yoshida, Y., Suzuki, J., & Suzuki, S., 1995. Seasonal changes in the concentration of polycyclic aromatic hydrocarbons in azalea leaves and relationship to atmospheric concentration. Chemosphere, 30(3), 409-418

New Zealand Ministry for the Environment, 2011. Guidelines for assessing and managing petroleum hydrocarbon contaminated sites in New Zealand.

PIC Environmental Services, 1995. Tank Removal Geologic Report Concerning Property at Blue Jay Enterprises, 241-259 East Lomita Blvd, Carson, California.

PIC Environmental Services, 1995a. Excavation Geologic Report, For Blue Jay Project, 241-259 East Lomita Blvd, Carson, California, December 7, 1995.

PIC Environmental Services, 1995b. Phase II Site Investigation Report, For Blue Jay Project, 241-259 East Lomita Blvd., Carson, California, April 24, 1995.

PIC Environmental Services, 1996. Sampling Workplan. Submitted to Blue Jay Housing Partners, l.P.

Ririe, T. and R. Sweeney, 1995. Fate and Transport of Volatile Hydrocarbons in the Vadose Zone. In Proceedings of 1995 Petroleum Hydrocarbon and Organic Chemicals in Groundwater, API/NGWA, Houston, TX, November.

Sexton, K., Adgate, J.L., Ramachandran, G., Pratt, G.C., Mongin, S.J., Stock, T.H., and Morandi, M.T., 2004. Comparison of Personal, Indoor, and Outdoor Exposures to Hazardous Air Pollutants in Three Urban Communities. Environmental Science and Technology 38(2): 423-430.

South Coast Air Quality Management District, 2008. Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES-III), Final Report. September 2008.

State Water Resources Control Board (SWRCB), 2012. Resolution No, 2012-0016, Approve a Substitute Environmental Document and Adopt a Proposed Water Quality Control Policy for Low Threat Underground Storage Tank Case Closure.

Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG), 1997a. Volume 4. Development of Fraction Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons (TPH).

TPHCWG, 1997b. Volume 3. Selection of Representative TPH Fractions Based on Fate and Transport Considerations, July 1997.

TPHCWG, 1998a. Volume 1. Analysis of Petroleum Hydrocarbons in Environmental Media, March 1998.

TPHCWG, 1998b. Volume 2. Composition of Petroleum Mixtures. May 1998

TPHCWG, 1999. Volume 5. Human Health Risk-Based Evaluation of Petroleum Release Sites: Implementing the Working Group Approach. June 1999.

Trapp, S., & Legind, C. N., 2011. Uptake of organic contaminants from soil into vegetables and fruits. Dealing with Contaminated Sites, 369-408.

URS, 2009a. Interim Remedial Action Plan, Former Kast Property, Carson, California, November 4, 2009.

URS, 2010a. Plume Delineation Report, Former Kast Property, Carson, California, September 25, 2010.

URS, 2010b. Soil Vapor Extraction Pilot Test Report. Former Kast Property, Carson, California. Site Cleanup No. 1230, Site ID 2040330. September 30.

URS, 2010c. Soil Background Evaluation Report. Former Kast Property, Carson, California, September 14, 2010.

URS, 2011. Gage Aquifer Investigation, Former Kast Property, Carson, California, October 10, 2011.

URS, 2013a. Excavation Pilot Test, 24612 Neptune Avenue, Former Kast Property, Carson, California, January 4, 2013.

URS, 2013b. Quarterly Sampling of Existing and Replacement Soil Vapor Probes, Fourth Quarter 2012, Carousel and Monterey Pines Neighborhoods, Former Kast Property, Carson, California, January 11, 2013.

URS, 2013c. Fourth Quarter 2012 Groundwater Monitoring Report, October through December 2012, Former Kast Property, Carson, California, January 15, 2013.

URS, 2013d. Excavation Pilot Test, 24533 Ravenna Avenue, Former Kast Property, Carson, California, February 4, 2013.

URS, 2013e. Pilot Test Summary Report – Part 1. Former Kast Property, Carson, California, May 30, 2013.

URS, 2013g. Pilot Test Summary Report – Part 2. Former Kast Property, Carson, California, August 30, 2013.

URS, 2013h. Third Quarter Groundwater Monitoring Report, July through September 2013, Former Kast Property, Carson, California, October 15, 2013.

URS, 2013i. Second Quarter Groundwater Monitoring Report, April through June 2013, Former Kast Property, Carson, California, July 12, 2013.

URS and Geosyntec, 2011. Pilot Test Work Plan for Remedial Excavation and In-situ Treatment Pilot Testing, Former Kast Property, Carson, California, May 10, 2011.

URS and Geosyntec, 2013. Assessment of Environmental Impact and Feasibility of Removal of Residual Concrete Rervoir Slabs, Former Kast Property, Carson, California, June 28, 2013.

United States Environmental Protection Agency (USEPA), 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA 540/G-89/004, October 1988.

USEPA, 1989. Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual (Part A), USEPA 540/1-89-002, Office of Emergency and Remedial Response. Washington, DC.

USEPA, 1991a. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part B: Development of Risk-Based Preliminary Remediation Goals). Office of Emergency and Remedial Response. Publication 9285.7-01B. December.

USEPA, 1991b. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part C: Risk Evaluation of Remedial Alternatives). Office of Emergency and Remedial Response. Publication 9285.7-01C. October.

USEPA, 1991c. The Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions.

USEPA, 1996. Bioscreen Natural Attenuation Decision Support System User's Manual, Version 1.3. August 1996. EPA/600/R-96/087

USEPA, 1997. Exposure Factors Handbook. Volumes I-III. An Update to Exposure Factors Handbook EPA/600/8-89/043 May 1989. EPA/600/P-95-002fa, fb, and fc. August.

USEPA, 2001. Risk Assessment Guidance for Superfund (RAGS). Volume I: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). Final December 2001.

USEPA, 2002a. Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. OSWER 9285.7-41. September.

USEPA, 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Emergency and Remedial Response. OSWER 9355.4 24. December.

USEPA, 2004. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings, Office of Emergency and Remedial Response, Revised February 22, 2004.

USEPA, 2004b. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R-99/005. Office of Solid Waste and Emergency Response, Washington, DC. PB99-963312. OSWER 9285.7-02EP. July.

USEPA, 2009. Risk Assessment Guidance for Superfund (RAGS). Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. EPA-540-R-070-002. OSWER 9285.7-82. January.

USEPA, 2011. Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990-2005): A Compilation of Statistics for Assessing Vapor Intrusion, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, EPA 530-R-10-001. June 2011.

USEPA, 2012a. EPA Assessment of Chlorinated Volatile Organic Soil Contamination at Monterey Pines, Carson, CA, Letter dated September 5, 2012.

USEPA, 2012b. Regional Screening Levels. http://www.epa.gov/region9/superfund/prg/, November 2012.

USEPA, 2012c. 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, EPA 530-R-10-002. March 16, 2012.

USEPA, 2012d. Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites, Office of Solid Waste and Emergency Response, Office of Enforcement and Compliance Assurance, OSWER 9355.0-89, EPA-540-R-03-001, December 2012.

Van Winkle and Scheff, 2001. Volatile Organic Compounds, Polycyclic Aromatic Hydrocarbons and Elements in the Air of Ten Urban Homes. Indoor Air, 11(1): 49-64.

Welch, A. H., Westjohn, D. B., Helsel, D.R., and Wanty, R. B., 2000. Arsenic in Ground Water of the United States—Occurrence and Geochemistry, Ground Water v. 38, no. 4.

Wilcke, W., 2000. Synopsis polycyclic aromatic hydrocarbons (PAHs) in soil—a review. Journal of Plant Nutrition and Soil Science, 163(3), 229-248.

Water Replenishment District (WRD), 2008. Groundwater Quality in the Central and West Coast Basins.

Water Replenishment District (WRD), 2013. Regional Groundwater Monitoring Report, Water Year 2011-2012, Central and West Coast Basins, Los Angeles County, California, March 2013.

TABLES

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	0 - 2 ft Number of Samples	0 - 2 ft Number of Detects	0 - 2 ft Percent Detected	0 - 2 ft Minimum DL	0 - 2 ft Maximum DL	0 - 2 ft Minimum Detected Value	0 - 2 ft Maximum Detected Value	> 2 to <= 5 ft Number of Samples	> 2 to <= 5 ft Number of Detects	> 2 to <= 5 ft Percent Detected	> 2 to <= 5 ft Minimum DL	> 2 to <= 5 ft Maximum DL	> 2 to <= 5 ft Minimum Detected Value	> 2 to <= 5 ft Maximum Detected Value
Metal																	
Soil	7440-36-0	Antimony	mg/kg	4683	920	19.6%	0.149	0.306	0.151	4.92	2930	534	18.2%	0.149	0.306	0.154	6.45
Soil	7440-38-2	Arsenic	mg/kg	4683	4664	99.6%	0.259	0.398	0.398	20	2930	2919	99.6%	0.398	0.398	0.408	50.9
Soil	7440-39-3	Barium	mg/kg	4683	4683	100.0%	--	--	10.9	457	2930	2930	100.0%	--	--	21.3	1020
Soil	7440-41-7	Beryllium	mg/kg	4683	4676	99.9%	0.0894	0.0894	0.102	1.17	2930	2928	99.9%	0.137	0.137	0.0906	1.19
Soil	7440-43-9	Cadmium	mg/kg	4683	1653	35.3%	0.0064	0.135	0.0072	9.02	2930	611	20.9%	0.0064	0.135	0.007	6.88
Soil	7440-47-3	Chromium	mg/kg	4683	4683	100.0%	--	--	2.64	74.2	2930	2930	100.0%	--	--	3.66	62.8
Soil	CR6	Chromium, Hexavalent	mg/kg	4594	428	9.3%	0.0025	0.43	0.048	1.5	2818	384	13.6%	0.038	0.22	0.039	1
Soil	7440-48-4	Cobalt	mg/kg	4683	4683	100.0%	--	--	1.19	24.1	2930	2930	100.0%	--	--	2.36	26
Soil	7440-50-8	Copper	mg/kg	4683	4683	100.0%	--	--	1.01	1190	2930	2930	100.0%	--	--	2.79	158
Soil	7439-92-1	Lead	mg/kg	4683	4681	100.0%	0.181	0.181	0.514	381	2930	2928	99.9%	0.181	0.181	0.48	330
Soil	7439-97-6	Mercury	mg/kg	4683	4531	96.8%	0.0013	0.00588	0.004	1.33	2930	2767	94.4%	0.0013	0.00588	0.0039	0.918
Soil	7439-98-7	Molybdenum	mg/kg	4683	2856	61.0%	0.0206	0.132	0.0456	24.1	2930	1396	47.6%	0.0206	0.132	0.0268	5.83
Soil	7440-02-0	Nickel	mg/kg	4683	4683	100.0%	--	--	1.57	31.9	2930	2930	100.0%	--	--	4.14	43.1
Soil	7782-49-2	Selenium	mg/kg	4683	282	6.0%	0.175	0.351	0.198	6.16	2930	149	5.1%	0.175	0.351	0.335	6.99
Soil	7440-22-4	Silver	mg/kg	4683	64	1.4%	0.017	0.117	0.0362	3.82	2930	14	0.5%	0.017	0.117	0.147	2.66
Soil	7440-28-0	Thallium	mg/kg	4683	175	3.7%	0.0987	0.232	0.163	3.38	2930	101	3.4%	0.0987	0.232	0.166	3.47
Soil	7440-62-2	Vanadium	mg/kg	4683	4683	100.0%	--	--	4.16	76.4	2930	2930	100.0%	--	--	10.1	82.1
Soil	7440-66-6	Zinc	mg/kg	4683	4683	100.0%	--	--	6.61	5770	2930	2930	100.0%	--	--	8.62	1240
PCBs																	
Soil	12674-11-2	AROCLOR 1016	ug/kg	13	0	0.0%	10	10	--	--	16	0	0.0%	10	14	--	--
Soil	11104-28-2	AROCLOR 1221	ug/kg	13	0	0.0%	10	10	--	--	16	0	0.0%	10	13	--	--
Soil	11141-16-5	AROCLOR 1232	ug/kg	13	0	0.0%	10	10	--	--	16	0	0.0%	10	11	--	--
Soil	53469-21-9	AROCLOR 1242	ug/kg	13	0	0.0%	10	10	--	--	16	0	0.0%	10	12	--	--
Soil	12672-29-6	AROCLOR 1248	ug/kg	13	0	0.0%	10	10	--	--	16	0	0.0%	10	14	--	--
Soil	11097-69-1	AROCLOR 1254	ug/kg	13	0	0.0%	10	10	--	--	16	0	0.0%	10	12	--	--
Soil	11096-82-5	AROCLOR 1260	ug/kg	13	0	0.0%	11	11	--	--	16	0	0.0%	11	11	--	--
Soil	37324-23-5	AROCLOR 1262	ug/kg	13	0	0.0%	10	10	--	--	16	0	0.0%	10	12	--	--
SVOCs/PAHs																	
Soil	120-82-1	1,2,4-Trichlorobenzene	ug/kg	4718	3	0.1%	0.12	160	0.17	17	2851	4	0.1%	0.13	81000	0.17	33
Soil	95-50-1	1,2-Dichlorobenzene	ug/kg	4718	8	0.2%	0.084	110	0.11	1.8	2851	7	0.2%	0.091	41000	0.25	330
Soil	541-73-1	1,3-Dichlorobenzene	ug/kg	4718	1	0.0%	0.11	140	0.21	0.21	2851	3	0.1%	0.12	41000	0.79	30
Soil	106-46-7	1,4-Dichlorobenzene	ug/kg	4718	64	1.4%	0.1	130	0.14	200	2851	11	0.4%	0.11	81000	0.13	170
Soil	90-12-0	1-Methylnaphthalene	mg/kg	4714	1370	29.1%	0.001	48	0.001	45	2850	1582	53.6%	0.001	4	0.0011	180
Soil	95-95-4	2,4,5-Trichlorophenol	mg/kg	4714	0	0.0%	0.013	76	--	--	2850	0	0.0%	0.0121	150	--	--
Soil	88-06-2	2,4,6-Trichlorophenol	mg/kg	4714	0	0.0%	0.013	79	--	--	2850	1	0.0%	0.0121	160	0.14	0.14
Soil	120-83-2	2,4-Dichlorophenol	mg/kg	4714	1	0.0%	0.013	69	0.43	0.43	2850	0	0.0%	0.0121	140	--	--
Soil	105-67-9	2,4-Dimethylphenol	mg/kg	4714	0	0.0%	0.013	60	--	--	2850	0	0.0%	0.0121	120	--	--

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	0 - 2 ft							> 2 to <= 5 ft						
				Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	51-28-5	2,4-Dinitrophenol	mg/kg	4714	0	0.0%	0.045	360	--	--	2950	0	0.0%	0.045	720	--	--
Soil	121-14-2	2,4-Dinitrotoluene	mg/kg	4714	5	0.1%	0.013	78	0.061	1.6	2950	2	0.1%	0.0121	150	0.082	0.67
Soil	606-20-2	2,6-Dinitrotoluene	mg/kg	4714	0	0.0%	0.008	83	--	--	2950	2	0.1%	0.008	170	0.056	0.18
Soil	91-58-7	2-Chloronaphthalene	mg/kg	4714	2	0.0%	0.0083	48	0.16	0.56	2950	0	0.0%	0.0083	97	--	--
Soil	95-57-8	2-Chlorophenol	mg/kg	4714	0	0.0%	0.013	88	--	--	2950	0	0.0%	0.0121	140	--	--
Soil	91-57-6	2-Methylnaphthalene	mg/kg	4714	3523	74.7%	0.0006	47	0.0006	72	2950	2135	72.4%	0.0006	3.6	0.0006	260
Soil	95-48-7	2-Methylphenol	mg/kg	4714	0	0.0%	0.013	70	--	--	2950	0	0.0%	0.0121	140	--	--
Soil	88-74-4	2-Nitroaniline	mg/kg	4714	0	0.0%	0.046	62	--	--	2950	0	0.0%	0.046	160	--	--
Soil	88-75-5	2-Nitrophenol	mg/kg	4714	0	0.0%	0.013	64	--	--	2950	0	0.0%	0.0121	130	--	--
Soil	91-94-1	3,3'-Dichlorobenzidine	mg/kg	4714	0	0.0%	0.0093	540	--	--	2950	0	0.0%	0.0093	1100	--	--
Soil	106-44-5	3/4-Methylphenol	mg/kg	4714	1	0.0%	0.0547	68	0.073	0.073	2950	0	0.0%	0.0121	140	--	--
Soil	99-09-2	3-Nitroaniline	mg/kg	4714	0	0.0%	0.01	79	--	--	2950	0	0.0%	0.01	160	--	--
Soil	534-52-1	4,6-Dinitro-2-Methylphenol	mg/kg	4714	0	0.0%	0.05	790	--	--	2950	0	0.0%	0.0483	1600	--	--
Soil	101-55-3	4-Bromophenyl-Phenyl Ether	mg/kg	4714	0	0.0%	0.0067	50	--	--	2950	0	0.0%	0.0067	100	--	--
Soil	59-50-7	4-Chloro-3-Methylphenol	mg/kg	4714	0	0.0%	0.013	76	--	--	2950	0	0.0%	0.0121	150	--	--
Soil	106-47-8	4-Chloroaniline	mg/kg	4714	0	0.0%	0.013	82	--	--	2950	0	0.0%	0.0121	120	--	--
Soil	7005-72-3	4-Chlorophenyl-Phenyl Ether	mg/kg	4714	0	0.0%	0.0057	52	--	--	2950	0	0.0%	0.0057	100	--	--
Soil	MEPH4	4-Methylphenol (p-Cresol)	mg/kg	315	5	1.6%	0.079	24	0.14	0.22	174	2	1.1%	0.079	47	0.16	0.17
Soil	100-01-6	4-Nitroaniline	mg/kg	4714	0	0.0%	0.05	70	--	--	2950	0	0.0%	0.0483	140	--	--
Soil	100-02-7	4-Nitrophenol	mg/kg	4714	0	0.0%	0.0067	79	--	--	2950	0	0.0%	0.0067	160	--	--
Soil	83-32-9	Acenaphthene	mg/kg	4714	526	11.2%	0.0009	49	0.001	7.1	2950	1440	48.8%	0.0009	22	0.0011	17
Soil	208-96-8	Acenaphthylene	mg/kg	4714	1016	21.6%	0.0006	64	0.0006	1	2950	477	16.2%	0.0006	19	0.0006	4.5
Soil	62-53-3	Aniline	mg/kg	4714	2	0.0%	0.056	58	0.97	1.6	2950	2	0.1%	0.056	110	0.088	2.6
Soil	120-12-7	Anthracene	mg/kg	4714	1613	34.2%	0.0004	57	0.00054	28	2950	1315	44.6%	0.0004	8.2	0.00057	16
Soil	103-33-3	Azobenzene	mg/kg	4714	0	0.0%	0.1	54	--	--	2950	0	0.0%	0.1	110	--	--
Soil	92-87-5	Benzidine	mg/kg	4714	0	0.0%	0.071	460	--	--	2950	0	0.0%	0.071	930	--	--
Soil	56-55-3	Benzo (a) Anthracene	mg/kg	4714	3906	82.9%	0.00065	95	0.0007	19	2950	2049	69.5%	0.00065	1.8	0.0007	47
Soil	50-32-8	Benzo (a) Pyrene	mg/kg	4714	3910	82.9%	0.00049	43	0.0005	8	2950	1924	65.2%	0.00049	1.2	0.0005	22
Soil	205-99-2	Benzo (b) Fluoranthene	mg/kg	4714	3393	72.0%	0.00035	42	0.0005	5.2	2950	1539	52.2%	0.00035	4.1	0.0005	16
Soil	191-24-2	Benzo (g,h,i) Perylene	mg/kg	4714	3939	83.6%	0.00047	45	0.00057	5.7	2950	1694	57.4%	0.00047	3.8	0.00052	13
Soil	207-08-9	Benzo (k) Fluoranthene	mg/kg	4714	1359	28.8%	0.0007	55	0.00076	2.3	2950	528	17.9%	0.0007	17	0.00092	4.6
Soil	65-85-0	Benzoic Acid	mg/kg	4714	6	0.1%	0.064	380	0.29	1.5	2950	1	0.0%	0.064	780	0.12	0.12
Soil	100-51-6	Benzyl Alcohol	mg/kg	4714	1	0.0%	0.054	77	1.8	1.8	2950	0	0.0%	0.054	160	--	--
Soil	111-91-1	Bis(2-Chloroethoxy) Methane	mg/kg	4714	0	0.0%	0.012	82	--	--	2950	0	0.0%	0.012	120	--	--
Soil	111-44-4	Bis(2-Chloroethyl) Ether	mg/kg	4714	0	0.0%	0.013	57	--	--	2950	0	0.0%	0.0121	110	--	--
Soil	108-60-1	Bis(2-Chloroisopropyl) Ether	mg/kg	4714	0	0.0%	0.013	60	--	--	2950	0	0.0%	0.0121	120	--	--
Soil	117-81-7	Bis(2-Ethylhexyl) Phthalate	mg/kg	4714	238	5.0%	0.039	48	0.11	6.9	2950	51	1.7%	0.039	96	0.083	22
Soil	85-68-7	Butyl Benzyl Phthalate	mg/kg	4714	72	1.5%	0.013	50	0.12	1	2950	18	0.6%	0.0121	100	0.023	0.7

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	0 - 2 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	> 2 to <= 5 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	218-01-9	Chrysene	mg/kg	4714	4170	88.5%	0.00058	2.2	0.00066	72	2950	2238	75.8%	0.00058	1.2	0.00096	130
Soil	53-70-3	Dibenz (a,h) Anthracene	mg/kg	4714	1611	34.2%	0.00052	45	0.00064	1.8	2950	624	21.2%	0.00052	13	0.00053	3.4
Soil	132-64-9	Dibenzofuran	mg/kg	4714	2	0.0%	0.0073	58	0.15	0.23	2950	3	0.1%	0.0073	120	0.13	0.42
Soil	84-66-2	Diethyl Phthalate	mg/kg	4714	239	5.1%	0.0063	79	0.061	0.75	2950	130	4.4%	0.0063	160	0.06	3.1
Soil	131-11-3	Dimethyl Phthalate	mg/kg	4714	372	7.9%	0.008	90	0.052	2.7	2950	202	6.8%	0.008	180	0.054	2.1
Soil	84-74-2	Di-n-Butyl Phthalate	mg/kg	4714	8	0.2%	0.033	48	0.13	0.33	2950	0	0.0%	0.033	96	--	--
Soil	117-84-0	Di-n-Octyl Phthalate	mg/kg	4714	2	0.0%	0.0063	42	0.47	0.57	2950	1	0.0%	0.0063	120	0.27	0.27
Soil	206-44-0	Fluoranthene	mg/kg	4714	3749	79.5%	0.00049	54	0.0005	11	2950	2116	71.8%	0.00049	1.1	0.0005	28
Soil	86-73-7	Fluorene	mg/kg	4714	962	20.4%	0.00073	53	0.00078	23	2950	1571	53.3%	0.00073	2.9	0.0008	22
Soil	87-68-3	Hexachloro-1,3-Butadiene	ug/kg	4714	0	0.0%	0.5	50000	--	--	2950	0	0.0%	0.59	100000	--	--
Soil	118-74-1	Hexachlorobenzene	mg/kg	4714	0	0.0%	0.006	52	--	--	2950	0	0.0%	0.006	100	--	--
Soil	77-47-4	Hexachlorocyclopentadiene	mg/kg	4714	0	0.0%	0.013	350	--	--	2950	0	0.0%	0.0121	700	--	--
Soil	67-72-1	Hexachloroethane	mg/kg	4714	0	0.0%	0.0067	54	--	--	2950	0	0.0%	0.0067	110	--	--
Soil	193-39-5	Indeno (1,2,3-c,d) Pyrene	mg/kg	4714	2406	51.0%	0.00053	49	0.00084	2	2950	879	29.8%	0.00053	13	0.00056	3.2
Soil	78-59-1	Isophorone	mg/kg	4714	0	0.0%	0.0063	59	--	--	2950	0	0.0%	0.0063	120	--	--
Soil	1319-77-3	Methyl Phenol	mg/kg	210	0	0.0%	0.013	3.2	--	--	128	0	0.0%	0.013	1.8	--	--
Soil	91-20-3	Naphthalene	ug/kg	4718	2530	53.6%	0.23	110	0.26	26000	2951	1971	66.8%	0.23	740	0.25	68000
Soil	98-95-3	Nitrobenzene	mg/kg	4714	0	0.0%	0.013	380	--	--	2950	0	0.0%	0.0121	760	--	--
Soil	62-75-9	N-Nitrosodimethylamine	mg/kg	4714	0	0.0%	0.091	58	--	--	2950	0	0.0%	0.091	120	--	--
Soil	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	4714	0	0.0%	0.0067	58	--	--	2950	0	0.0%	0.0067	120	--	--
Soil	86-30-6	N-Nitrosodiphenylamine	mg/kg	4714	2	0.0%	0.0073	59	0.24	0.32	2950	1	0.0%	0.0073	120	0.61	0.61
Soil	87-86-5	Pentachlorophenol	mg/kg	4714	0	0.0%	0.05	640	--	--	2950	0	0.0%	0.0483	1300	--	--
Soil	85-01-8	Phenanthrene	mg/kg	4714	4082	86.6%	0.00051	56	0.00082	100	2950	2288	77.6%	0.00051	0.96	0.00058	94
Soil	108-95-2	Phenol	mg/kg	4714	2	0.0%	0.0053	71	0.97	1.8	2950	0	0.0%	0.0053	140	--	--
Soil	129-00-0	Pyrene	mg/kg	4714	4345	92.2%	0.00049	2.1	0.0006	140	2950	2447	82.9%	0.00049	1	0.0005	180
Soil	110-86-1	Pyridine	mg/kg	4714	0	0.0%	0.082	170	--	--	2950	0	0.0%	0.082	330	--	--
TPH																	
Soil	C19C32ALIPH	Aliphatics (C19 - C32)	mg/kg	917	808	88.1%	5	10	5	7200	566	438	77.4%	5	10	5.1	32000
Soil	C5C8ALIPH	Aliphatics (C5 - C8)	mg/kg	917	373	40.7%	0.0091	0.5	0.0091	1100	565	375	66.4%	0.0091	0.5	0.0093	5600
Soil	C9C18ALIPH	Aliphatics (C9 - C18)	mg/kg	917	356	38.8%	5	10	5	3000	565	296	52.4%	5	10	5	6300
Soil	C17C32AROM	Aromatics (C17 - C32)	mg/kg	917	765	83.4%	5	10	5	8000	566	409	72.3%	5	10	5	36000
Soil	C6C8AROM	Aromatics (C6 - C8)	mg/kg	917	70	7.6%	0.0002	0.02	0.0002	60	566	197	34.8%	0.0002	0.02	0.0002	310
Soil	C9C16AROM	Aromatics (C9 - C16)	mg/kg	917	400	43.6%	5	10	5	6800	566	324	57.2%	5	10	5	41000
Soil	TPHC6C44	Total Petroleum Hydrocarbons (C6-C44)	mg/kg	4	4	100.0%	--	--	350	11000	3	3	100.0%	--	--	410	10000
Soil	68334-30-5	TPH as Diesel	mg/kg	4714	3930	83.4%	4.8	4.8	4.9	96000	2950	2075	70.3%	4.8	4.8	4.9	140000
Soil	PHCG	TPH as Gasoline	mg/kg	4716	1577	33.4%	0.0001	0.42	0.043	3700	2948	1646	65.8%	0.0001	12	0.045	7000
Soil	TPHMOIL	TPH as Motor Oil	mg/kg	4714	4047	85.9%	7	7	7	180000	2950	2129	72.2%	7	7	7.1	320000

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	0 - 2 ft: Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	> 2 to <= 6 ft: Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
VOCs																	
Soil	630-20-6	1,1,1,2-Tetrachloroethane	ug/kg	4718	0	0.0%	0.17	280	--	--	2948	0	0.0%	0.17	1500	--	--
Soil	71-55-6	1,1,1-Trichloroethane	ug/kg	4718	0	0.0%	0.17	220	--	--	2948	1	0.0%	0.16	1100	0.86	0.88
Soil	79-34-5	1,1,2,2-Tetrachloroethane	ug/kg	4718	8	0.2%	0.08	200	0.1	0.48	2948	18	0.6%	0.08	1000	0.1	420
Soil	79-00-5	1,1,2-Trichloroethane	ug/kg	4718	0	0.0%	0.16	210	--	--	2948	4	0.1%	0.17	1100	0.23	14
Soil	75-34-3	1,1-Dichloroethane	ug/kg	4718	1	0.0%	0.1	140	0.26	0.26	2948	0	0.0%	0.11	700	--	--
Soil	75-35-4	1,1-Dichloroethene	ug/kg	4718	1	0.0%	0.091	120	0.18	0.18	2948	0	0.0%	0.1	620	--	--
Soil	563-58-6	1,1-Dichloropropene	ug/kg	4718	0	0.0%	0.14	190	--	--	2948	0	0.0%	0.16	980	--	--
Soil	87-61-6	1,2,3-Trichlorobenzene	ug/kg	4718	7	0.1%	0.13	180	0.18	53	2948	10	0.3%	0.15	900	0.21	89
Soil	96-18-4	1,2,3-Trichloropropane	ug/kg	4718	8	0.2%	0.2	570	0.55	1.3	2948	5	0.2%	0.2	2900	0.48	130
Soil	95-63-6	1,2,4-Trimethylbenzene	ug/kg	4718	1062	22.5%	0.077	59	0.089	46000	2948	1146	38.9%	0.063	89	0.091	60000
Soil	96-12-8	1,2-Dibromo-3-Chloropropane	ug/kg	4718	0	0.0%	0.5	3200	--	--	2948	1	0.0%	0.5	16000	9.6	9.6
Soil	106-93-4	1,2-Dibromoethane (EDB)	ug/kg	4718	2	0.0%	0.19	160	0.51	950	2948	0	0.0%	0.19	2000	--	--
Soil	107-06-2	1,2-Dichloroethane	ug/kg	4718	5	0.1%	0.11	150	0.2	3.7	2948	0	0.0%	0.12	750	--	--
Soil	78-87-5	1,2-Dichloropropane	ug/kg	4718	2	0.0%	0.17	230	0.31	0.65	2948	2	0.1%	0.19	1200	2.8	100
Soil	108-67-8	1,3,5-Trimethylbenzene	ug/kg	4718	146	3.1%	0.065	56	0.083	12000	2948	657	22.3%	0.071	440	0.079	25000
Soil	142-28-9	1,3-Dichloropropane	ug/kg	4718	0	0.0%	0.12	150	--	--	2948	1	0.0%	0.13	780	0.19	0.19
Soil	594-20-7	2,2-Dichloropropane	ug/kg	4718	0	0.0%	0.24	400	--	--	2948	0	0.0%	0.24	2000	--	--
Soil	78-93-3	2-Butanone (Methyl Ethyl Ketone)	ug/kg	4718	504	10.7%	1.5	8300	2.7	2700	2948	180	6.1%	1.7	42000	2.5	53
Soil	95-49-8	2-Chlorotoluene	ug/kg	4718	4	0.1%	0.078	48	0.15	180	2948	1	0.0%	0.083	520	4.1	4.1
Soil	591-78-6	2-Hexanone	ug/kg	4718	8	0.2%	0.8	4800	2.3	31	2948	1	0.0%	0.8	25000	6.1	6.1
Soil	106-43-4	4-Chlorotoluene	ug/kg	4718	0	0.0%	0.068	91	--	--	2948	0	0.0%	0.075	460	--	--
Soil	108-10-1	4-Methyl-2-Pentanone	ug/kg	4718	21	0.4%	0.8	1800	1.6	15	2948	2	0.1%	0.8	9000	1.4	2.7
Soil	67-64-1	Acetone	ug/kg	4718	4403	93.3%	4.7	5600	5	860	2948	2061	69.9%	4.6	28000	5	1400
Soil	71-43-2	Benzene	ug/kg	4718	2732	57.9%	0.095	55	0.1	13000	2948	1339	45.4%	0.095	600	0.1	24000
Soil	108-86-1	Bromobenzene	ug/kg	4718	1	0.0%	0.14	180	0.41	0.41	2948	1	0.0%	0.15	930	0.42	0.42
Soil	74-97-5	Bromochloromethane	ug/kg	4718	0	0.0%	0.51	1200	--	--	2948	0	0.0%	0.5	6100	--	--
Soil	75-27-4	Bromodichloromethane	ug/kg	4718	24	0.5%	0.08	60	0.12	660	2948	1	0.0%	0.08	850	0.13	0.13
Soil	75-25-2	Bromoform	ug/kg	4718	6	0.1%	0.3	560	0.65	2.9	2948	1	0.0%	0.3	2900	140	140
Soil	74-83-9	Bromomethane	ug/kg	4718	119	2.5%	0.5	1600	0.71	850	2948	83	2.8%	0.59	8200	0.69	900
Soil	75-15-0	Carbon Disulfide	ug/kg	4718	2655	56.3%	0.13	150	0.13	52	2948	1637	55.5%	0.13	780	0.14	110
Soil	56-23-5	Carbon Tetrachloride	ug/kg	4718	1	0.0%	0.21	280	0.3	0.3	2948	0	0.0%	0.21	1400	--	--
Soil	108-90-7	Chlorobenzene	ug/kg	4718	90	1.9%	0.098	62	0.12	150	2948	31	1.1%	0.11	660	0.12	81
Soil	75-00-3	Chloroethane	ug/kg	4718	7	0.1%	0.27	360	0.39	1.8	2948	3	0.1%	0.3	1800	0.54	1.3
Soil	67-66-3	Chloroform	ug/kg	4718	493	10.4%	0.11	150	0.14	110	2948	173	5.9%	0.12	760	0.14	30
Soil	74-87-3	Chloromethane	ug/kg	4718	35	0.7%	0.23	2500	0.27	520	2948	14	0.5%	0.22	13000	0.25	480
Soil	156-59-2	cis-1,2-Dichloroethene	ug/kg	4718	2	0.0%	0.19	250	0.33	0.56	2948	8	0.2%	0.2	1300	0.31	48
Soil	10061-01-5	cis-1,3-Dichloropropene	ug/kg	4718	0	0.0%	0.12	160	--	--	2948	0	0.0%	0.13	810	--	--

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	0 - 2 ft							> 2 to <= 5 ft						
				Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	98-82-8	Cumene (Isopropylbenzene)	ug/kg	4718	281	6.0%	0.078	67	0.098	5900	2948	1092	37.0%	0.085	220	0.092	11000
Soil	124-48-1	Dibromochloromethane	ug/kg	4718	17	0.4%	0.06	170	0.1	6.6	2948	4	0.1%	0.06	860	0.1	0.17
Soil	74-95-3	Dibromomethane	ug/kg	4718	0	0.0%	0.2	610	--	--	2948	2	0.1%	0.2	3100	0.41	0.83
Soil	108-20-3	Diisopropyl Ether (DIPE)	ug/kg	4718	4	0.1%	0.16	220	0.21	0.3	2948	6	0.2%	0.18	1100	0.2	0.97
Soil	64-17-5	Ethanol	ug/kg	4718	637	13.5%	37	87000	50	100000	2948	235	8.0%	40	240000	45	17000
Soil	100-41-4	Ethylbenzene	ug/kg	4718	407	8.6%	0.1	19	0.12	15000	2948	1074	36.4%	0.11	25	0.12	29000
Soil	637-92-3	Ethyl-t-Butyl Ether (ETBE)	ug/kg	4718	0	0.0%	0.14	180	--	--	2948	0	0.0%	0.15	950	--	--
Soil	75-69-4	Freon 11	ug/kg	4718	3	0.1%	0.1	140	0.17	0.47	2948	0	0.0%	0.11	690	--	--
Soil	76-13-1	Freon 113	ug/kg	4718	0	0.0%	0.26	410	--	--	2948	0	0.0%	0.26	2100	--	--
Soil	75-71-8	Freon 12	ug/kg	4718	13	0.3%	0.13	170	0.16	0.66	2948	8	0.3%	0.14	860	0.17	17
Soil	75-09-2	Methylene Chloride	ug/kg	4718	18	0.4%	0.99	4500	2.8	2100	2948	17	0.6%	0.98	23000	1.4	51
Soil	1634-04-4	Methyl-tert-Butyl Ether	ug/kg	4718	24	0.5%	0.067	120	0.11	1.9	2948	31	1.1%	0.085	590	0.11	140
Soil	104-51-8	n-Butylbenzene	ug/kg	4718	115	2.4%	0.11	27	0.13	6200	2948	1016	34.5%	0.11	38	0.12	11000
Soil	95-47-6	o-Xylene	ug/kg	559	5	0.9%	0.088	1.8	0.57	270	322	48	14.9%	0.092	170	0.12	15000
Soil	1330-20.7.1	p/m-Xylene	ug/kg	559	6	1.1%	0.15	2.9	1.4	10000	322	48	14.8%	0.16	290	0.22	34000
Soil	99-87-6	p-Isopropyltoluene	ug/kg	4718	803	17.0%	0.076	77	0.089	6100	2948	1069	36.3%	0.082	98	0.088	7000
Soil	103-65-1	Propylbenzene	ug/kg	4718	68	1.4%	0.14	340	0.58	8800	2948	738	25.0%	0.17	880	0.18	15000
Soil	135-98-8	sec-Butylbenzene	ug/kg	4718	167	3.5%	0.068	71	0.063	4000	2948	1246	42.2%	0.074	300	0.083	8000
Soil	100-42-5	Styrene	ug/kg	4718	4	0.1%	0.14	180	0.21	3.9	2948	4	0.1%	0.15	910	0.23	76
Soil	994-05-8	tert-Amyl-Methyl Ether (TAME)	ug/kg	4718	0	0.0%	0.086	110	--	--	2948	0	0.0%	0.063	580	--	--
Soil	75-65-0	tert-Butyl Alcohol (TBA)	ug/kg	4718	26	0.6%	3.6	13000	4.1	430	2948	35	1.2%	3.8	68000	4.1	200
Soil	98-06-6	tert-Butylbenzene	ug/kg	4718	56	1.2%	0.061	110	0.11	230	2948	649	22.0%	0.068	550	0.096	350
Soil	127-18-4	Tetrachloroethene	ug/kg	4718	74	1.6%	0.11	150	0.15	19000	2948	55	1.9%	0.12	750	0.14	37
Soil	108-88-3	Toluene	ug/kg	4718	2412	51.1%	0.098	130	0.11	4900	2948	903	30.6%	0.11	660	0.11	57000
Soil	156-60-5	trans-1,2-Dichloroethene	ug/kg	4718	0	0.0%	0.17	220	--	--	2948	0	0.0%	0.18	1100	--	--
Soil	10061-02-6	trans-1,3-Dichloropropene	ug/kg	4718	0	0.0%	0.16	1700	--	--	2948	0	0.0%	0.2	8400	--	--
Soil	79-01-6	Trichloroethene	ug/kg	4718	29	0.6%	0.12	160	0.15	140	2948	14	0.5%	0.13	800	0.18	300
Soil	108-05-4	Vinyl Acetate	ug/kg	4718	0	0.0%	3.5	6500	--	--	2948	0	0.0%	3.5	33000	--	--
Soil	75-01-4	Vinyl Chloride	ug/kg	4718	8	0.2%	0.14	190	0.19	0.49	2948	4	0.1%	0.15	950	0.27	49
Soil	1330-20-7	Xylenes, Total	ug/kg	4704	843	17.9%	0.13	83	0.16	52000	2938	1024	34.9%	0.14	170	0.15	140000

Notes:
All data through August 31, 2013
--: Not applicable
ft: foot
"0" ft includes samples collected above ground surface
DL: Sample-specific detection limit
mg/kg: milligram per kilogram; ug/kg: microgram per kilogram

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 5 to <= 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	0 to <= 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Metal																	
Soil	7440-36-0	Antimony	mg/kg	2603	445	17.1%	0.149	0.306	0.191	4.87	10216	1899	18.6%	0.149	0.306	0.151	6.45
Soil	7440-38-2	Arsenic	mg/kg	2603	2597	99.8%	0.398	0.398	0.44	62.9	10216	10160	99.6%	0.259	0.398	0.398	62.9
Soil	7440-39-3	Barium	mg/kg	2603	2603	100.0%	--	--	14.8	460	10216	10216	100.0%	--	--	10.8	1020
Soil	7440-41-7	Beryllium	mg/kg	2603	2587	99.4%	0.0037	0.137	0.0813	1.21	10216	10191	99.8%	0.0037	0.137	0.0813	1.21
Soil	7440-43-9	Cadmium	mg/kg	2603	467	17.9%	0.0064	0.135	0.011	2.89	10216	2731	26.7%	0.0064	0.135	0.007	9.02
Soil	7440-47-3	Chromium	mg/kg	2603	2603	100.0%	--	--	2.11	38.2	10216	10216	100.0%	--	--	2.11	74.2
Soil	CR6	Chromium, Hexavalent	mg/kg	2518	318	12.8%	0.038	0.43	0.04	4.8	9926	1130	11.4%	0.0025	0.43	0.039	4.8
Soil	7440-48-4	Cobalt	mg/kg	2603	2603	100.0%	--	--	1.2	31.3	10216	10216	100.0%	--	--	1.19	31.3
Soil	7440-50-8	Copper	mg/kg	2603	2603	100.0%	--	--	1.22	91.4	10216	10216	100.0%	--	--	1.01	1190
Soil	7439-92-1	Lead	mg/kg	2603	2582	99.2%	0.0527	0.181	0.231	1330	10216	10191	99.8%	0.0527	0.181	0.231	1330
Soil	7439-97-6	Mercury	mg/kg	2603	2514	96.6%	0.0013	0.00568	0.0041	0.279	10216	9812	96.0%	0.0013	0.00568	0.0039	1.33
Soil	7439-98-7	Molybdenum	mg/kg	2603	1437	55.2%	0.0206	0.132	0.0315	8.97	10216	5691	55.7%	0.0208	0.132	0.0266	24.1
Soil	7440-02-0	Nickel	mg/kg	2603	2603	100.0%	--	--	1.81	40.7	10216	10216	100.0%	--	--	1.57	43.1
Soil	7782-49-2	Selenium	mg/kg	2603	142	5.5%	0.175	0.43	0.291	4.14	10216	573	5.6%	0.175	0.43	0.198	6.98
Soil	7440-22-4	Silver	mg/kg	2603	43	1.7%	0.017	0.117	0.128	2.03	10216	121	1.2%	0.017	0.117	0.0362	3.82
Soil	7440-28-0	Thallium	mg/kg	2603	144	5.5%	0.0987	0.232	0.195	3.47	10216	420	4.1%	0.0987	0.232	0.163	3.47
Soil	7440-62-2	Vanadium	mg/kg	2603	2603	100.0%	--	--	4.74	66	10216	10216	100.0%	--	--	4.16	86
Soil	7440-66-6	Zinc	mg/kg	2603	2603	100.0%	--	--	5.57	673	10216	10216	100.0%	--	--	5.57	5770
PCBs																	
Soil	12674-11-2	AROCLOR 1016	ug/kg	18	0	0.0%	10	14	--	--	47	0	0.0%	10	14	--	--
Soil	11104-28-2	AROCLOR 1221	ug/kg	18	0	0.0%	10	13	--	--	47	0	0.0%	10	13	--	--
Soil	11141-16-5	AROCLOR 1232	ug/kg	18	0	0.0%	10	11	--	--	47	0	0.0%	10	11	--	--
Soil	53469-21-9	AROCLOR 1242	ug/kg	18	0	0.0%	10	12	--	--	47	0	0.0%	10	12	--	--
Soil	12672-29-6	AROCLOR 1248	ug/kg	18	0	0.0%	10	14	--	--	47	0	0.0%	10	14	--	--
Soil	11097-69-1	AROCLOR 1254	ug/kg	18	0	0.0%	10	12	--	--	47	0	0.0%	10	12	--	--
Soil	11096-82-5	AROCLOR 1260	ug/kg	18	0	0.0%	11	11	--	--	47	0	0.0%	11	11	--	--
Soil	37324-23-5	AROCLOR 1262	ug/kg	18	0	0.0%	10	12	--	--	47	0	0.0%	10	12	--	--
SVOCs/PAHs																	
Soil	120-82-1	1,2,4-Trichlorobenzene	ug/kg	2628	5	0.2%	0.13	1000	0.24	320	10297	12	0.1%	0.12	81000	0.17	320
Soil	95-50-1	1,2-Dichlorobenzene	ug/kg	2628	1	0.0%	0.091	520	0.55	0.55	10297	16	0.2%	0.084	41000	0.11	330
Soil	541-73-1	1,3-Dichlorobenzene	ug/kg	2628	0	0.0%	0.084	610	--	--	10297	4	0.0%	0.084	41000	0.21	30
Soil	106-46-7	1,4-Dichlorobenzene	ug/kg	2628	2	0.1%	0.11	770	0.29	440	10297	77	0.7%	0.1	81000	0.13	440
Soil	90-12-0	1-Methylnaphthalene	mg/kg	2626	1563	59.5%	0.001	4.3	0.001	140	10290	4515	43.9%	0.001	48	0.001	160
Soil	95-95-4	2,4,5-Trichlorophenol	mg/kg	2627	1	0.0%	0.0116	30	0.075	0.075	10291	1	0.0%	0.0116	150	0.075	0.075
Soil	88-06-2	2,4,6-Trichlorophenol	mg/kg	2627	0	0.0%	0.0116	32	--	--	10291	1	0.0%	0.0116	160	0.14	0.14
Soil	120-83-2	2,4-Dichlorophenol	mg/kg	2627	1	0.0%	0.0116	28	0.078	0.078	10291	2	0.0%	0.0116	140	0.078	0.43
Soil	105-67-9	2,4-Dimethylphenol	mg/kg	2627	0	0.0%	0.0116	24	--	--	10291	0	0.0%	0.0116	120	--	--

Table 4.1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 5 to <= 10 ft							0 to <= 10 ft						
				Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	51-28-5	2,4-Dinitrophenol	mg/kg	2627	0	0.0%	0.045	180	--	--	10291	0	0.0%	0.045	720	--	--
Soil	121-14-2	2,4-Dinitrotoluene	mg/kg	2627	8	0.3%	0.0116	30	0.066	3.1	10291	15	0.1%	0.0116	150	0.061	3.1
Soil	606-20-2	2,6-Dinitrotoluene	mg/kg	2627	0	0.0%	0.008	33	--	--	10291	2	0.0%	0.008	170	0.058	0.18
Soil	91-58-7	2-Chloronaphthalene	mg/kg	2627	1	0.0%	0.0083	20	2.8	2.8	10291	3	0.0%	0.0083	97	0.16	2.8
Soil	95-57-8	2-Chlorophenol	mg/kg	2627	0	0.0%	0.0116	27	--	--	10291	0	0.0%	0.0116	140	--	--
Soil	91-57-6	2-Methylnaphthalene	mg/kg	2627	1913	72.8%	0.0006	2.4	0.0006	280	10291	7571	73.6%	0.0006	47	0.0006	280
Soil	95-48-7	2-Methylphenol	mg/kg	2627	0	0.0%	0.0116	28	--	--	10291	0	0.0%	0.0116	140	--	--
Soil	88-74-4	2-Nitroaniline	mg/kg	2627	1	0.0%	0.046	33	0.18	0.18	10291	1	0.0%	0.046	160	0.18	0.18
Soil	88-75-5	2-Nitrophenol	mg/kg	2627	0	0.0%	0.0116	26	--	--	10291	0	0.0%	0.0116	130	--	--
Soil	91-94-1	3,3'-Dichlorobenzidine	mg/kg	2627	0	0.0%	0.0093	220	--	--	10291	0	0.0%	0.0093	1100	--	--
Soil	106-44-5	3/4-Methylphenol	mg/kg	2626	0	0.0%	0.0116	27	--	--	10290	1	0.0%	0.0116	140	0.073	0.073
Soil	99-09-2	3-Nitroaniline	mg/kg	2627	0	0.0%	0.01	32	--	--	10291	0	0.0%	0.01	160	--	--
Soil	534-52-1	4,6-Dinitro-2-Methylphenol	mg/kg	2627	0	0.0%	0.0463	320	--	--	10291	0	0.0%	0.0463	1600	--	--
Soil	101-55-3	4-Bromophenyl-Phenyl Ether	mg/kg	2627	0	0.0%	0.0067	20	--	--	10291	0	0.0%	0.0067	100	--	--
Soil	59-50-7	4-Chloro-3-Methylphenol	mg/kg	2627	1	0.0%	0.0116	30	0.087	0.087	10291	1	0.0%	0.0116	150	0.087	0.087
Soil	106-47-8	4-Chloroaniline	mg/kg	2627	0	0.0%	0.0116	25	--	--	10291	0	0.0%	0.0116	120	--	--
Soil	7005-72-3	4-Chlorophenyl-Phenyl Ether	mg/kg	2627	0	0.0%	0.0057	21	--	--	10291	0	0.0%	0.0057	100	--	--
Soil	MEPH4	4-Methylphenol (p-Cresol)	mg/kg	183	1	0.6%	0.079	24	0.14	0.14	652	8	1.2%	0.079	47	0.14	0.22
Soil	100-01-6	4-Nitroaniline	mg/kg	2627	0	0.0%	0.0463	28	--	--	10291	0	0.0%	0.0463	140	--	--
Soil	100-02-7	4-Nitrophenol	mg/kg	2627	1	0.0%	0.0067	32	0.1	0.1	10291	1	0.0%	0.0067	160	0.1	0.1
Soil	83-32-9	Acenaphthene	mg/kg	2627	1387	52.8%	0.0009	13	0.0009	11	10291	3353	32.6%	0.0009	49	0.0009	17
Soil	208-96-8	Acenaphthylene	mg/kg	2627	439	16.7%	0.0006	6	0.0006	3	10291	1932	18.8%	0.0006	84	0.0006	4.5
Soil	62-53-3	Aniline	mg/kg	2626	2	0.1%	0.056	23	1.9	4	10290	6	0.1%	0.056	110	0.088	4
Soil	120-12-7	Anthracene	mg/kg	2627	1074	40.9%	0.0004	15	0.00083	8.7	10291	4002	38.9%	0.0004	57	0.00054	26
Soil	103-33-3	Azobenzene	mg/kg	2626	1	0.0%	0.1	21	0.24	0.24	10290	1	0.0%	0.1	110	0.24	0.24
Soil	92-87-5	Benzidine	mg/kg	2627	0	0.0%	0.071	240	--	--	10291	0	0.0%	0.071	930	--	--
Soil	56-55-3	Benzo (a) Anthracene	mg/kg	2627	1632	62.1%	0.00065	3.1	0.0007	35	10291	7589	73.7%	0.00065	95	0.0007	47
Soil	50-32-8	Benzo (a) Pyrene	mg/kg	2627	1454	55.3%	0.00049	2.3	0.0005	15	10291	7266	70.6%	0.00049	43	0.0005	22
Soil	205-99-2	Benzo (b) Fluoranthene	mg/kg	2627	1142	43.5%	0.00035	2.2	0.0005	8	10291	6074	59.0%	0.00035	42	0.0005	16
Soil	191-24-2	Benzo (g,h,i) Perylene	mg/kg	2627	1138	43.4%	0.00047	8.2	0.0007	8.3	10291	6772	65.8%	0.00047	45	0.00052	13
Soil	207-08-9	Benzo (k) Fluoranthene	mg/kg	2627	366	13.9%	0.0007	11	0.00078	2.2	10291	2253	21.9%	0.0007	65	0.00078	4.6
Soil	65-85-0	Benzoic Acid	mg/kg	2627	1	0.0%	0.064	160	1.2	1.2	10291	6	0.1%	0.064	780	0.12	1.5
Soil	100-51-6	Benzyl Alcohol	mg/kg	2627	0	0.0%	0.054	31	--	--	10291	1	0.0%	0.054	150	1.8	1.8
Soil	111-91-1	Bis(2-Chloroethoxy) Methane	mg/kg	2627	0	0.0%	0.0116	25	--	--	10291	0	0.0%	0.0116	120	--	--
Soil	111-44-4	Bis(2-Chloroethyl) Ether	mg/kg	2627	0	0.0%	0.0116	23	--	--	10291	0	0.0%	0.0116	110	--	--
Soil	108-60-1	Bis(2-Chloroisopropyl) Ether	mg/kg	2627	0	0.0%	0.0116	24	--	--	10291	0	0.0%	0.0116	120	--	--
Soil	117-81-7	Bis(2-Ethylhexyl) Phthalate	mg/kg	2627	33	1.3%	0.039	33	0.096	1.4	10291	322	3.1%	0.038	98	0.083	22
Soil	85-68-7	Butyl Benzyl Phthalate	mg/kg	2627	26	1.0%	0.0116	24	0.024	3.1	10291	116	1.1%	0.0116	100	0.023	3.1

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 5 to <= 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	0 to <= 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	218-01-9	Chrysene	mg/kg	2627	1823	69.4%	0.00058	2.2	0.00062	68	10291	6231	60.0%	0.00058	2.2	0.00062	130
Soil	53-70-3	Dibenz (a,h) Anthracene	mg/kg	2627	395	15.0%	0.00052	6.7	0.0007	0.92	10291	2630	25.6%	0.00052	45	0.00053	3.4
Soil	132-64-9	Dibenzofuran	mg/kg	2627	2	0.1%	0.0073	23	0.48	1.2	10291	7	0.1%	0.0073	120	0.13	1.2
Soil	84-66-2	Diethyl Phthalate	mg/kg	2627	125	4.8%	0.0063	31	0.06	0.65	10291	494	4.8%	0.0063	160	0.06	3.1
Soil	131-11-3	Dimethyl Phthalate	mg/kg	2627	167	6.4%	0.008	38	0.054	0.8	10291	741	7.2%	0.008	180	0.052	2.7
Soil	84-74-2	Di-n-Butyl Phthalate	mg/kg	2627	0	0.0%	0.033	25	--	--	10291	8	0.1%	0.033	98	0.13	0.33
Soil	117-84-0	Di-n-Octyl Phthalate	mg/kg	2627	2	0.1%	0.0083	48	0.12	0.32	10291	5	0.0%	0.0083	120	0.12	0.57
Soil	206-44-0	Fluoranthene	mg/kg	2627	1711	65.1%	0.00049	2.2	0.0005	12	10291	7578	73.6%	0.00049	54	0.0005	28
Soil	86-73-7	Fluorene	mg/kg	2627	1588	60.4%	0.00073	3.1	0.00078	20	10291	4121	40.0%	0.00073	53	0.00078	23
Soil	87-68-3	Hexachloro-1,3-Butadiene	ug/kg	2628	0	0.0%	0.6	20000	--	--	10292	0	0.0%	0.6	100000	--	--
Soil	118-74-1	Hexachlorobenzene	mg/kg	2627	0	0.0%	0.008	28	--	--	10291	0	0.0%	0.008	100	--	--
Soil	77-47-4	Hexachlorocyclopentadiene	mg/kg	2627	0	0.0%	0.0116	170	--	--	10291	0	0.0%	0.0116	700	--	--
Soil	67-72-1	Hexachloroethane	mg/kg	2627	1	0.0%	0.0067	22	6.6	6.6	10291	1	0.0%	0.0067	110	6.6	6.6
Soil	193-39-5	Indeno (1,2,3-c,d) Pyrene	mg/kg	2627	562	21.4%	0.00053	8.7	0.00076	1.9	10291	3847	37.4%	0.00053	49	0.00056	3.2
Soil	78-59-1	Isophorone	mg/kg	2627	0	0.0%	0.0083	24	--	--	10291	0	0.0%	0.0083	120	--	--
Soil	1319-77-3	Methyl Phenol	mg/kg	95	0	0.0%	0.013	1.6	--	--	433	0	0.0%	0.013	3.2	--	--
Soil	91-20-3	Naphthalene	ug/kg	2628	1905	72.5%	0.24	360	0.26	92000	10297	6406	62.2%	0.23	740	0.25	92000
Soil	98-95-3	Nitrobenzene	mg/kg	2627	0	0.0%	0.0116	150	--	--	10291	0	0.0%	0.0116	760	--	--
Soil	62-75-9	N-Nitrosodimethylamine	mg/kg	2626	0	0.0%	0.091	23	--	--	10290	0	0.0%	0.091	120	--	--
Soil	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	2627	1	0.0%	0.0067	23	0.14	0.14	10291	1	0.0%	0.0067	120	0.14	0.14
Soil	86-30-6	N-Nitrosodiphenylamine	mg/kg	2627	1	0.0%	0.0073	24	5.5	5.5	10291	4	0.0%	0.0073	120	0.24	5.5
Soil	87-86-5	Pentachlorophenol	mg/kg	2627	0	0.0%	0.0463	260	--	--	10291	0	0.0%	0.0463	1300	--	--
Soil	85-01-8	Phenanthrene	mg/kg	2627	1949	74.2%	0.00051	2	0.00059	95	10291	6319	60.6%	0.00051	56	0.00058	100
Soil	108-95-2	Phenol	mg/kg	2627	0	0.0%	0.0053	28	--	--	10291	2	0.0%	0.0053	140	0.97	1.8
Soil	129-00-0	Pyrene	mg/kg	2627	2094	79.7%	0.00049	2.1	0.00056	240	10291	8886	86.3%	0.00049	2.1	0.0005	240
Soil	110-86-1	Pyridine	mg/kg	2626	0	0.0%	0.082	67	--	--	10290	0	0.0%	0.082	330	--	--
TPH																	
Soil	C19C32ALIPH	Aliphatics (C19 - C32)	mg/kg	537	389	72.4%	5	10	5.1	16000	2020	1635	80.9%	5	10	5	32000
Soil	C5C8ALIPH	Aliphatics (C5 - C8)	mg/kg	537	359	66.9%	0.0091	0.5	0.0092	7000	2019	1107	54.8%	0.0091	0.5	0.0091	7000
Soil	C9C18ALIPH	Aliphatics (C9 - C18)	mg/kg	537	264	49.2%	5	10	5.3	5900	2019	916	45.4%	5	10	5	6300
Soil	C17C32AROM	Aromatics (C17 - C32)	mg/kg	537	351	65.4%	5	10	5	18000	2020	1525	75.5%	5	10	5	36000
Soil	C6C8AROM	Aromatics (C6 - C8)	mg/kg	537	230	42.8%	0.0002	0.02	0.0002	180	2020	497	24.6%	0.0002	0.02	0.0002	310
Soil	C9C18AROM	Aromatics (C9 - C18)	mg/kg	537	283	52.7%	5	10	5	6400	2020	1007	49.9%	5	10	5	41000
Soil	TPHC6C44	Total Petroleum Hydrocarbons (C6-C44)	mg/kg	5	2	40.0%	4.8	4.8	4900	22000	12	9	75.0%	4.8	4.8	350	22000
Soil	68334-30-5	TPH as Diesel	mg/kg	2627	1660	63.2%	4.8	4.8	4.9	54000	10291	7665	74.5%	4.8	4.8	4.9	140000
Soil	PHCG	TPH as Gasoline	mg/kg	2625	1568	59.7%	0.038	0.42	0.048	9800	10291	4791	46.6%	0.0001	12	0.043	9800
Soil	TPHMOIL	TPH as Motor Oil	mg/kg	2627	1723	65.6%	7	7	7	78000	10291	7899	76.8%	7	7	7	320000

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 5 to <= 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	0 to <= 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
VOCs																	
Soil	630-20-6	1,1,1,2-Tetrachloroethane	ug/kg	2624	0	0.0%	0.11	810	--	--	10290	0	0.0%	0.11	1500	--	--
Soil	71-55-6	1,1,1-Trichloroethane	ug/kg	2624	0	0.0%	0.11	460	--	--	10290	1	0.0%	0.11	1100	0.86	0.86
Soil	79-34-5	1,1,2,2-Tetrachloroethane	ug/kg	2624	5	0.2%	0.09	420	0.1	1.6	10290	31	0.3%	0.08	1000	0.1	420
Soil	79-00-5	1,1,2-Trichloroethane	ug/kg	2624	6	0.2%	0.17	440	0.49	59	10290	10	0.1%	0.16	1100	0.23	59
Soil	75-34-3	1,1-Dichloroethane	ug/kg	2624	0	0.0%	0.11	420	--	--	10290	1	0.0%	0.1	700	0.26	0.26
Soil	75-35-4	1,1-Dichloroethene	ug/kg	2624	0	0.0%	0.1	320	--	--	10290	1	0.0%	0.091	820	0.18	0.18
Soil	563-58-6	1,1-Dichloropropene	ug/kg	2624	0	0.0%	0.16	400	--	--	10290	0	0.0%	0.14	980	--	--
Soil	87-61-6	1,2,3-Trichlorobenzene	ug/kg	2624	10	0.4%	0.15	840	0.17	340	10290	27	0.3%	0.13	900	0.17	340
Soil	96-18-4	1,2,3-Trichloropropane	ug/kg	2624	11	0.4%	0.2	1200	0.6	180	10290	24	0.2%	0.2	2900	0.46	180
Soil	95-63-6	1,2,4-Trimethylbenzene	ug/kg	2624	1369	52.2%	0.064	62	0.09	84000	10290	3579	34.8%	0.077	99	0.059	84000
Soil	96-12-8	1,2-Dibromo-3-Chloropropane	ug/kg	2624	0	0.0%	0.5	6700	--	--	10290	1	0.0%	0.5	16000	9.6	9.6
Soil	106-93-4	1,2-Dibromoethane (EDB)	ug/kg	2624	0	0.0%	0.12	820	--	--	10290	2	0.0%	0.12	2000	0.51	950
Soil	107-06-2	1,2-Dichloroethane	ug/kg	2624	2	0.1%	0.12	310	0.21	7.3	10290	7	0.1%	0.11	750	0.2	7.3
Soil	78-87-5	1,2-Dichloropropane	ug/kg	2624	2	0.1%	0.19	490	0.45	90	10290	6	0.1%	0.17	1200	0.31	100
Soil	108-67-8	1,3,5-Trimethylbenzene	ug/kg	2624	898	34.2%	0.072	510	0.078	31000	10290	1701	16.5%	0.065	510	0.078	31000
Soil	142-28-9	1,3-Dichloropropane	ug/kg	2624	0	0.0%	0.12	320	--	--	10290	1	0.0%	0.12	780	0.19	0.19
Soil	594-20-7	2,2-Dichloropropane	ug/kg	2624	0	0.0%	0.16	840	--	--	10290	0	0.0%	0.16	2000	--	--
Soil	78-93-3	2-Butanone (Methyl Ethyl Ketone)	ug/kg	2622	131	5.0%	1.6	17000	2.1	32	10288	815	7.9%	1.5	42000	2.1	2700
Soil	95-49-8	2-Chlorotoluene	ug/kg	2624	1	0.0%	0.083	210	3.6	3.6	10290	6	0.1%	0.076	520	0.15	160
Soil	591-78-6	2-Hexanone	ug/kg	2622	0	0.0%	0.8	10000	--	--	10288	9	0.1%	0.8	25000	2.3	31
Soil	106-43-4	4-Chlorotoluene	ug/kg	2624	1	0.0%	0.075	200	0.27	0.27	10290	1	0.0%	0.066	480	0.27	0.27
Soil	108-10-1	4-Methyl-2-Pentanone	ug/kg	2622	3	0.1%	0.8	4000	1.7	2.8	10288	26	0.3%	0.8	9000	1.4	15
Soil	67-64-1	Acetone	ug/kg	2622	1482	56.5%	4.6	12000	4.6	1600	10288	7936	77.1%	4.6	28000	4.6	1600
Soil	71-43-2	Benzene	ug/kg	2624	1334	50.8%	0.086	240	0.1	33000	10290	5405	52.5%	0.095	600	0.1	33000
Soil	108-86-1	Bromobenzene	ug/kg	2624	1	0.0%	0.1	380	1.6	1.6	10290	3	0.0%	0.1	930	0.41	1.6
Soil	74-97-5	Bromochloromethane	ug/kg	2622	0	0.0%	0.33	2500	--	--	10288	0	0.0%	0.33	6100	--	--
Soil	75-27-4	Bromodichloromethane	ug/kg	2624	6	0.2%	0.09	270	0.14	1300	10290	31	0.3%	0.08	650	0.12	1300
Soil	75-25-2	Bromoform	ug/kg	2624	2	0.1%	0.3	1200	0.76	2.3	10290	9	0.1%	0.3	2900	0.65	140
Soil	74-83-9	Bromomethane	ug/kg	2624	79	3.0%	0.6	8700	0.73	1300	10290	281	2.7%	0.5	8700	0.69	1300
Soil	75-15-0	Carbon Disulfide	ug/kg	2622	1245	47.6%	0.13	320	0.13	120	10288	5537	53.8%	0.13	780	0.13	120
Soil	56-23-5	Carbon Tetrachloride	ug/kg	2624	0	0.0%	0.13	580	--	--	10290	1	0.0%	0.13	1400	0.3	0.3
Soil	108-90-7	Chlorobenzene	ug/kg	2624	20	0.8%	0.11	270	0.12	29	10290	141	1.4%	0.098	660	0.12	150
Soil	75-00-3	Chloroethane	ug/kg	2624	3	0.1%	0.3	1400	0.32	0.89	10290	13	0.1%	0.27	1800	0.32	1.8
Soil	67-66-3	Chloroform	ug/kg	2624	121	4.6%	0.11	320	0.13	60	10290	787	7.6%	0.11	780	0.13	110
Soil	74-87-3	Chloromethane	ug/kg	2624	25	1.0%	0.23	5300	0.28	310	10290	74	0.7%	0.22	13000	0.25	520
Soil	156-59-2	cis-1,2-Dichloroethene	ug/kg	2624	7	0.3%	0.13	520	0.23	440	10290	15	0.1%	0.13	1300	0.23	440
Soil	10061-01-5	cis-1,3-Dichloropropene	ug/kg	2624	0	0.0%	0.12	330	--	--	10290	0	0.0%	0.12	810	--	--

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 6 to <= 10 ft							0 to <= 10 ft						
				Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value	Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	98-82-8	Cumene (Isopropylbenzene)	ug/kg	2624	1284	48.8%	0.036	500	0.096	16000	10290	2657	25.8%	0.078	500	0.092	16000
Soil	124-48-1	Dibromochloromethane	ug/kg	2624	5	0.2%	0.09	630	0.1	6.2	10290	28	0.3%	0.08	880	0.1	6.8
Soil	74-95-3	Dibromomethane	ug/kg	2624	1	0.0%	0.2	1300	50	50	10290	3	0.0%	0.2	3100	0.41	50
Soil	108-20-3	Diisopropyl Ether (DIPE)	ug/kg	2624	4	0.2%	0.18	450	0.23	1.4	10290	14	0.1%	0.16	1100	0.2	1.4
Soil	64-17-5	Ethanol	ug/kg	2622	167	6.4%	40	180000	47	21000	10288	1038	10.1%	37	240000	45	100000
Soil	100-41-4	Ethylbenzene	ug/kg	2624	1351	51.5%	0.11	48	0.12	42000	10290	2832	27.5%	0.1	48	0.12	42000
Soil	637-92-3	Ethyl-t-Butyl Ether (ETBE)	ug/kg	2624	0	0.0%	0.15	470	--	--	10280	0	0.0%	0.14	950	--	--
Soil	75-69-4	Freon 11	ug/kg	2624	0	0.0%	0.11	350	--	--	10290	3	0.0%	0.1	690	0.17	0.47
Soil	76-13-1	Freon 113	ug/kg	2622	0	0.0%	0.17	660	--	--	10288	0	0.0%	0.17	2100	--	--
Soil	75-71-8	Freon 12	ug/kg	2624	6	0.2%	0.14	410	0.16	17	10290	27	0.3%	0.13	860	0.16	17
Soil	75-09-2	Methylene Chloride	ug/kg	2624	12	0.5%	0.64	9500	2.2	23	10290	47	0.5%	0.64	23000	1.4	2100
Soil	1634-04-4	Methyl-tert-Butyl Ether	ug/kg	2624	18	0.7%	0.095	270	0.16	1.9	10290	73	0.7%	0.087	590	0.11	140
Soil	104-51-8	n-Butylbenzene	ug/kg	2624	1241	47.3%	0.12	19	0.15	13000	10290	2372	23.1%	0.11	38	0.12	13000
Soil	95-47-6	o-Xylene	ug/kg	281	49	17.4%	0.092	410	0.67	11000	1162	102	8.8%	0.088	410	0.12	15000
Soil	1330-20-7-1	p/m-Xylene	ug/kg	281	66	23.5%	0.16	260	0.34	18000	1162	120	10.3%	0.15	290	0.22	34000
Soil	99-87-6	p-Isopropyltoluene	ug/kg	2624	1265	48.2%	0.084	580	0.092	12000	10290	3137	30.5%	0.076	580	0.088	12000
Soil	103-65-1	Propylbenzene	ug/kg	2624	1048	39.9%	0.17	410	0.3	24000	10290	1854	18.0%	0.14	880	0.18	24000
Soil	135-98-8	sec-Butylbenzene	ug/kg	2624	1337	51.0%	0.075	530	0.079	9600	10290	2749	26.7%	0.068	530	0.079	9800
Soil	100-42-5	Styrene	ug/kg	2624	9	0.3%	0.15	560	0.25	36	10290	17	0.2%	0.14	910	0.21	78
Soil	994-05-8	tert-Amyl-Methyl Ether (TAME)	ug/kg	2624	0	0.0%	0.093	320	--	--	10290	0	0.0%	0.086	580	--	--
Soil	75-65-0	tert-Butyl Alcohol (TBA)	ug/kg	2624	62	2.4%	2.5	28000	4.2	120	10290	123	1.2%	2.5	66000	4.1	430
Soil	98-06-6	tert-Butylbenzene	ug/kg	2624	763	29.1%	0.072	230	0.097	420	10290	1466	14.3%	0.072	550	0.096	420
Soil	127-18-4	Tetrachloroethene	ug/kg	2624	36	1.4%	0.1	310	0.14	28	10290	165	1.6%	0.1	750	0.14	19000
Soil	108-88-3	Toluene	ug/kg	2624	1003	38.2%	0.11	470	0.11	50000	10290	4316	42.0%	0.098	680	0.11	57000
Soil	156-60-5	trans-1,2-Dichloroethene	ug/kg	2624	4	0.2%	0.18	470	0.53	1500	10290	4	0.0%	0.17	1100	0.53	1500
Soil	10061-02-6	trans-1,3-Dichloropropene	ug/kg	2622	0	0.0%	0.2	3500	--	--	10288	0	0.0%	0.16	8400	--	--
Soil	79-01-6	Trichloroethene	ug/kg	2624	8	0.3%	0.13	330	0.17	720	10290	51	0.5%	0.12	800	0.15	720
Soil	108-05-4	Vinyl Acetate	ug/kg	2622	1	0.0%	2.3	14000	9200	9200	10288	1	0.0%	2.3	33000	9200	9200
Soil	75-01-4	Vinyl Chloride	ug/kg	2624	3	0.1%	0.15	460	0.18	0.34	10290	15	0.1%	0.14	950	0.18	49
Soil	1330-20-7	Xylenes, Total	ug/kg	2615	1225	46.8%	0.15	200	0.16	140000	10257	3092	30.1%	0.13	200	0.15	140000

Notes:
All data through August 31, 2013
--: Not applicable
ft: foot
"0" ft includes samples collected above ground surface
DL: Sample-specific detection limit
mg/kg: milligram per kilogram; ug/kg: microgram per kilogram

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Metal										
Soil	7440-36-0	Antimony	mg/kg	204	28	13.7%	0.149	0.308	0.312	5.77
Soil	7440-38-2	Arsenic	mg/kg	204	186	91.2%	0.13	0.388	0.423	53.2
Soil	7440-39-3	Barium	mg/kg	204	204	100.0%	--	--	8.27	221
Soil	7440-41-7	Beryllium	mg/kg	204	128	62.7%	0.0037	0.137	0.0847	0.982
Soil	7440-43-9	Cadmium	mg/kg	204	40	18.6%	0.0099	0.135	0.158	1.24
Soil	7440-47-3	Chromium	mg/kg	204	204	100.0%	--	--	2.53	29.3
Soil	CR6	Chromium, Hexavalent	mg/kg	36	6	16.8%	0.036	0.22	0.062	0.33
Soil	7440-48-4	Cobalt	mg/kg	204	204	100.0%	--	--	1.46	18.3
Soil	7440-50-8	Copper	mg/kg	204	204	100.0%	--	--	0.859	50.5
Soil	7439-92-1	Lead	mg/kg	204	201	98.5%	0.0527	0.0527	0.536	15.6
Soil	7439-97-6	Mercury	mg/kg	204	105	51.5%	0.0013	0.00588	0.0049	0.124
Soil	7439-98-7	Molybdenum	mg/kg	204	31	15.2%	0.0206	0.132	0.0805	2.01
Soil	7440-02-0	Nickel	mg/kg	204	204	100.0%	--	--	1.71	29.9
Soil	7782-49-2	Selenium	mg/kg	204	2	1.0%	0.175	0.351	0.585	0.906
Soil	7440-22-4	Silver	mg/kg	204	6	2.9%	0.0209	0.117	0.12	0.841
Soil	7440-28-0	Thallium	mg/kg	204	13	6.4%	0.0987	0.232	0.249	8.21
Soil	7440-62-2	Vanadium	mg/kg	204	204	100.0%	--	--	4.08	81.9
Soil	7440-66-6	Zinc	mg/kg	204	204	100.0%	--	--	6.5	175
PCBs										
Soil	12674-11-2	AROCLOR 1016	ug/kg	96	0	0.0%	10	10	--	--
Soil	11104-28-2	AROCLOR 1221	ug/kg	96	0	0.0%	10	10	--	--
Soil	11141-16-5	AROCLOR 1232	ug/kg	96	0	0.0%	10	10	--	--
Soil	53469-21-9	AROCLOR 1242	ug/kg	96	0	0.0%	10	10	--	--
Soil	12672-29-6	AROCLOR 1248	ug/kg	96	0	0.0%	10	10	--	--
Soil	11097-69-1	AROCLOR 1254	ug/kg	96	0	0.0%	10	10	--	--
Soil	11096-82-5	AROCLOR 1260	ug/kg	96	0	0.0%	11	11	--	--
Soil	37324-23-5	AROCLOR 1262	ug/kg	96	0	0.0%	10	10	--	--
SVOCs/PAHs										
Soil	120-82-1	1,2,4-Trichlorobenzene	ug/kg	249	1	0.4%	0.15	580	80	80
Soil	95-50-1	1,2-Dichlorobenzene	ug/kg	249	0	0.0%	0.1	430	--	--
Soil	541-73-1	1,3-Dichlorobenzene	ug/kg	249	0	0.0%	0.13	360	--	--
Soil	106-46-7	1,4-Dichlorobenzene	ug/kg	249	0	0.0%	0.12	420	--	--
Soil	90-12-0	1-Methylnaphthalene	mg/kg	249	119	47.8%	0.001	0.095	0.0011	68
Soil	95-95-4	2,4,5-Trichlorophenol	mg/kg	249	0	0.0%	0.013	3.3	--	--
Soil	88-06-2	2,4,6-Trichlorophenol	mg/kg	249	0	0.0%	0.013	3.2	--	--
Soil	120-83-2	2,4-Dichlorophenol	mg/kg	249	0	0.0%	0.013	3.2	--	--
Soil	105-67-9	2,4-Dimethylphenol	mg/kg	249	0	0.0%	0.013	4.2	--	--

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 10 ft						
				Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	51-28-5	2,4-Dinitrophenol	mg/kg	249	0	0.0%	0.05	49	--	--
Soil	121-14-2	2,4-Dinitrotoluene	mg/kg	249	0	0.0%	0.013	3	--	--
Soil	606-20-2	2,6-Dinitrotoluene	mg/kg	249	0	0.0%	0.013	3.3	--	--
Soil	91-58-7	2-Chloronaphthalene	mg/kg	249	0	0.0%	0.013	4.9	--	--
Soil	95-57-8	2-Chlorophenol	mg/kg	249	0	0.0%	0.013	5.2	--	--
Soil	91-57-6	2-Methylnaphthalene	mg/kg	249	122	49.0%	0.0006	0.1	0.0012	100
Soil	95-48-7	2-Methylphenol	mg/kg	249	0	0.0%	0.013	3.4	--	--
Soil	88-74-4	2-Nitroaniline	mg/kg	249	0	0.0%	0.047	3.3	--	--
Soil	88-75-5	2-Nitrophenol	mg/kg	249	0	0.0%	0.013	3.2	--	--
Soil	91-94-1	3,3'-Dichlorobenzidine	mg/kg	249	0	0.0%	0.013	55	--	--
Soil	106-44-5	3/4-Methylphenol	mg/kg	249	0	0.0%	0.058	2.9	--	--
Soil	99-09-2	3-Nitroaniline	mg/kg	249	0	0.0%	0.05	3.2	--	--
Soil	534-52-1	4,6-Dinitro-2-Methylphenol	mg/kg	249	0	0.0%	0.05	50	--	--
Soil	101-55-3	4-Bromophenyl-Phenyl Ether	mg/kg	249	0	0.0%	0.013	4.7	--	--
Soil	59-50-7	4-Chloro-3-Methylphenol	mg/kg	249	0	0.0%	0.013	3	--	--
Soil	106-47-8	4-Chloroaniline	mg/kg	249	0	0.0%	0.013	3.1	--	--
Soil	7005-72-3	4-Chlorophenyl-Phenyl Ether	mg/kg	249	0	0.0%	0.013	5	--	--
Soil	MEPH4	4-Methylphenol (p-Cresol)	mg/kg							
Soil	100-01-6	4-Nitroaniline	mg/kg	249	0	0.0%	0.05	2.8	--	--
Soil	100-02-7	4-Nitrophenol	mg/kg	249	0	0.0%	0.05	3.2	--	--
Soil	83-32-9	Acenaphthene	mg/kg	249	54	21.7%	0.0009	12	0.0017	7.7
Soil	208-96-8	Acenaphthylene	mg/kg	249	9	3.6%	0.0006	4.1	0.0007	0.92
Soil	62-53-3	Aniline	mg/kg	249	0	0.0%	0.056	2.8	--	--
Soil	120-12-7	Anthracene	mg/kg	249	21	8.4%	0.0004	5	0.00072	5
Soil	103-33-3	Azobenzene	mg/kg	249	0	0.0%	0.1	5.2	--	--
Soil	92-87-5	Benzidine	mg/kg	249	0	0.0%	0.93	60	--	--
Soil	56-55-3	Benzo (a) Anthracene	mg/kg	240	28	11.2%	0.0007	5.5	0.0007	1.3
Soil	50-32-8	Benzo (a) Pyrene	mg/kg	240	26	10.4%	0.0005	5.8	0.0005	0.78
Soil	205-99-2	Benzo (b) Fluoranthene	mg/kg	249	15	6.0%	0.0004	5.4	0.0006	0.4
Soil	191-24-2	Benzo (g,h,i) Perylene	mg/kg	249	13	5.2%	0.00047	12	0.0011	0.4
Soil	207-08-9	Benzo (k) Fluoranthene	mg/kg	249	2	0.8%	0.0007	8.5	0.0012	0.34
Soil	65-85-0	Benzoic Acid	mg/kg	249	0	0.0%	0.56	28	--	--
Soil	100-51-6	Benzyl Alcohol	mg/kg	249	0	0.0%	0.054	3.1	--	--
Soil	111-91-1	Bis(2-Chloroethoxy) Methane	mg/kg	249	0	0.0%	0.013	4.1	--	--
Soil	111-44-4	Bis(2-Chloroethyl) Ether	mg/kg	249	0	0.0%	0.013	5.2	--	--
Soil	108-60-1	Bis(2-Chloroisopropyl) Ether	mg/kg	249	0	0.0%	0.013	4.6	--	--
Soil	117-81-7	Bis(2-Ethylhexyl) Phthalate	mg/kg	249	1	0.4%	0.098	8.2	1.8	1.8
Soil	85-68-7	Butyl Benzyl Phthalate	mg/kg	249	1	0.4%	0.013	6	0.17	0.17

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 10 ft						
				Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	218-01-9	Chrysene	mg/kg	249	40	16.1%	0.00058	5.6	0.00094	5.1
Soil	53-70-3	Dibenz (a,h) Anthracene	mg/kg	249	4	1.6%	0.00052	10	0.00052	0.36
Soil	132-64-9	Dibenzofuran	mg/kg	248	1	0.4%	0.013	4.8	0.097	0.087
Soil	84-66-2	Diethyl Phthalate	mg/kg	249	0	0.0%	0.013	3.1	--	--
Soil	131-11-3	Dimethyl Phthalate	mg/kg	249	17	6.8%	0.013	3.6	0.2	0.46
Soil	84-74-2	Di-n-Butyl Phthalate	mg/kg	249	0	0.0%	0.05	8.2	--	--
Soil	117-84-0	Di-n-Octyl Phthalate	mg/kg	249	0	0.0%	0.013	12	--	--
Soil	206-44-0	Fluoranthene	mg/kg	249	40	16.1%	0.00049	5.5	0.0006	1
Soil	86-73-7	Fluorene	mg/kg	249	79	31.7%	0.00073	4.4	0.0011	7.8
Soil	87-68-3	Hexachloro-1,3-Butadiene	ug/kg	249	0	0.0%	0.7	4400	--	--
Soil	118-74-1	Hexachlorobenzene	mg/kg	249	0	0.0%	0.013	6.9	--	--
Soil	77-47-4	Hexachlorocyclopentadiene	mg/kg	249	0	0.0%	0.013	42	--	--
Soil	67-72-1	Hexachloroethane	mg/kg	249	0	0.0%	0.013	4.8	--	--
Soil	193-39-5	Indeno (1,2,3-c,d) Pyrene	mg/kg	249	9	3.6%	0.00053	12	0.00074	0.38
Soil	78-59-1	Isophorone	mg/kg	249	0	0.0%	0.013	2.7	--	--
Soil	1319-77-3	Methyl Phenol	mg/kg	1	0	0.0%	0.013	0.013	--	--
Soil	91-20-3	Naphthalene	ug/kg	249	141	56.6%	0.28	110	0.4	51000
Soil	98-95-3	Nitrobenzene	mg/kg	249	0	0.0%	0.013	15	--	--
Soil	62-75-9	N-Nitrosodimethylamine	mg/kg	249	0	0.0%	0.091	4.5	--	--
Soil	621-64-7	N-Nitroso-di-n-propylamine	mg/kg	249	0	0.0%	0.013	4.1	--	--
Soil	86-30-6	N-Nitrosodiphenylamine	mg/kg	249	0	0.0%	0.013	3.7	--	--
Soil	87-86-5	Pentachlorophenol	mg/kg	249	0	0.0%	0.05	44	--	--
Soil	85-01-8	Phenanthrene	mg/kg	249	103	41.4%	0.00051	0.98	0.00076	20
Soil	108-95-2	Phenol	mg/kg	249	0	0.0%	0.013	4	--	--
Soil	129-00-0	Pyrene	mg/kg	249	50	20.1%	0.00049	5.2	0.0009	13
Soil	110-86-1	Pyridine	mg/kg	248	0	0.0%	0.082	6.7	--	--
TPH										
Soil	C19C32ALIPH	Aliphatics (C19 - C32)	mg/kg	6	6	100.0%	--	--	11	1900
Soil	C5C8ALIPH	Aliphatics (C5 - C8)	mg/kg	6	5	83.3%	0.5	0.5	19	1100
Soil	C9C18ALIPH	Aliphatics (C9 - C18)	mg/kg	6	5	83.3%	10	10	180	2100
Soil	C17C32AROM	Aromatics (C17 - C32)	mg/kg	6	6	100.0%	--	--	10	2400
Soil	C6C8AROM	Aromatics (C6 - C8)	mg/kg	6	4	66.7%	0.005	0.005	0.97	130
Soil	C9C16AROM	Aromatics (C9 - C16)	mg/kg	6	6	100.0%	--	--	10	2000
Soil	TPHC6C44	Total Petroleum Hydrocarbons (C6-C44)	mg/kg	65	20	30.8%	4.8	4.8	6.5	22000
Soil	68334-30-5	TPH as Diesel	mg/kg	249	118	47.4%	4.8	4.8	6	43000
Soil	PHCG	TPH as Gasoline	mg/kg	249	137	55.0%	0.044	0.078	0.057	8800
Soil	TPHMOIL	TPH as Motor Oil	mg/kg	248	110	44.2%	7	7	9.8	38000

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 10 ft Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
VOCs										
Soil	630-20-6	1,1,1,2-Tetrachloroethane	ug/kg	249	0	0.0%	0.19	1500	--	--
Soil	71-55-6	1,1,1-Trichloroethane	ug/kg	249	0	0.0%	0.18	1100	--	--
Soil	79-34-5	1,1,2,2-Tetrachloroethane	ug/kg	249	1	0.4%	0.1	1000	16000	16000
Soil	79-00-5	1,1,2-Trichloroethane	ug/kg	249	0	0.0%	0.19	1600	--	--
Soil	75-34-3	1,1-Dichloroethane	ug/kg	249	0	0.0%	0.13	1900	--	--
Soil	75-35-4	1,1-Dichloroethene	ug/kg	249	0	0.0%	0.11	880	--	--
Soil	563-58-6	1,1-Dichloropropene	ug/kg	249	0	0.0%	0.18	980	--	--
Soil	87-61-6	1,2,3-Trichlorobenzene	ug/kg	249	1	0.4%	0.16	1700	230	230
Soil	96-18-4	1,2,3-Trichloropropane	ug/kg	249	7	2.8%	0.3	2900	1.1	4700
Soil	95-63-6	1,2,4-Trimethylbenzene	ug/kg	249	118	47.4%	0.093	56	0.11	65000
Soil	96-12-8	1,2-Dibromo-3-Chloropropane	ug/kg	249	0	0.0%	0.6	16000	--	--
Soil	106-93-4	1,2-Dibromoethane (EDB)	ug/kg	249	0	0.0%	0.21	2000	--	--
Soil	107-06-2	1,2-Dichloroethane	ug/kg	249	0	0.0%	0.14	760	--	--
Soil	78-87-5	1,2-Dichloropropane	ug/kg	249	0	0.0%	0.21	1200	--	--
Soil	108-67-8	1,3,5-Trimethylbenzene	ug/kg	249	99	39.8%	0.079	230	0.18	37000
Soil	142-28-9	1,3-Dichloropropane	ug/kg	249	0	0.0%	0.14	790	--	--
Soil	594-20-7	2,2-Dichloropropane	ug/kg	249	0	0.0%	0.27	2000	--	--
Soil	78-93-3	2-Butanone (Methyl Ethyl Ketone)	ug/kg	249	3	1.2%	2	43000	5.8	8.4
Soil	95-49-8	2-Chlorotoluene	ug/kg	249	0	0.0%	0.093	520	--	--
Soil	591-78-6	2-Hexanone	ug/kg	249	0	0.0%	1	25000	--	--
Soil	106-43-4	4-Chlorotoluene	ug/kg	249	0	0.0%	0.084	470	--	--
Soil	108-10-1	4-Methyl-2-Pentanone	ug/kg	249	0	0.0%	1	9100	--	--
Soil	67-64-1	Acetone	ug/kg	249	50	20.1%	4.8	29000	5.7	11000
Soil	71-43-2	Benzene	ug/kg	249	105	42.2%	0.11	290	0.13	34000
Soil	108-86-1	Bromobenzene	ug/kg	249	0	0.0%	0.17	940	--	--
Soil	74-97-5	Bromochloromethane	ug/kg	249	0	0.0%	0.56	6200	--	--
Soil	75-27-4	Bromodichloromethane	ug/kg	249	0	0.0%	0.1	680	--	--
Soil	75-25-2	Bromoform	ug/kg	249	0	0.0%	0.4	3000	--	--
Soil	74-83-9	Bromomethane	ug/kg	249	4	1.6%	0.7	16000	740	990
Soil	75-15-0	Carbon Disulfide	ug/kg	249	37	14.9%	0.15	780	0.16	140
Soil	56-23-5	Carbon Tetrachloride	ug/kg	249	0	0.0%	0.23	1400	--	--
Soil	108-90-7	Chlorobenzene	ug/kg	249	0	0.0%	0.12	870	--	--
Soil	75-00-3	Chloroethane	ug/kg	249	0	0.0%	0.33	3600	--	--
Soil	67-66-3	Chloroform	ug/kg	249	1	0.4%	0.14	770	0.38	0.38
Soil	74-87-3	Chloromethane	ug/kg	249	2	0.8%	0.4	13000	0.31	0.34
Soil	156-59-2	cis-1,2-Dichloroethene	ug/kg	249	6	2.4%	0.23	1300	0.41	5.5
Soil	10061-01-5	cis-1,3-Dichloropropene	ug/kg	249	0	0.0%	0.15	820	--	--

Table 4-1
Statistical Summary of Soil Matrix Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Analyte	Unit	> 10 ft						
				Number of Samples	Number of Detects	Percent Detected	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil	98-82-8	Cumene (Isopropylbenzene)	ug/kg	249	111	44.6%	0.095	50	0.24	12000
Soil	124-48-1	Dibromochloromethane	ug/kg	249	0	0.0%	0.1	1100	--	--
Soil	74-95-3	Dibromomethane	ug/kg	249	0	0.0%	0.3	3100	--	--
Soil	108-20-3	Diisopropyl Ether (DIPE)	ug/kg	249	0	0.0%	0.2	1100	--	--
Soil	64-17-5	Ethanol	ug/kg	249	3	1.2%	46	250000	13000	17000
Soil	100-41-4	Ethylbenzene	ug/kg	249	120	48.2%	0.12	35	0.17	36000
Soil	637-92-3	Ethyl-t-Butyl Ether (ETBE)	ug/kg	249	0	0.0%	0.17	960	--	--
Soil	75-69-4	Freon 11	ug/kg	249	0	0.0%	0.13	710	--	--
Soil	76-13-1	Freon 113	ug/kg	249	0	0.0%	0.29	2100	--	--
Soil	75-71-8	Freon 12	ug/kg	249	0	0.0%	0.15	870	--	--
Soil	75-09-2	Methylene Chloride	ug/kg	249	0	0.0%	1.1	23000	--	--
Soil	1634-04-4	Methyl-tert-Butyl Ether	ug/kg	249	0	0.0%	0.11	590	--	--
Soil	104-51-8	n-Butylbenzene	ug/kg	249	118	47.4%	0.13	13	0.18	13000
Soil	95-47-6	o-Xylene	ug/kg	1	1	100.0%	--	--	260	260
Soil	1330-20-7-1	p/m-Xylene	ug/kg	1	1	100.0%	--	--	1200	1200
Soil	99-87-6	p-Isopropyltoluene	ug/kg	249	105	42.2%	0.092	58	0.13	10000
Soil	103-65-1	Propylbenzene	ug/kg	249	102	41.0%	0.17	2100	1.1	20000
Soil	135-98-8	sec-Butylbenzene	ug/kg	249	110	44.2%	0.083	230	0.13	7700
Soil	100-42-5	Styrene	ug/kg	249	0	0.0%	0.18	1100	--	--
Soil	994-05-8	tert-Amyl-Methyl Ether (TAME)	ug/kg	249	0	0.0%	0.1	670	--	--
Soil	75-65-0	tert-Butyl Alcohol (TBA)	ug/kg	249	4	1.6%	4.2	68000	5.6	48
Soil	98-06-6	tert-Butylbenzene	ug/kg	249	57	22.9%	0.099	550	0.62	440
Soil	127-18-4	Tetrachloroethene	ug/kg	249	0	0.0%	0.14	760	--	--
Soil	108-88-3	Toluene	ug/kg	249	77	30.9%	0.12	980	0.15	83000
Soil	156-60-5	trans-1,2-Dichloroethene	ug/kg	249	1	0.4%	0.2	1100	4.5	4.5
Soil	10061-02-6	trans-1,3-Dichloropropene	ug/kg	249	0	0.0%	0.21	8500	--	--
Soil	79-01-6	Trichloroethene	ug/kg	249	0	0.0%	0.15	810	--	--
Soil	108-05-4	Vinyl Acetate	ug/kg	249	0	0.0%	3.9	33000	--	--
Soil	75-01-4	Vinyl Chloride	ug/kg	249	0	0.0%	0.17	960	--	--
Soil	1330-20-7	Xylenes, Total	ug/kg	249	121	48.6%	0.16	98	0.26	260000

Notes:
All data through August 31, 2013
--: Not applicable
ft: foot
"0" ft includes samples collected above ground surface
DL: Sample-specific detection limit
mg/kg: milligram per kilogram; ug/kg: microgram per kilogram

Table 4-2
Statistical Summary of Soil Vapor Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil Vapor, Sub-Slab	71-55-6	1,1,1-Trichloroethane	2075	34	1.6%	ug/m3	0.21	260	1.8	100
Soil Vapor, Sub-Slab	79-34-5	1,1,2,2-Tetrachloroethane	2075	0	0.0%	ug/m3	0.12	210	--	--
Soil Vapor, Sub-Slab	79-00-5	1,1,2-Trichloroethane	2075	0	0.0%	ug/m3	0.23	460	--	--
Soil Vapor, Sub-Slab	75-34-3	1,1-Dichloroethane	2075	0	0.0%	ug/m3	0.23	230	--	--
Soil Vapor, Sub-Slab	75-35-4	1,1-Dichloroethene	2075	1	0.0%	ug/m3	0.37	370	18	18
Soil Vapor, Sub-Slab	120-82-1	1,2,4-Trichlorobenzene	2075	1	0.0%	ug/m3	0.59	1100	1300	1300
Soil Vapor, Sub-Slab	95-63-6	1,2,4-Trimethylbenzene	2075	64	3.1%	ug/m3	0.12	280	2.7	2200
Soil Vapor, Sub-Slab	106-93-4	1,2-Dibromoethane (EDB)	2075	0	0.0%	ug/m3	0.19	500	--	--
Soil Vapor, Sub-Slab	95-50-1	1,2-Dichlorobenzene	2075	8	0.4%	ug/m3	0.17	460	5.4	780
Soil Vapor, Sub-Slab	107-06-2	1,2-Dichloroethane	2075	4	0.2%	ug/m3	0.22	210	4.5	47
Soil Vapor, Sub-Slab	78-87-5	1,2-Dichloropropane	2075	5	0.2%	ug/m3	0.38	260	5.2	22
Soil Vapor, Sub-Slab	108-67-8	1,3,5-Trimethylbenzene	2075	21	1.0%	ug/m3	0.14	550	5.3	1000
Soil Vapor, Sub-Slab	106-99-0	1,3-Butadiene	2075	1	0.0%	ug/m3	0.15	360	2.2	2.2
Soil Vapor, Sub-Slab	541-73-1	1,3-Dichlorobenzene	2075	1	0.0%	ug/m3	0.085	300	36	36
Soil Vapor, Sub-Slab	106-46-7	1,4-Dichlorobenzene	2075	8	0.4%	ug/m3	0.18	160	2	110
Soil Vapor, Sub-Slab	123-91-1	1,4-Dioxane	2075	31	1.5%	ug/m3	0.25	2400	1.6	200
Soil Vapor, Sub-Slab	540-84-1	2,2,4-Trimethylpentane	2075	37	1.8%	ug/m3	0.19	87	2	140000
Soil Vapor, Sub-Slab	78-93-3	2-Butanone (Methyl Ethyl Ketone)	2075	439	21.2%	ug/m3	0.5	790	2.7	210
Soil Vapor, Sub-Slab	591-78-6	2-Hexanone	2075	22	1.1%	ug/m3	0.37	680	0.68	360
Soil Vapor, Sub-Slab	107-05-1	3-Chloropropene	2075	0	0.0%	ug/m3	0.32	990	--	--
Soil Vapor, Sub-Slab	622-96-8	4-Ethyltoluene	2075	40	1.9%	ug/m3	0.14	370	5.4	1300
Soil Vapor, Sub-Slab	108-10-1	4-Methyl-2-Pentanone	2075	4	0.2%	ug/m3	0.09	270	3.8	14
Soil Vapor, Sub-Slab	67-64-1	Acetone	2075	1224	59.0%	ug/m3	1	410	8.2	1300
Soil Vapor, Sub-Slab	BZLCL	alpha-Chlorotoluene	2075	0	0.0%	ug/m3	0.14	360	--	--
Soil Vapor, Sub-Slab	71-43-2	Benzene	2075	189	9.1%	ug/m3	0.2	72	0.53	62000
Soil Vapor, Sub-Slab	75-27-4	Bromodichloromethane	2075	32	1.5%	ug/m3	0.2	470	0.92	370
Soil Vapor, Sub-Slab	75-25-2	Bromoform	2075	2	0.1%	ug/m3	0.11	950	2.2	3.1
Soil Vapor, Sub-Slab	74-83-9	Bromomethane	2032	33	1.6%	ug/m3	0.28	860	4.5	95
Soil Vapor, Sub-Slab	C10C12ALIPH	C10-C12 Aliphatics	2069	48	2.3%	ug/m3	94	48000	110	59000
Soil Vapor, Sub-Slab	C10C12AROM	C10-C12 Aromatics	2069	16	0.8%	ug/m3	74	38000	140	3400
Soil Vapor, Sub-Slab	C5C6ALIPH	C5-C6 Aliphatics	2069	40	1.9%	ug/m3	44	1400	58	380000

Table 4-2
Statistical Summary of Soil Vapor Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil Vapor, Sub-Slab	C6C8ALIPH	C6-C8 Aliphatics	2069	57	2.8%	ug/m3	55	1800	100	1600000
Soil Vapor, Sub-Slab	C8C10ALIPH	C8-C10 Aliphatics	2069	53	2.6%	ug/m3	78	2600	120	210000
Soil Vapor, Sub-Slab	C8C10AROM	C8-C10 Aromatics	2069	23	1.1%	ug/m3	66	34000	120	19000
Soil Vapor, Sub-Slab	75-15-0	Carbon Disulfide	2075	122	5.9%	ug/m3	0.22	600	0.69	230
Soil Vapor, Sub-Slab	56-23-5	Carbon Tetrachloride	2075	7	0.3%	ug/m3	0.39	610	2.2	99
Soil Vapor, Sub-Slab	108-90-7	Chlorobenzene	2075	2	0.1%	ug/m3	0.18	280	2.4	48
Soil Vapor, Sub-Slab	75-00-3	Chloroethane	2075	3	0.1%	ug/m3	0.29	680	3.8	66
Soil Vapor, Sub-Slab	67-66-3	Chloroform	2075	339	16.3%	ug/m3	0.27	880	1.5	8400
Soil Vapor, Sub-Slab	74-87-3	Chloromethane	2075	16	0.8%	ug/m3	0.29	1300	9.7	200
Soil Vapor, Sub-Slab	156-59-2	cis-1,2-Dichloroethene	2075	9	0.4%	ug/m3	0.28	600	4.2	130
Soil Vapor, Sub-Slab	10061-01-5	cis-1,3-Dichloropropene	2075	0	0.0%	ug/m3	0.29	320	--	--
Soil Vapor, Sub-Slab	98-82-8	Cumene (Isopropylbenzene)	2075	47	2.3%	ug/m3	0.3	240	0.75	100
Soil Vapor, Sub-Slab	110-82-7	Cyclohexane	2075	42	2.0%	ug/m3	0.24	120	2.5	14000
Soil Vapor, Sub-Slab	124-48-1	Dibromochloromethane	2075	8	0.4%	ug/m3	0.15	580	0.75	110
Soil Vapor, Sub-Slab	74-84-0	Ethane	19	0	0.0%	MOL %	0.00003	0.00004	--	--
Soil Vapor, Sub-Slab	64-17-5	Ethanol	2075	467	22.5%	ug/m3	0.26	800	3	1600
Soil Vapor, Sub-Slab	C2H4	Ethene	19	0	0.0%	MOL %	0.00002	0.00002	--	--
Soil Vapor, Sub-Slab	100-41-4	Ethylbenzene	2075	47	2.3%	ug/m3	0.21	120	4.2	5300
Soil Vapor, Sub-Slab	75-69-4	Freon 11	2075	40	1.9%	ug/m3	0.16	300	1.1	72
Soil Vapor, Sub-Slab	76-13-1	Freon 113	2075	23	1.1%	ug/m3	0.3	530	1.7	150
Soil Vapor, Sub-Slab	76-14-2	Freon 114	2075	1	0.0%	ug/m3	0.29	550	27	27
Soil Vapor, Sub-Slab	75-71-8	Freon 12	2075	174	8.4%	ug/m3	0.14	240	1.8	120
Soil Vapor, Sub-Slab	142-82-5	Heptane	2075	63	3.0%	ug/m3	0.35	110	2.3	3500
Soil Vapor, Sub-Slab	87-68-3	Hexachloro-1,3-Butadiene	2075	0	0.0%	ug/m3	0.46	1300	--	--
Soil Vapor, Sub-Slab	110-54-3	Hexane	2075	91	4.4%	ug/m3	0.22	100	1.7	7500
Soil Vapor, Sub-Slab	67-63-0	Isopropanol	2075	114	5.5%	ug/m3	0.51	740	0.95	17000
Soil Vapor, Sub-Slab	74-82-8	Methane*	2072	143	6.9%	MOL %	0.00001	0.15	0.00016	23
Soil Vapor, Sub-Slab	75-09-2	Methylene Chloride	2075	39	1.9%	ug/m3	0.27	190	1.8	28000
Soil Vapor, Sub-Slab	1634-04-4	Methyl-tert-Butyl Ether	2075	6	0.3%	ug/m3	0.17	200	10	440
Soil Vapor, Sub-Slab	91-20-3	Naphthalene	2075	1105	53.3%	ug/m3	0.27	620	0.3	260
Soil Vapor, Sub-Slab	95-47-6	o-Xylene	2075	36	1.7%	ug/m3	0.11	340	4.6	190

Table 4-2
Statistical Summary of Soil Vapor Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil Vapor, Sub-Slab	1330-20-7-1	p/m-Xylene	2075	78	3.8%	ug/m3	0.22	130	3.7	5200
Soil Vapor, Sub-Slab	103-65-1	Propylbenzene	2075	15	0.7%	ug/m3	0.13	230	4.5	280
Soil Vapor, Sub-Slab	100-42-5	Styrene	2075	2	0.1%	ug/m3	0.15	220	5.8	20
Soil Vapor, Sub-Slab	127-18-4	Tetrachloroethene	2075	184	8.9%	ug/m3	0.33	300	1.8	950
Soil Vapor, Sub-Slab	109-99-9	Tetrahydrofuran	2075	35	1.7%	ug/m3	0.22	240	2.2	77
Soil Vapor, Sub-Slab	108-88-3	Toluene	2075	188	9.1%	ug/m3	0.17	70	1.6	1800
Soil Vapor, Sub-Slab	156-60-5	trans-1,2-Dichloroethene	2075	2	0.1%	ug/m3	0.32	520	6.2	12
Soil Vapor, Sub-Slab	10061-02-6	trans-1,3-Dichloropropene	2075	2	0.1%	ug/m3	0.13	170	7.4	8.4
Soil Vapor, Sub-Slab	79-01-6	Trichloroethene	2075	28	1.3%	ug/m3	0.26	430	2.1	720
Soil Vapor, Sub-Slab	75-01-4	Vinyl Chloride	2075	1	0.0%	ug/m3	0.17	380	27	27
Soil Vapor, Non-Sub-Slab	71-55-6	1,1,1-Trichloroethane	164	1	0.6%	ug/m3	0.3	9800	6.2	6.2
Soil Vapor, Non-Sub-Slab	79-34-5	1,1,2,2-Tetrachloroethane	164	1	0.6%	ug/m3	0.64	13000	9000	9000
Soil Vapor, Non-Sub-Slab	79-00-5	1,1,2-Trichloroethane	164	1	0.6%	ug/m3	0.38	12000	7.1	7.1
Soil Vapor, Non-Sub-Slab	75-34-3	1,1-Dichloroethane	164	1	0.6%	ug/m3	0.26	7500	200	200
Soil Vapor, Non-Sub-Slab	75-35-4	1,1-Dichloroethene	164	1	0.6%	ug/m3	0.57	7900	1.8	1.8
Soil Vapor, Non-Sub-Slab	75-37-6	1,1-Difluoroethane	74	2	2.7%	ug/m3	2.3	27000	13	15
Soil Vapor, Non-Sub-Slab	120-82-1	1,2,4-Trichlorobenzene	164	0	0.0%	ug/m3	1.7	97000	--	--
Soil Vapor, Non-Sub-Slab	95-63-6	1,2,4-Trimethylbenzene	164	89	54.3%	ug/m3	0.46	6800	3.2	990000
Soil Vapor, Non-Sub-Slab	106-93-4	1,2-Dibromoethane (EDB)	164	0	0.0%	ug/m3	0.6	15000	--	--
Soil Vapor, Non-Sub-Slab	95-50-1	1,2-Dichlorobenzene	164	0	0.0%	ug/m3	0.55	12000	--	--
Soil Vapor, Non-Sub-Slab	107-06-2	1,2-Dichloroethane	164	6	3.7%	ug/m3	0.39	6900	1.7	1700
Soil Vapor, Non-Sub-Slab	78-87-5	1,2-Dichloropropane	164	0	0.0%	ug/m3	0.44	9500	--	--
Soil Vapor, Non-Sub-Slab	108-67-8	1,3,5-Trimethylbenzene	164	57	34.8%	ug/m3	0.44	3500	3.7	450000
Soil Vapor, Non-Sub-Slab	106-99-0	1,3-Butadiene	91	0	0.0%	ug/m3	0.26	1000	--	--
Soil Vapor, Non-Sub-Slab	541-73-1	1,3-Dichlorobenzene	164	0	0.0%	ug/m3	0.52	14000	--	--
Soil Vapor, Non-Sub-Slab	106-46-7	1,4-Dichlorobenzene	164	1	0.6%	ug/m3	0.48	15000	170	170
Soil Vapor, Non-Sub-Slab	123-91-1	1,4-Dioxane	91	0	0.0%	ug/m3	0.87	1500	--	--
Soil Vapor, Non-Sub-Slab	540-84-1	2,2,4-Trimethylpentane	91	2	2.2%	ug/m3	0.28	560	8	14
Soil Vapor, Non-Sub-Slab	78-93-3	2-Butanone (Methyl Ethyl Ketone)	164	77	47.0%	ug/m3	0.6	1600	3.2	160000
Soil Vapor, Non-Sub-Slab	591-78-6	2-Hexanone	164	10	6.1%	ug/m3	0.55	38000	3.6	16000
Soil Vapor, Non-Sub-Slab	107-05-1	3-Chloropropene	91	0	0.0%	ug/m3	0.58	3200	--	--

Table 4-2
Statistical Summary of Soil Vapor Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil Vapor, Non-Sub-Slab	622-96-8	4-Ethyltoluene	164	76	46.3%	ug/m3	0.41	3800	1.9	440000
Soil Vapor, Non-Sub-Slab	108-10-1	4-Methyl-2-Pentanone	164	9	5.5%	ug/m3	0.095	11000	3.6	16
Soil Vapor, Non-Sub-Slab	67-64-1	Acetone	164	79	48.2%	ug/m3	0.9	3000	18	240000
Soil Vapor, Non-Sub-Slab	BZLCL	alpha-Chlorotoluene	164	0	0.0%	ug/m3	0.24	37000	--	--
Soil Vapor, Non-Sub-Slab	71-43-2	Benzene	164	136	82.9%	ug/m3	0.29	53	3.4	3800000
Soil Vapor, Non-Sub-Slab	75-27-4	Bromodichloromethane	164	4	2.4%	ug/m3	0.46	12000	2.3	12000
Soil Vapor, Non-Sub-Slab	75-25-2	Bromoform	164	0	0.0%	ug/m3	1.2	29000	--	--
Soil Vapor, Non-Sub-Slab	74-83-9	Bromomethane	164	1	0.6%	ug/m3	0.6	6500	1.4	1.4
Soil Vapor, Non-Sub-Slab	C10C12ALIPH	C10-C12 Aliphatics	7	1	14.3%	ug/m3	160	210	360000	360000
Soil Vapor, Non-Sub-Slab	C10C12AROM	C10-C12 Aromatics	7	0	0.0%	ug/m3	120	8600	--	--
Soil Vapor, Non-Sub-Slab	C5C6ALIPH	C5-C6 Aliphatics	7	2	28.6%	ug/m3	75	78	110	550000
Soil Vapor, Non-Sub-Slab	C6C8ALIPH	C6-C8 Aliphatics	7	2	28.6%	ug/m3	95	99	1000	3500000
Soil Vapor, Non-Sub-Slab	C8C10ALIPH	C8-C10 Aliphatics	7	2	28.6%	ug/m3	130	140	400	2200000
Soil Vapor, Non-Sub-Slab	C8C10AROM	C8-C10 Aromatics	7	1	14.3%	ug/m3	110	150	88000	88000
Soil Vapor, Non-Sub-Slab	75-15-0	Carbon Disulfide	164	89	54.3%	ug/m3	0.5	1200	1.4	170000
Soil Vapor, Non-Sub-Slab	56-23-5	Carbon Tetrachloride	164	0	0.0%	ug/m3	0.46	11000	--	--
Soil Vapor, Non-Sub-Slab	108-90-7	Chlorobenzene	164	1	0.6%	ug/m3	0.18	9000	5.9	5.9
Soil Vapor, Non-Sub-Slab	75-00-3	Chloroethane	164	1	0.6%	ug/m3	0.6	7400	6.7	6.7
Soil Vapor, Non-Sub-Slab	67-66-3	Chloroform	164	12	7.3%	ug/m3	0.39	8000	3.6	370
Soil Vapor, Non-Sub-Slab	74-87-3	Chloromethane	164	12	7.3%	ug/m3	0.3	3700	1	98
Soil Vapor, Non-Sub-Slab	156-59-2	cis-1,2-Dichloroethene	164	6	3.7%	ug/m3	0.52	9500	2.7	690
Soil Vapor, Non-Sub-Slab	10061-01-5	cis-1,3-Dichloropropene	164	0	0.0%	ug/m3	0.52	11000	--	--
Soil Vapor, Non-Sub-Slab	98-82-8	Cumene (Isopropylbenzene)	91	57	62.6%	ug/m3	0.35	200	6.2	31000
Soil Vapor, Non-Sub-Slab	110-82-7	Cyclohexane	91	51	56.0%	ug/m3	0.3	220	3.9	2700000
Soil Vapor, Non-Sub-Slab	124-48-1	Dibromochloromethane	164	0	0.0%	ug/m3	0.84	17000	--	--
Soil Vapor, Non-Sub-Slab	108-20-3	Diisopropyl Ether (DIPE)	73	0	0.0%	ug/m3	0.9	10000	--	--
Soil Vapor, Non-Sub-Slab	64-17-5	Ethanol	164	53	32.3%	ug/m3	0.44	2500	1.4	54000
Soil Vapor, Non-Sub-Slab	100-41-4	Ethylbenzene	164	134	81.7%	ug/m3	0.48	160	3.2	1800000
Soil Vapor, Non-Sub-Slab	637-92-3	Ethyl-t-Butyl Ether (ETBE)	73	0	0.0%	ug/m3	2.1	25000	--	--
Soil Vapor, Non-Sub-Slab	75-69-4	Freon 11	164	3	1.8%	ug/m3	0.26	7900	2.5	19
Soil Vapor, Non-Sub-Slab	76-13-1	Freon 113	164	2	1.2%	ug/m3	0.67	14000	54	200

Table 4-2
Statistical Summary of Soil Vapor Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Soil Vapor, Non-Sub-Slab	76-14-2	Freon 114	164	0	0.0%	ug/m3	0.89	14000	--	--
Soil Vapor, Non-Sub-Slab	75-71-8	Freon 12	164	9	5.5%	ug/m3	0.23	13000	2.3	210
Soil Vapor, Non-Sub-Slab	142-82-5	Heptane	91	23	25.3%	ug/m3	0.35	1300	16	1000000
Soil Vapor, Non-Sub-Slab	87-68-3	Hexachloro-1,3-Butadiene	164	3	1.8%	ug/m3	2.2	35000	730	2000
Soil Vapor, Non-Sub-Slab	110-54-3	Hexane	91	30	33.0%	ug/m3	0.28	850	3.1	1900000
Soil Vapor, Non-Sub-Slab	67-63-0	Isopropanol	164	48	29.3%	ug/m3	0.83	960	9.8	450000
Soil Vapor, Non-Sub-Slab	74-82-8	Methane*	89	67	75.3%	MOL %	0.00001	0.00005	0.0011	74
Soil Vapor, Non-Sub-Slab	75-09-2	Methylene Chloride	164	31	18.9%	ug/m3	0.28	12000	2.3	7300
Soil Vapor, Non-Sub-Slab	1634-04-4	Methyl-tert-Butyl Ether	164	16	9.8%	ug/m3	0.23	7800	1.2	2800
Soil Vapor, Non-Sub-Slab	91-20-3	Naphthalene	163	68	41.7%	ug/m3	0.34	200000	0.5	5200
Soil Vapor, Non-Sub-Slab	95-47-6	o-Xylene	91	14	15.4%	ug/m3	0.19	1300	5	21000
Soil Vapor, Non-Sub-Slab	1330-20-7-1	p/m-Xylene	91	35	38.5%	ug/m3	0.38	820	4.4	170000
Soil Vapor, Non-Sub-Slab	103-65-1	Propylbenzene	91	54	59.3%	ug/m3	0.3	180	9.5	37000
Soil Vapor, Non-Sub-Slab	100-42-5	Styrene	164	24	14.6%	ug/m3	0.35	14000	2.1	5900
Soil Vapor, Non-Sub-Slab	994-05-8	tert-Amyl-Methyl Ether (TAME)	73	0	0.0%	ug/m3	1.2	14000	--	--
Soil Vapor, Non-Sub-Slab	75-65-0	tert-Butyl Alcohol (TBA)	73	6	8.2%	ug/m3	1.2	14000	5.4	140
Soil Vapor, Non-Sub-Slab	127-18-4	Tetrachloroethene	164	31	18.9%	ug/m3	0.42	14000	3.7	5300
Soil Vapor, Non-Sub-Slab	109-99-9	Tetrahydrofuran	91	6	6.6%	ug/m3	0.43	780	3.5	12
Soil Vapor, Non-Sub-Slab	108-88-3	Toluene	164	98	59.8%	ug/m3	0.25	710	4.8	3700000
Soil Vapor, Non-Sub-Slab	156-60-5	trans-1,2-Dichloroethene	164	5	3.0%	ug/m3	0.55	13000	4.8	5600
Soil Vapor, Non-Sub-Slab	10061-02-6	trans-1,3-Dichloropropene	164	1	0.6%	ug/m3	0.42	8400	6.5	6.5
Soil Vapor, Non-Sub-Slab	79-01-6	Trichloroethene	164	7	4.3%	ug/m3	0.5	10000	2	6600
Soil Vapor, Non-Sub-Slab	108-05-4	Vinyl Acetate	73	3	4.1%	ug/m3	2.5	29000	2.6	5.1
Soil Vapor, Non-Sub-Slab	75-01-4	Vinyl Chloride	164	0	0.0%	ug/m3	0.33	4700	--	--

Notes:
All data through August 31, 2013
" -- " not available
ug/m^3: microgram per cubic meter
mol %: mole percent
* : May include methane from natural gas or sewer leaks

Table 4-3
Statistical Summary of Indoor Air Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Air, Indoor	71-55-6	1,1,1-Trichloroethane	787	79	10.0%	ug/m3	0.11	0.38	0.21	7.8
Air, Indoor	79-34-5	1,1,2,2-Tetrachloroethane	787	46	5.8%	ug/m3	0.0021	0.11	0.0062	0.38
Air, Indoor	79-00-5	1,1,2-Trichloroethane	787	31	3.9%	ug/m3	0.0032	0.11	0.0057	0.38
Air, Indoor	75-34-3	1,1-Dichloroethane	787	0	0.0%	ug/m3	0.12	0.4	--	--
Air, Indoor	75-35-4	1,1-Dichloroethene	787	0	0.0%	ug/m3	0.14	0.55	--	--
Air, Indoor	95-63-6	1,2,4-Trimethylbenzene	787	747	94.9%	ug/m3	0.24	0.38	0.25	17
Air, Indoor	95-50-1	1,2-Dichlorobenzene	787	7	0.9%	ug/m3	0.14	0.45	0.28	2.5
Air, Indoor	107-06-2	1,2-Dichloroethane	787	787	100.0%	ug/m3	--	--	0.062	28
Air, Indoor	108-67-8	1,3,5-Trimethylbenzene	787	314	39.9%	ug/m3	0.17	0.4	0.19	5.4
Air, Indoor	541-73-1	1,3-Dichlorobenzene	787	1	0.1%	ug/m3	0.11	0.42	0.42	0.42
Air, Indoor	106-46-7	1,4-Dichlorobenzene	787	786	99.9%	ug/m3	0.024	0.024	0.025	670
Air, Indoor	123-91-1	1,4-Dioxane	2	0	0.0%	ug/m3	0.26	0.27	--	--
Air, Indoor	78-93-3	2-Butanone (Methyl Ethyl Ketone)	787	780	99.1%	ug/m3	0.24	0.43	0.61	28
Air, Indoor	591-78-6	2-Hexanone	787	343	43.6%	ug/m3	0.15	0.53	0.26	3
Air, Indoor	622-96-8	4-Ethyltoluene	787	286	36.3%	ug/m3	0.18	0.4	0.22	3.3
Air, Indoor	108-10-1	4-Methyl-2-Pentanone	787	577	73.3%	ug/m3	0.14	0.43	0.16	5.8
Air, Indoor	67-64-1	Acetone	787	787	100.0%	ug/m3	--	--	5	820
Air, Indoor	71-43-2	Benzene	787	787	100.0%	ug/m3	--	--	0.23	6.8
Air, Indoor	75-27-4	Bromodichloromethane	787	528	67.1%	ug/m3	0.0034	0.077	0.066	2.9
Air, Indoor	74-83-9	Bromomethane	787	52	6.6%	ug/m3	0.14	0.46	0.2	2.2
Air, Indoor	124-38-9	Carbon Dioxide	787	0	0.0%	MOL %	0.1	0.27	--	--
Air, Indoor	75-15-0	Carbon Disulfide	787	274	34.8%	ug/m3	0.18	0.44	0.19	12
Air, Indoor	56-23-5	Carbon Tetrachloride	785	785	100.0%	ug/m3	--	--	0.28	0.91
Air, Indoor	75-00-3	Chloroethane	787	4	0.5%	ug/m3	0.13	0.47	0.93	1.3
Air, Indoor	67-66-3	Chloroform	787	787	100.0%	ug/m3	--	--	0.12	13
Air, Indoor	74-87-3	Chloromethane	787	780	99.1%	ug/m3	0.2	0.35	0.27	1.5
Air, Indoor	156-59-2	cis-1,2-Dichloroethene	787	0	0.0%	ug/m3	0.14	0.44	--	--
Air, Indoor	98-82-8	Cumene (Isopropylbenzene)	787	19	2.4%	ug/m3	0.15	0.38	0.21	0.72
Air, Indoor	110-82-7	Cyclohexane	787	453	57.6%	ug/m3	0.38	0.73	0.36	8.3
Air, Indoor	64-17-5	Ethanol	787	787	100.0%	ug/m3	--	--	2.9	4600
Air, Indoor	100-41-4	Ethylbenzene	787	787	100.0%	ug/m3	--	--	0.19	13

Table 4-3
Statistical Summary of Indoor Air Data
Former Kast Property
Carson, CA

Matrix	CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL	Maximum DL	Minimum Detected Value	Maximum Detected Value
Air, Indoor	75-69-4	Freon 11	787	787	100.0%	ug/m3	--	--	0.76	60
Air, Indoor	76-13-1	Freon 113	787	780	99.1%	ug/m3	0.25	0.54	0.35	2.5
Air, Indoor	75-71-8	Freon 12	787	787	100.0%	ug/m3	--	--	1.4	53
Air, Indoor	142-82-5	Heptane	785	738	94.0%	ug/m3	0.25	0.43	0.22	23
Air, Indoor	87-68-3	Hexachloro-1,3-Butadiene	787	2	0.3%	ug/m3	0.19	0.53	0.47	0.51
Air, Indoor	110-54-3	Hexane	787	775	98.5%	ug/m3	0.26	0.33	0.27	12
Air, Indoor	67-63-0	Isopropanol	787	776	98.6%	ug/m3	0.49	0.85	0.57	880
Air, Indoor	74-82-8	Methane	787	0	0.0%	MOL %	0.1	0.27	--	--
Air, Indoor	75-09-2	Methylene Chloride	787	787	100.0%	ug/m3	--	--	0.21	67
Air, Indoor	1634-04-4	Methyl-tert-Butyl Ether	787	27	3.4%	ug/m3	0.14	0.43	0.32	7
Air, Indoor	91-20-3	Naphthalene	787	782	99.4%	ug/m3	0.033	0.34	0.055	7.2
Air, Indoor	OXYARGON	Oxygen/Argon	787	787	100.0%	MOL %	--	--	20.1	22.4
Air, Indoor	95-47-6	o-Xylene	787	765	97.2%	ug/m3	0.25	0.4	0.23	13
Air, Indoor	1330-20-7-1	p/m-Xylene	787	782	99.4%	ug/m3	0.46	0.59	0.54	48
Air, Indoor	103-65-1	Propylbenzene	787	184	23.4%	ug/m3	0.15	0.46	0.19	4
Air, Indoor	100-42-5	Styrene	787	750	95.3%	ug/m3	0.22	0.38	0.23	10
Air, Indoor	127-18-4	Tetrachloroethene	787	787	100.0%	ug/m3	--	--	0.03	45
Air, Indoor	109-99-9	Tetrahydrofuran	787	208	26.4%	ug/m3	0.24	0.7	0.28	11
Air, Indoor	108-88-3	Toluene	787	787	100.0%	ug/m3	--	--	0.65	91
Air, Indoor	156-60-5	trans-1,2-Dichloroethene	787	6	0.8%	ug/m3	0.13	0.48	0.4	0.93
Air, Indoor	79-01-6	Trichloroethene	785	53	6.8%	ug/m3	0.13	0.38	0.24	10
Air, Indoor	75-01-4	Vinyl Chloride	2	1	50.0%	ug/m3	0.0036	0.0036	0.0036	0.0036

Notes:
All data through August 31, 2013
" -- " not available
ug/m^3: microgram per cubic meter; mol %: mole percent

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
Water Table									
Metals									
7429-90-5	Aluminum	11	11	100.0%	MG/L	--	--	0.00825	6.42
7440-36-0	Antimony	30	4	13.3%	MG/L	0.0021	0.00787	0.0095	0.0193
15584-04-0	Arsenate	11	11	100.0%	UG/L	--	--	0.16	16.9
7440-38-2	Arsenic	41	31	75.6%	MG/L	0.0031	0.0061	0.00039	0.9
15502-74-6	Arsenite	11	11	100.0%	UG/L	--	--	0.097	264
7440-39-3	Barium	30	30	100.0%	MG/L	--	--	0.048	0.839
7440-41-7	Beryllium	30	0	0.0%	MG/L	0.0002	0.0044	--	--
7440-43-9	Cadmium	30	0	0.0%	MG/L	0.0004	0.00454	--	--
7440-70-2	Calcium	30	30	100.0%	MG/L	--	--	82.1	482
7440-47-3	Chromium	41	6	14.6%	MG/L	0.0004	0.0044	0.00057	0.0126
7440-48-4	Cobalt	30	0	0.0%	MG/L	0.0007	0.00441	--	--
7440-50-8	Copper	47	14	29.8%	MG/L	0.0013	0.00392	0.00153	0.0181
7439-89-6	Iron	30	30	100.0%	MG/L	--	--	0.0643	67
7439-92-1	Lead	30	2	6.7%	MG/L	0.0024	0.00693	0.00473	0.0105
7439-95-4	Magnesium	30	30	100.0%	MG/L	--	--	22.7	139
7439-96-5	Manganese	30	29	96.7%	MG/L	0.0045	0.0045	0.00248	2.55
7439-97-6	Mercury	30	3	10.0%	MG/L	0.00003	0.0001	0.00004	0.0001
7439-98-7	Molybdenum	30	10	33.3%	MG/L	0.0008	0.0043	0.00379	0.0293
7440-02-0	Nickel	30	1	3.3%	MG/L	0.0014	0.00433	0.00396	0.00396
7440-09-7	Potassium	30	30	100.0%	MG/L	--	--	4.69	12.7
7782-49-2	Selenium	30	5	16.7%	MG/L	0.003	0.0107	0.00823	0.0242
7440-22-4	Silver	30	2	6.7%	MG/L	0.0004	0.00211	0.00144	0.00228
7440-23-5	Sodium	30	30	100.0%	MG/L	--	--	68.1	502
7440-28-0	Thallium	30	3	10.0%	MG/L	0.0023	0.0054	0.00376	0.00424
7440-62-2	Vanadium	30	0	0.0%	MG/L	0.0003	0.0045	--	--
7440-66-6	Zinc	36	11	30.6%	MG/L	0.0008	0.0067	0.00576	0.123
PCBs									
12674-11-2	AROCLOR 1016	5	0	0.0%	UG/L	0.15	0.15	--	--
11104-28-2	AROCLOR 1221	5	0	0.0%	UG/L	0.1	0.1	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
11141-16-5	AROCLOR 1232	5	0	0.0%	UG/L	0.1	0.1	--	--
53469-21-9	AROCLOR 1242	5	0	0.0%	UG/L	0.1	0.1	--	--
12672-29-6	AROCLOR 1248	5	0	0.0%	UG/L	0.1	0.1	--	--
11097-69-1	AROCLOR 1254	5	0	0.0%	UG/L	0.1	0.1	--	--
11096-82-5	AROCLOR 1260	5	0	0.0%	UG/L	0.25	0.25	--	--
37324-23-5	AROCLOR 1262	5	0	0.0%	UG/L	0.1	0.1	--	--
SVOCs/PAHs									
120-82-1	1,2,4-Trichlorobenzene	156	0	0.0%	UG/L	0.49	2.5	--	--
95-50-1	1,2-Dichlorobenzene	156	4	2.6%	UG/L	0.27	2.3	2	4.6
541-73-1	1,3-Dichlorobenzene	156	0	0.0%	UG/L	0.28	2	--	--
106-46-7	1,4-Dichlorobenzene	156	4	2.6%	UG/L	0.21	2.2	4.7	11
90-12-0	1-Methylnaphthalene	18	7	38.9%	UG/L	0.036	1.4	0.071	1.4
95-95-4	2,4,5-Trichlorophenol	18	0	0.0%	UG/L	0.97	0.97	--	--
88-06-2	2,4,6-Trichlorophenol	18	0	0.0%	UG/L	1.2	1.2	--	--
120-83-2	2,4-Dichlorophenol	18	0	0.0%	UG/L	1.1	1.1	--	--
105-67-9	2,4-Dimethylphenol	18	2	11.1%	UG/L	1.2	1.2	7.2	11
51-28-5	2,4-Dinitrophenol	18	0	0.0%	UG/L	2.6	2.6	--	--
121-14-2	2,4-Dinitrotoluene	18	0	0.0%	UG/L	1	1	--	--
606-20-2	2,6-Dinitrotoluene	18	0	0.0%	UG/L	1.1	1.1	--	--
91-58-7	2-Chloronaphthalene	18	0	0.0%	UG/L	1.3	1.3	--	--
95-57-8	2-Chlorophenol	18	0	0.0%	UG/L	1	1	--	--
91-57-6	2-Methylnaphthalene	18	7	38.9%	UG/L	0.035	1.2	0.078	0.48
95-48-7	2-Methylphenol	18	0	0.0%	UG/L	1.1	1.1	--	--
88-74-4	2-Nitroaniline	18	0	0.0%	UG/L	1	1	--	--
88-75-5	2-Nitrophenol	18	0	0.0%	UG/L	1.2	1.2	--	--
91-94-1	3,3'-Dichlorobenzidine	18	0	0.0%	UG/L	1.3	1.3	--	--
106-44-5	3/4-Methylphenol	18	0	0.0%	UG/L	1	1	--	--
99-09-2	3-Nitroaniline	18	0	0.0%	UG/L	1.2	1.2	--	--
534-52-1	4,6-Dinitro-2-Methylphenol	18	0	0.0%	UG/L	3.4	3.4	--	--
101-55-3	4-Bromophenyl-Phenyl Ether	18	0	0.0%	UG/L	1.2	1.2	--	--
59-50-7	4-Chloro-3-Methylphenol	18	0	0.0%	UG/L	1.2	1.2	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
106-47-8	4-Chloroaniline	18	0	0.0%	UG/L	1.3	1.3	--	--
7005-72-3	4-Chlorophenyl-Phenyl Ether	18	0	0.0%	UG/L	1.2	1.2	--	--
100-01-6	4-Nitroaniline	18	0	0.0%	UG/L	2.4	2.4	--	--
100-02-7	4-Nitrophenol	18	0	0.0%	UG/L	0.86	0.86	--	--
83-32-9	Acenaphthene	18	1	5.6%	UG/L	0.037	1.4	0.14	0.14
208-96-8	Acenaphthylene	18	2	11.1%	UG/L	0.033	1.4	0.063	0.085
62-53-3	Aniline	18	0	0.0%	UG/L	1.2	1.2	--	--
120-12-7	Anthracene	18	0	0.0%	UG/L	0.036	1.5	--	--
103-33-3	Azobenzene	18	0	0.0%	UG/L	1.7	1.7	--	--
92-87-5	Benzidine	18	0	0.0%	UG/L	0.62	0.62	--	--
56-55-3	Benzo (a) Anthracene	18	0	0.0%	UG/L	0.043	1.1	--	--
50-32-8	Benzo (a) Pyrene	18	0	0.0%	UG/L	0.035	0.88	--	--
205-99-2	Benzo (b) Fluoranthene	18	0	0.0%	UG/L	0.036	1.2	--	--
191-24-2	Benzo (g,h,i) Perylene	18	0	0.0%	UG/L	0.037	0.71	--	--
207-08-9	Benzo (k) Fluoranthene	18	0	0.0%	UG/L	0.05	1.7	--	--
65-85-0	Benzoic Acid	18	0	0.0%	UG/L	0.43	0.43	--	--
100-51-6	Benzyl Alcohol	18	0	0.0%	UG/L	1	1	--	--
111-91-1	Bis(2-Chloroethoxy) Methane	18	0	0.0%	UG/L	1.2	1.2	--	--
111-44-4	Bis(2-Chloroethyl) Ether	18	0	0.0%	UG/L	1	1	--	--
108-60-1	Bis(2-Chloroisopropyl) Ether	18	0	0.0%	UG/L	1.5	1.5	--	--
117-81-7	Bis(2-Ethylhexyl) Phthalate	18	0	0.0%	UG/L	1	1	--	--
85-68-7	Butyl Benzyl Phthalate	18	0	0.0%	UG/L	1	1	--	--
218-01-9	Chrysene	18	0	0.0%	UG/L	0.041	1.3	--	--
53-70-3	Dibenz (a,h) Anthracene	18	0	0.0%	UG/L	0.039	0.82	--	--
132-64-9	Dibenzofuran	18	0	0.0%	UG/L	1.4	1.4	--	--
84-66-2	Diethyl Phthalate	18	0	0.0%	UG/L	1.4	1.4	--	--
131-11-3	Dimethyl Phthalate	18	0	0.0%	UG/L	1.3	1.3	--	--
84-74-2	Di-n-Butyl Phthalate	18	0	0.0%	UG/L	1.5	1.5	--	--
117-84-0	Di-n-Octyl Phthalate	18	0	0.0%	UG/L	1	1	--	--
206-44-0	Fluoranthene	18	0	0.0%	UG/L	0.038	1.5	--	--
86-73-7	Fluorene	18	1	5.6%	UG/L	0.035	1.4	0.18	0.18

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
87-68-3	Hexachloro-1,3-Butadiene	18	0	0.0%	UG/L	1.2	1.2	--	--
118-74-1	Hexachlorobenzene	18	0	0.0%	UG/L	1.2	1.2	--	--
77-47-4	Hexachlorocyclopentadiene	18	0	0.0%	UG/L	0.44	0.44	--	--
67-72-1	Hexachloroethane	18	0	0.0%	UG/L	0.98	0.98	--	--
193-39-5	Indeno (1,2,3-c,d) Pyrene	18	0	0.0%	UG/L	0.036	0.83	--	--
78-59-1	Isophorone	18	0	0.0%	UG/L	1.2	1.2	--	--
91-20-3	Naphthalene	156	40	25.6%	UG/L	0.037	5.1	0.041	82
98-95-3	Nitrobenzene	18	0	0.0%	UG/L	1.3	1.3	--	--
62-75-9	N-Nitrosodimethylamine	18	0	0.0%	UG/L	1.1	1.1	--	--
621-64-7	N-Nitroso-di-n-propylamine	18	0	0.0%	UG/L	1.3	1.3	--	--
86-30-6	N-Nitrosodiphenylamine	18	0	0.0%	UG/L	1.4	1.4	--	--
87-86-5	Pentachlorophenol	18	0	0.0%	UG/L	0.75	0.75	--	--
85-01-8	Phenanthrene	18	0	0.0%	UG/L	0.038	1.5	--	--
108-95-2	Phenol	18	3	16.7%	UG/L	1.2	1.2	1.8	13
129-00-0	Pyrene	18	0	0.0%	UG/L	0.05	1.4	--	--
110-86-1	Pyridine	18	0	0.0%	UG/L	1.4	1.4	--	--
TPH									
TPHC11C12	Carbon Chain C11-C12	151	80	53.0%	UG/L	14	50	0.52	620
TPHC13C14	Carbon Chain C13-C14	150	67	44.7%	UG/L	16	50	1.4	600
TPHC15C16	Carbon Chain C15-C16	150	69	46.0%	UG/L	17	50	6.5	520
TPHC17C18	Carbon Chain C17-C18	151	85	56.3%	UG/L	17	50	0.94	420
TPHC19C20	Carbon Chain C19-C20	151	82	54.3%	UG/L	18	50	0.32	300
TPHC21C22	Carbon Chain C21-C22	151	86	57.0%	UG/L	18	50	4.4	230
TPHC23C24	Carbon Chain C23-C24	151	93	61.6%	UG/L	18	50	13	140
TPHC25C28	Carbon Chain C25-C28	151	98	64.9%	UG/L	16	50	5.6	140
TPHC29C32	Carbon Chain C29-C32	151	96	63.6%	UG/L	8.5	50	3.5	130
TPHC33C36	Carbon Chain C33-C36	151	58	38.4%	UG/L	7.9	50	0.019	86
TPHC37C40	Carbon Chain C37-C40	147	50	34.0%	UG/L	6.8	50	0.28	55
TPHC41C44	Carbon Chain C41-C44	146	15	10.3%	UG/L	6.6	50	6.7	22
TPHC6	Carbon Chain C6	146	77	52.7%	UG/L	1.4	50	1.6	300
TPHC7	Carbon Chain C7	147	84	57.1%	UG/L	6.1	50	4.8	100

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
TPHC8	Carbon Chain C8	147	88	59.9%	UG/L	9.9	50	5.5	390
TPHC9C10	Carbon Chain C9-C10	149	85	57.0%	UG/L	13	50	0.9	620
TPHC6C44	Total Petroleum Hydrocarbons (C6-C44)	151	128	84.8%	UG/L	47	47	48	4000
68334-30-5	TPH as Diesel	156	153	98.1%	UG/L	33	33	33	3200
PHCG	TPH as Gasoline	156	119	76.3%	UG/L	48	48	52	3000
TPHMOIL	TPH as Motor Oil	156	66	42.3%	UG/L	210	210	210	1700
VOCs									
630-20-6	1,1,1,2-Tetrachloroethane	156	1	0.6%	UG/L	0.35	2	4	4
71-55-6	1,1,1-Trichloroethane	156	4	2.6%	UG/L	0.3	1.5	0.44	0.52
79-34-5	1,1,2,2-Tetrachloroethane	156	0	0.0%	UG/L	0.41	2	--	--
79-00-5	1,1,2-Trichloroethane	156	8	5.1%	UG/L	0.38	1.9	0.39	1.5
75-34-3	1,1-Dichloroethane	156	77	49.4%	UG/L	0.28	1.4	0.34	22
75-35-4	1,1-Dichloroethene	156	93	59.6%	UG/L	0.4	2.2	0.46	33
563-58-6	1,1-Dichloropropene	156	0	0.0%	UG/L	0.26	2.3	--	--
87-61-6	1,2,3-Trichlorobenzene	156	0	0.0%	UG/L	0.31	2.5	--	--
96-18-4	1,2,3-Trichloropropane	156	17	10.9%	UG/L	0.64	3.2	3.6	27
95-63-6	1,2,4-Trimethylbenzene	156	48	30.8%	UG/L	0.24	1.8	0.24	97
96-12-8	1,2-Dibromo-3-Chloropropane	156	0	0.0%	UG/L	1.2	6.2	--	--
106-93-4	1,2-Dibromoethane (EDB)	156	0	0.0%	UG/L	0.36	1.8	--	--
107-06-2	1,2-Dichloroethane	156	15	9.6%	UG/L	0.24	1.2	0.38	6.1
78-87-5	1,2-Dichloropropane	156	0	0.0%	UG/L	0.38	2.1	--	--
108-67-8	1,3,5-Trimethylbenzene	156	32	20.5%	UG/L	0.23	1.4	0.32	25
142-28-9	1,3-Dichloropropane	156	0	0.0%	UG/L	0.3	1.5	--	--
594-20-7	2,2-Dichloropropane	156	0	0.0%	UG/L	0.36	1.8	--	--
78-93-3	2-Butanone (Methyl Ethyl Ketone)	156	2	1.3%	UG/L	2.2	14	2.9	8.4
95-49-8	2-Chlorotoluene	156	0	0.0%	UG/L	0.24	1.2	--	--
591-78-6	2-Hexanone	156	0	0.0%	UG/L	2.1	14	--	--
106-43-4	4-Chlorotoluene	156	1	0.6%	UG/L	0.13	0.66	0.27	0.27
108-10-1	4-Methyl-2-Pentanone	156	0	0.0%	UG/L	4.4	22	--	--
67-64-1	Acetone	156	6	3.8%	UG/L	6	50	12	120
71-43-2	Benzene	156	136	87.2%	UG/L	0.14	0.57	0.14	680

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
108-86-1	Bromobenzene	156	0	0.0%	UG/L	0.3	1.5	--	--
74-97-5	Bromochloromethane	156	0	0.0%	UG/L	0.48	2.4	--	--
75-27-4	Bromodichloromethane	156	0	0.0%	UG/L	0.21	1	--	--
75-25-2	Bromoform	156	0	0.0%	UG/L	0.5	2.5	--	--
74-83-9	Bromomethane	156	0	0.0%	UG/L	3.9	19	--	--
75-15-0	Carbon Disulfide	156	1	0.6%	UG/L	0.41	3.8	0.84	0.84
56-23-5	Carbon Tetrachloride	156	0	0.0%	UG/L	0.23	1.1	--	--
108-90-7	Chlorobenzene	156	0	0.0%	UG/L	0.17	0.86	--	--
75-00-3	Chloroethane	156	0	0.0%	UG/L	1.3	11	--	--
67-66-3	Chloroform	156	17	10.9%	UG/L	0.33	2.3	2.2	7
74-87-3	Chloromethane	156	1	0.6%	UG/L	0.49	8.8	0.6	0.6
156-59-2	cis-1,2-Dichloroethene	156	120	76.9%	UG/L	0.48	2.4	0.5	510
10061-01-5	cis-1,3-Dichloropropene	156	0	0.0%	UG/L	0.25	1.2	--	--
98-82-8	Cumene (Isopropylbenzene)	156	57	36.5%	UG/L	0.23	1.2	0.38	25
124-48-1	Dibromochloromethane	156	0	0.0%	UG/L	0.25	1.2	--	--
74-95-3	Dibromomethane	156	0	0.0%	UG/L	0.46	2.3	--	--
108-20-3	Diisopropyl Ether (DIPE)	156	0	0.0%	UG/L	0.31	1.7	--	--
64-17-5	Ethanol	156	0	0.0%	UG/L	43	250	--	--
100-41-4	Ethylbenzene	156	82	52.6%	UG/L	0.14	0.44	0.16	150
637-92-3	Ethyl-t-Butyl Ether (ETBE)	156	0	0.0%	UG/L	0.27	2.2	--	--
75-69-4	Freon 11	156	0	0.0%	UG/L	0.31	8.3	--	--
76-13-1	Freon 113	156	3	1.9%	UG/L	0.64	3.9	0.84	1.2
75-71-8	Freon 12	156	0	0.0%	UG/L	0.46	2.3	--	--
75-09-2	Methylene Chloride	156	1	0.6%	UG/L	0.64	5.2	0.84	0.84
1634-04-4	Methyl-tert-Butyl Ether	156	12	7.7%	UG/L	0.3	1.5	0.64	2.5
104-51-8	n-Butylbenzene	156	34	21.8%	UG/L	0.23	1.1	0.28	3.4
95-47-6	o-Xylene	11	2	18.2%	UG/L	0.23	0.46	1.4	2.1
1330-20-7-1	p/m-Xylene	11	4	36.4%	UG/L	0.24	0.49	0.27	68
99-87-6	p-Isopropyltoluene	156	38	24.4%	UG/L	0.16	0.79	0.17	4.4
103-65-1	Propylbenzene	156	56	35.9%	UG/L	0.17	1.6	0.18	25
135-98-8	sec-Butylbenzene	156	67	42.9%	UG/L	0.2	0.49	0.21	3.4

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
100-42-5	Styrene	156	1	0.6%	UG/L	0.17	0.86	0.2	0.2
994-05-8	tert-Amyl-Methyl Ether (TAME)	156	0	0.0%	UG/L	0.22	1.1	--	--
75-65-0	tert-Butyl Alcohol (TBA)	156	76	48.7%	UG/L	3.5	23	4.2	62
98-06-6	tert-Butylbenzene	156	3	1.9%	UG/L	0.28	1.4	0.28	0.37
127-18-4	Tetrachloroethene	156	21	13.5%	UG/L	0.39	1.9	0.88	260
108-88-3	Toluene	156	17	10.9%	UG/L	0.24	1.2	0.25	12
156-60-5	trans-1,2-Dichloroethene	156	80	51.3%	UG/L	0.37	1.8	0.37	120
10061-02-6	trans-1,3-Dichloropropene	156	0	0.0%	UG/L	0.25	1.3	--	--
79-01-6	Trichloroethene	156	77	49.4%	UG/L	0.3	1.8	0.39	400
108-05-4	Vinyl Acetate	156	0	0.0%	UG/L	2.8	14	--	--
75-01-4	Vinyl Chloride	156	11	7.1%	UG/L	0.3	1.5	0.33	0.71
1330-20-7	Xylenes, Total	156	61	39.1%	UG/L	0.23	0.91	0.27	280
Upper Gage									
Metals									
7429-90-5	Aluminum	4	4	100.0%	MG/L	--	--	0.00702	0.106
7440-36-0	Antimony	8	1	12.5%	MG/L	0.00744	0.00787	0.0101	0.0101
15584-04-0	Arsenate	4	4	100.0%	UG/L	--	--	0.3	6.61
7440-38-2	Arsenic	12	10	83.3%	MG/L	0.00438	0.00438	0.00416	0.0267
15502-74-6	Arsenite	4	4	100.0%	UG/L	--	--	0.097	16.4
7440-39-3	Barium	8	8	100.0%	MG/L	--	--	0.0142	0.134
7440-41-7	Beryllium	8	0	0.0%	MG/L	0.00056	0.00439	--	--
7440-43-9	Cadmium	8	0	0.0%	MG/L	0.00269	0.00454	--	--
7440-70-2	Calcium	8	8	100.0%	MG/L	--	--	35.8	142
7440-47-3	Chromium	12	1	8.3%	MG/L	0.0004	0.00436	0.00055	0.00055
7440-48-4	Cobalt	8	0	0.0%	MG/L	0.00295	0.00441	--	--
7440-50-8	Copper	12	6	50.0%	MG/L	0.00267	0.00392	0.00076	0.00612
7439-89-6	Iron	8	8	100.0%	MG/L	--	--	0.0592	0.287
7439-92-1	Lead	8	1	12.5%	MG/L	0.00406	0.00693	0.00748	0.00748
7439-95-4	Magnesium	8	8	100.0%	MG/L	--	--	13.2	38.3
7439-96-5	Manganese	8	8	100.0%	MG/L	--	--	0.00933	0.232
7439-97-6	Mercury	8	1	12.5%	MG/L	0.00003	0.00004	0.00004	0.00004

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
7439-98-7	Molybdenum	8	4	50.0%	MG/L	0.00278	0.00278	0.00748	0.0167
7440-02-0	Nickel	8	0	0.0%	MG/L	0.00298	0.00433	--	--
7440-09-7	Potassium	8	8	100.0%	MG/L	--	--	7.69	19.4
7782-49-2	Selenium	8	0	0.0%	MG/L	0.00699	0.0107	--	--
7440-22-4	Silver	8	0	0.0%	MG/L	0.00139	0.00211	--	--
7440-23-5	Sodium	8	8	100.0%	MG/L	--	--	131	338
7440-28-0	Thallium	8	2	25.0%	MG/L	0.00291	0.0054	0.00292	0.00313
7440-62-2	Vanadium	8	2	25.0%	MG/L	0.00244	0.00449	0.00708	0.0112
7440-66-6	Zinc	8	5	62.5%	MG/L	0.00352	0.00352	0.00716	0.0461
SVOCs/PAHs									
120-82-1	1,2,4-Trichlorobenzene	36	0	0.0%	UG/L	0.5	0.5	--	--
95-50-1	1,2-Dichlorobenzene	36	0	0.0%	UG/L	0.46	0.46	--	--
541-73-1	1,3-Dichlorobenzene	36	0	0.0%	UG/L	0.4	0.4	--	--
106-46-7	1,4-Dichlorobenzene	36	0	0.0%	UG/L	0.43	0.43	--	--
90-12-0	1-Methylnaphthalene	4	0	0.0%	UG/L	0.036	0.036	--	--
95-95-4	2,4,5-Trichlorophenol	4	0	0.0%	UG/L	0.97	0.97	--	--
88-06-2	2,4,6-Trichlorophenol	4	0	0.0%	UG/L	1.2	1.2	--	--
120-83-2	2,4-Dichlorophenol	4	0	0.0%	UG/L	1.1	1.1	--	--
105-67-9	2,4-Dimethylphenol	4	0	0.0%	UG/L	1.2	1.2	--	--
51-28-5	2,4-Dinitrophenol	4	0	0.0%	UG/L	2.6	2.6	--	--
121-14-2	2,4-Dinitrotoluene	4	0	0.0%	UG/L	1	1	--	--
606-20-2	2,6-Dinitrotoluene	4	0	0.0%	UG/L	1.1	1.1	--	--
91-58-7	2-Chloronaphthalene	4	0	0.0%	UG/L	1.3	1.3	--	--
95-57-8	2-Chlorophenol	4	0	0.0%	UG/L	1	1	--	--
91-57-6	2-Methylnaphthalene	4	0	0.0%	UG/L	0.035	0.035	--	--
95-48-7	2-Methylphenol	4	0	0.0%	UG/L	1.1	1.1	--	--
88-74-4	2-Nitroaniline	4	0	0.0%	UG/L	1	1	--	--
88-75-5	2-Nitrophenol	4	0	0.0%	UG/L	1.2	1.2	--	--
91-94-1	3,3'-Dichlorobenzidine	4	0	0.0%	UG/L	1.3	1.3	--	--
106-44-5	3/4-Methylphenol	4	0	0.0%	UG/L	1	1	--	--
99-09-2	3-Nitroaniline	4	0	0.0%	UG/L	1.2	1.2	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
534-52-1	4,6-Dinitro-2-Methylphenol	4	0	0.0%	UG/L	3.4	3.4	--	--
101-55-3	4-Bromophenyl-Phenyl Ether	4	0	0.0%	UG/L	1.2	1.2	--	--
59-50-7	4-Chloro-3-Methylphenol	4	0	0.0%	UG/L	1.2	1.2	--	--
106-47-8	4-Chloroaniline	4	0	0.0%	UG/L	1.3	1.3	--	--
7005-72-3	4-Chlorophenyl-Phenyl Ether	4	0	0.0%	UG/L	1.2	1.2	--	--
100-01-6	4-Nitroaniline	4	0	0.0%	UG/L	2.4	2.4	--	--
100-02-7	4-Nitrophenol	4	0	0.0%	UG/L	0.86	0.86	--	--
83-32-9	Acenaphthene	4	0	0.0%	UG/L	0.037	0.037	--	--
208-96-8	Acenaphthylene	4	0	0.0%	UG/L	0.033	0.033	--	--
62-53-3	Aniline	4	0	0.0%	UG/L	1.2	1.2	--	--
120-12-7	Anthracene	4	0	0.0%	UG/L	0.036	0.036	--	--
103-33-3	Azobenzene	4	0	0.0%	UG/L	1.7	1.7	--	--
92-87-5	Benzidine	4	0	0.0%	UG/L	0.62	0.62	--	--
56-55-3	Benzo (a) Anthracene	4	0	0.0%	UG/L	0.043	0.043	--	--
50-32-8	Benzo (a) Pyrene	4	0	0.0%	UG/L	0.035	0.035	--	--
205-99-2	Benzo (b) Fluoranthene	4	0	0.0%	UG/L	0.036	0.036	--	--
191-24-2	Benzo (g,h,i) Perylene	4	0	0.0%	UG/L	0.037	0.037	--	--
207-08-9	Benzo (k) Fluoranthene	4	0	0.0%	UG/L	0.05	0.05	--	--
65-85-0	Benzoic Acid	4	0	0.0%	UG/L	0.43	0.43	--	--
100-51-6	Benzyl Alcohol	4	0	0.0%	UG/L	1	1	--	--
111-91-1	Bis(2-Chloroethoxy) Methane	4	0	0.0%	UG/L	1.2	1.2	--	--
111-44-4	Bis(2-Chloroethyl) Ether	4	0	0.0%	UG/L	1	1	--	--
108-60-1	Bis(2-Chloroisopropyl) Ether	4	0	0.0%	UG/L	1.5	1.5	--	--
117-81-7	Bis(2-Ethylhexyl) Phthalate	4	0	0.0%	UG/L	1	1	--	--
85-68-7	Butyl Benzyl Phthalate	4	0	0.0%	UG/L	1	1	--	--
218-01-9	Chrysene	4	0	0.0%	UG/L	0.041	0.041	--	--
53-70-3	Dibenz (a,h) Anthracene	4	0	0.0%	UG/L	0.039	0.039	--	--
132-64-9	Dibenzofuran	4	0	0.0%	UG/L	1.4	1.4	--	--
84-66-2	Diethyl Phthalate	4	0	0.0%	UG/L	1.4	1.4	--	--
131-11-3	Dimethyl Phthalate	4	0	0.0%	UG/L	1.3	1.3	--	--
84-74-2	Di-n-Butyl Phthalate	4	0	0.0%	UG/L	1.5	1.5	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
117-84-0	Di-n-Octyl Phthalate	4	0	0.0%	UG/L	1	1	--	--
206-44-0	Fluoranthene	4	0	0.0%	UG/L	0.038	0.038	--	--
86-73-7	Fluorene	4	0	0.0%	UG/L	0.035	0.035	--	--
87-68-3	Hexachloro-1,3-Butadiene	4	0	0.0%	UG/L	1.2	1.2	--	--
118-74-1	Hexachlorobenzene	4	0	0.0%	UG/L	1.2	1.2	--	--
77-47-4	Hexachlorocyclopentadiene	4	0	0.0%	UG/L	0.44	0.44	--	--
67-72-1	Hexachloroethane	4	0	0.0%	UG/L	0.98	0.98	--	--
193-39-5	Indeno (1,2,3-c,d) Pyrene	4	0	0.0%	UG/L	0.036	0.036	--	--
78-59-1	Isophorone	4	0	0.0%	UG/L	1.2	1.2	--	--
91-20-3	Naphthalene	36	4	11.1%	UG/L	2.5	2.5	0.047	0.4
98-95-3	Nitrobenzene	4	0	0.0%	UG/L	1.3	1.3	--	--
62-75-9	N-Nitrosodimethylamine	4	0	0.0%	UG/L	1.1	1.1	--	--
621-64-7	N-Nitroso-di-n-propylamine	4	0	0.0%	UG/L	1.3	1.3	--	--
86-30-6	N-Nitrosodiphenylamine	4	0	0.0%	UG/L	1.4	1.4	--	--
87-86-5	Pentachlorophenol	4	0	0.0%	UG/L	0.75	0.75	--	--
85-01-8	Phenanthrene	4	0	0.0%	UG/L	0.038	0.038	--	--
108-95-2	Phenol	4	0	0.0%	UG/L	1.2	1.2	--	--
129-00-0	Pyrene	4	0	0.0%	UG/L	0.05	0.05	--	--
110-86-1	Pyridine	4	0	0.0%	UG/L	1.4	1.4	--	--
TPH									
TPHC11C12	Carbon Chain C11-C12	36	8	22.2%	UG/L	14	14	15	49
TPHC13C14	Carbon Chain C13-C14	36	6	16.7%	UG/L	16	16	16	34
TPHC15C16	Carbon Chain C15-C16	36	4	11.1%	UG/L	17	17	21	24
TPHC17C18	Carbon Chain C17-C18	36	0	0.0%	UG/L	17	17	--	--
TPHC19C20	Carbon Chain C19-C20	36	0	0.0%	UG/L	18	18	--	--
TPHC21C22	Carbon Chain C21-C22	36	0	0.0%	UG/L	18	18	--	--
TPHC23C24	Carbon Chain C23-C24	36	3	8.3%	UG/L	18	18	20	28
TPHC25C28	Carbon Chain C25-C28	36	10	27.8%	UG/L	16	16	18	52
TPHC29C32	Carbon Chain C29-C32	36	6	16.7%	UG/L	8.5	8.5	8.9	32
TPHC33C36	Carbon Chain C33-C36	36	3	8.3%	UG/L	7.9	7.9	9.4	33
TPHC37C40	Carbon Chain C37-C40	36	6	16.7%	UG/L	6.8	6.8	7.4	12

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
TPHC41C44	Carbon Chain C41-C44	36	2	5.6%	UG/L	6.6	6.6	7.8	8
TPHC6	Carbon Chain C6	36	16	44.4%	UG/L	1.4	1.4	1.5	160
TPHC7	Carbon Chain C7	36	12	33.3%	UG/L	6.1	6.1	6.9	38
TPHC8	Carbon Chain C8	36	13	36.1%	UG/L	9.9	9.9	10	87
TPHC9C10	Carbon Chain C9-C10	36	14	38.9%	UG/L	13	13	13	120
TPHC6C44	Total Petroleum Hydrocarbons (C6-C44)	36	16	44.4%	UG/L	47	47	52	580
68334-30-5	TPH as Diesel	36	29	80.6%	UG/L	33	33	34	200
PHCG	TPH as Gasoline	36	16	44.4%	UG/L	48	48	49	710
TPHMOIL	TPH as Motor Oil	36	0	0.0%	UG/L	210	210	--	--
VOCs									
630-20-6	1,1,1,2-Tetrachloroethane	36	0	0.0%	UG/L	0.4	0.4	--	--
71-55-6	1,1,1-Trichloroethane	36	0	0.0%	UG/L	0.3	0.3	--	--
79-34-5	1,1,2,2-Tetrachloroethane	36	0	0.0%	UG/L	0.41	0.41	--	--
79-00-5	1,1,2-Trichloroethane	36	0	0.0%	UG/L	0.38	0.38	--	--
75-34-3	1,1-Dichloroethane	36	0	0.0%	UG/L	0.28	0.28	--	--
75-35-4	1,1-Dichloroethene	36	2	5.6%	UG/L	0.43	0.43	0.48	0.57
563-58-6	1,1-Dichloropropene	36	0	0.0%	UG/L	0.46	0.46	--	--
87-61-6	1,2,3-Trichlorobenzene	36	0	0.0%	UG/L	0.51	0.51	--	--
96-18-4	1,2,3-Trichloropropane	36	3	8.3%	UG/L	0.64	0.64	1.1	3.4
95-63-6	1,2,4-Trimethylbenzene	36	9	25.0%	UG/L	0.36	0.36	0.36	1.6
96-12-8	1,2-Dibromo-3-Chloropropane	36	0	0.0%	UG/L	1.2	1.2	--	--
106-93-4	1,2-Dibromoethane (EDB)	36	0	0.0%	UG/L	0.36	0.36	--	--
107-06-2	1,2-Dichloroethane	36	22	61.1%	UG/L	0.24	0.24	0.42	3.6
78-87-5	1,2-Dichloropropane	36	0	0.0%	UG/L	0.42	0.42	--	--
108-67-8	1,3,5-Trimethylbenzene	36	1	2.8%	UG/L	0.28	0.28	0.59	0.59
142-28-9	1,3-Dichloropropane	36	0	0.0%	UG/L	0.3	0.3	--	--
594-20-7	2,2-Dichloropropane	36	0	0.0%	UG/L	0.36	0.36	--	--
78-93-3	2-Butanone (Methyl Ethyl Ketone)	36	0	0.0%	UG/L	2.2	2.2	--	--
95-49-8	2-Chlorotoluene	36	0	0.0%	UG/L	0.24	0.24	--	--
591-78-6	2-Hexanone	36	0	0.0%	UG/L	2.1	2.1	--	--
106-43-4	4-Chlorotoluene	36	0	0.0%	UG/L	0.13	0.13	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
108-10-1	4-Methyl-2-Pentanone	36	0	0.0%	UG/L	4.4	4.4	--	--
67-64-1	Acetone	36	1	2.8%	UG/L	6	10	7	7
71-43-2	Benzene	36	26	72.2%	UG/L	0.14	0.14	0.15	370
108-86-1	Bromobenzene	36	0	0.0%	UG/L	0.3	0.3	--	--
74-97-5	Bromochloromethane	36	0	0.0%	UG/L	0.48	0.48	--	--
75-27-4	Bromodichloromethane	36	0	0.0%	UG/L	0.21	0.21	--	--
75-25-2	Bromoform	36	0	0.0%	UG/L	0.5	0.5	--	--
74-83-9	Bromomethane	36	0	0.0%	UG/L	3.9	3.9	--	--
75-15-0	Carbon Disulfide	36	10	27.8%	UG/L	0.41	0.41	0.45	4.8
56-23-5	Carbon Tetrachloride	36	0	0.0%	UG/L	0.23	0.23	--	--
108-90-7	Chlorobenzene	36	0	0.0%	UG/L	0.17	0.17	--	--
75-00-3	Chloroethane	36	0	0.0%	UG/L	2.3	2.3	--	--
67-66-3	Chloroform	36	3	8.3%	UG/L	0.46	0.46	0.5	0.59
74-87-3	Chloromethane	36	0	0.0%	UG/L	1.8	1.8	--	--
156-59-2	cis-1,2-Dichloroethene	36	22	61.1%	UG/L	0.48	0.48	0.55	71
10061-01-5	cis-1,3-Dichloropropene	36	0	0.0%	UG/L	0.25	0.25	--	--
98-82-8	Cumene (Isopropylbenzene)	36	2	5.6%	UG/L	0.58	0.58	0.9	0.96
124-48-1	Dibromochloromethane	36	0	0.0%	UG/L	0.25	0.25	--	--
74-95-3	Dibromomethane	36	0	0.0%	UG/L	0.46	0.46	--	--
108-20-3	Diisopropyl Ether (DIPE)	36	15	41.7%	UG/L	0.33	0.33	0.36	1.7
64-17-5	Ethanol	36	0	0.0%	UG/L	50	50	--	--
100-41-4	Ethylbenzene	36	14	38.9%	UG/L	0.14	0.14	0.16	14
637-92-3	Ethyl-t-Butyl Ether (ETBE)	36	0	0.0%	UG/L	0.44	0.44	--	--
75-69-4	Freon 11	36	0	0.0%	UG/L	1.7	1.7	--	--
76-13-1	Freon 113	36	0	0.0%	UG/L	0.78	0.78	--	--
75-71-8	Freon 12	36	0	0.0%	UG/L	0.46	0.46	--	--
75-09-2	Methylene Chloride	36	0	0.0%	UG/L	0.64	0.64	--	--
1634-04-4	Methyl-tert-Butyl Ether	36	0	0.0%	UG/L	0.31	0.31	--	--
104-51-8	n-Butylbenzene	36	0	0.0%	UG/L	0.23	0.23	--	--
95-47-6	o-Xylene	4	0	0.0%	UG/L	0.23	0.23	--	--
1330-20-7-1	p/m-Xylene	4	1	25.0%	UG/L	0.24	0.24	0.7	0.7

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
99-87-6	p-Isopropyltoluene	36	0	0.0%	UG/L	0.16	0.16	--	--
103-65-1	Propylbenzene	36	4	11.1%	UG/L	0.17	0.17	0.2	0.52
135-98-8	sec-Butylbenzene	36	0	0.0%	UG/L	0.25	0.25	--	--
100-42-5	Styrene	36	0	0.0%	UG/L	0.17	0.17	--	--
994-05-8	tert-Amyl-Methyl Ether (TAME)	36	0	0.0%	UG/L	0.22	0.22	--	--
75-65-0	tert-Butyl Alcohol (TBA)	36	21	58.3%	UG/L	4.6	4.6	5.9	250
98-06-6	tert-Butylbenzene	36	0	0.0%	UG/L	0.28	0.28	--	--
127-18-4	Tetrachloroethene	36	0	0.0%	UG/L	0.39	0.39	--	--
108-88-3	Toluene	36	9	25.0%	UG/L	0.24	0.24	0.94	3.6
156-60-5	trans-1,2-Dichloroethene	36	9	25.0%	UG/L	0.37	0.37	0.81	2.6
10061-02-6	trans-1,3-Dichloropropene	36	0	0.0%	UG/L	0.25	0.25	--	--
79-01-6	Trichloroethene	36	8	22.2%	UG/L	0.37	0.37	0.42	2.2
108-05-4	Vinyl Acetate	36	0	0.0%	UG/L	2.8	2.8	--	--
75-01-4	Vinyl Chloride	36	0	0.0%	UG/L	0.3	0.3	--	--
1330-20-7	Xylenes, Total	36	10	27.8%	UG/L	0.23	0.24	0.27	8.8
Lower Gage									
Metal									
7429-90-5	Aluminum	4	4	100.0%	MG/L	--	--	0.0144	0.0456
7440-36-0	Antimony	8	1	12.5%	MG/L	0.00744	0.00787	0.00968	0.00968
15584-04-0	Arsenate	4	4	100.0%	UG/L	--	--	0.27	0.84
7440-38-2	Arsenic	12	10	83.3%	MG/L	0.00611	0.00611	0.00532	0.026
15502-74-6	Arsenite	4	4	100.0%	UG/L	--	--	4.84	7.97
7440-39-3	Barium	8	7	87.5%	MG/L	0.00296	0.00296	0.0138	0.0796
7440-41-7	Beryllium	8	0	0.0%	MG/L	0.00056	0.00439	--	--
7440-43-9	Cadmium	8	0	0.0%	MG/L	0.00269	0.00454	--	--
7440-70-2	Calcium	8	8	100.0%	MG/L	--	--	8.54	106
7440-47-3	Chromium	12	0	0.0%	MG/L	0.0004	0.00436	--	--
7440-48-4	Cobalt	8	0	0.0%	MG/L	0.00295	0.00441	--	--
7440-50-8	Copper	12	9	75.0%	MG/L	0.00392	0.00392	0.00051	0.0175
7439-89-6	Iron	8	8	100.0%	MG/L	--	--	0.0339	6
7439-92-1	Lead	8	0	0.0%	MG/L	0.00406	0.00693	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
7439-95-4	Magnesium	8	8	100.0%	MG/L	--	--	5.26	30.1
7439-96-5	Manganese	8	8	100.0%	MG/L	--	--	0.0061	0.177
7439-97-6	Mercury	8	2	25.0%	MG/L	0.00003	0.00004	0.00004	0.00005
7439-98-7	Molybdenum	8	4	50.0%	MG/L	0.00278	0.00278	0.00824	0.0227
7440-02-0	Nickel	8	0	0.0%	MG/L	0.00298	0.00433	--	--
7440-09-7	Potassium	8	8	100.0%	MG/L	--	--	7.65	11.4
7782-49-2	Selenium	8	0	0.0%	MG/L	0.00699	0.0107	--	--
7440-22-4	Silver	8	0	0.0%	MG/L	0.00139	0.00211	--	--
7440-23-5	Sodium	8	8	100.0%	MG/L	--	--	110	304
7440-28-0	Thallium	8	1	12.5%	MG/L	0.00291	0.0054	0.00311	0.00311
7440-62-2	Vanadium	8	2	25.0%	MG/L	0.00244	0.00449	0.00354	0.0273
7440-66-6	Zinc	8	5	62.5%	MG/L	0.00352	0.00666	0.00618	0.465
SVOCs/PAHs									
120-82-1	1,2,4-Trichlorobenzene	36	0	0.0%	UG/L	0.5	0.5	--	--
95-50-1	1,2-Dichlorobenzene	36	0	0.0%	UG/L	0.46	0.46	--	--
541-73-1	1,3-Dichlorobenzene	36	0	0.0%	UG/L	0.4	0.4	--	--
106-46-7	1,4-Dichlorobenzene	36	0	0.0%	UG/L	0.43	0.43	--	--
90-12-0	1-Methylnaphthalene	4	0	0.0%	UG/L	0.036	0.036	--	--
95-95-4	2,4,5-Trichlorophenol	4	0	0.0%	UG/L	0.97	0.97	--	--
88-06-2	2,4,6-Trichlorophenol	4	0	0.0%	UG/L	1.2	1.2	--	--
120-83-2	2,4-Dichlorophenol	4	0	0.0%	UG/L	1.1	1.1	--	--
105-67-9	2,4-Dimethylphenol	4	0	0.0%	UG/L	1.2	1.2	--	--
51-28-5	2,4-Dinitrophenol	4	0	0.0%	UG/L	2.6	2.6	--	--
121-14-2	2,4-Dinitrotoluene	4	0	0.0%	UG/L	1	1	--	--
606-20-2	2,6-Dinitrotoluene	4	0	0.0%	UG/L	1.1	1.1	--	--
91-58-7	2-Chloronaphthalene	4	0	0.0%	UG/L	1.3	1.3	--	--
95-57-8	2-Chlorophenol	4	0	0.0%	UG/L	1	1	--	--
91-57-6	2-Methylnaphthalene	4	1	25.0%	UG/L	0.035	0.035	0.037	0.037
95-48-7	2-Methylphenol	4	0	0.0%	UG/L	1.1	1.1	--	--
88-74-4	2-Nitroaniline	4	0	0.0%	UG/L	1	1	--	--
88-75-5	2-Nitrophenol	4	0	0.0%	UG/L	1.2	1.2	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
91-94-1	3,3'-Dichlorobenzidine	4	0	0.0%	UG/L	1.3	1.3	--	--
106-44-5	3/4-Methylphenol	4	1	25.0%	UG/L	1	1	1.7	1.7
99-09-2	3-Nitroaniline	4	0	0.0%	UG/L	1.2	1.2	--	--
534-52-1	4,6-Dinitro-2-Methylphenol	4	0	0.0%	UG/L	3.4	3.4	--	--
101-55-3	4-Bromophenyl-Phenyl Ether	4	0	0.0%	UG/L	1.2	1.2	--	--
59-50-7	4-Chloro-3-Methylphenol	4	0	0.0%	UG/L	1.2	1.2	--	--
106-47-8	4-Chloroaniline	4	0	0.0%	UG/L	1.3	1.3	--	--
7005-72-3	4-Chlorophenyl-Phenyl Ether	4	0	0.0%	UG/L	1.2	1.2	--	--
100-01-6	4-Nitroaniline	4	0	0.0%	UG/L	2.4	2.4	--	--
100-02-7	4-Nitrophenol	4	0	0.0%	UG/L	0.86	0.86	--	--
83-32-9	Acenaphthene	4	0	0.0%	UG/L	0.037	0.037	--	--
208-96-8	Acenaphthylene	4	0	0.0%	UG/L	0.033	0.033	--	--
62-53-3	Aniline	4	0	0.0%	UG/L	1.2	1.2	--	--
120-12-7	Anthracene	4	0	0.0%	UG/L	0.036	0.036	--	--
103-33-3	Azobenzene	4	0	0.0%	UG/L	1.7	1.7	--	--
92-87-5	Benzidine	4	0	0.0%	UG/L	0.62	0.62	--	--
56-55-3	Benzo (a) Anthracene	4	0	0.0%	UG/L	0.043	0.043	--	--
50-32-8	Benzo (a) Pyrene	4	0	0.0%	UG/L	0.035	0.035	--	--
205-99-2	Benzo (b) Fluoranthene	4	0	0.0%	UG/L	0.036	0.036	--	--
191-24-2	Benzo (g,h,i) Perylene	4	0	0.0%	UG/L	0.037	0.037	--	--
207-08-9	Benzo (k) Fluoranthene	4	0	0.0%	UG/L	0.05	0.05	--	--
65-85-0	Benzoic Acid	4	1	25.0%	UG/L	0.43	0.43	2.6	2.6
100-51-6	Benzyl Alcohol	4	0	0.0%	UG/L	1	1	--	--
111-91-1	Bis(2-Chloroethoxy) Methane	4	0	0.0%	UG/L	1.2	1.2	--	--
111-44-4	Bis(2-Chloroethyl) Ether	4	0	0.0%	UG/L	1	1	--	--
108-60-1	Bis(2-Chloroisopropyl) Ether	4	0	0.0%	UG/L	1.5	1.5	--	--
117-81-7	Bis(2-Ethylhexyl) Phthalate	4	0	0.0%	UG/L	1	1	--	--
85-68-7	Butyl Benzyl Phthalate	4	0	0.0%	UG/L	1	1	--	--
218-01-9	Chrysene	4	0	0.0%	UG/L	0.041	0.041	--	--
53-70-3	Dibenz (a,h) Anthracene	4	0	0.0%	UG/L	0.039	0.039	--	--
132-64-9	Dibenzofuran	4	0	0.0%	UG/L	1.4	1.4	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
84-66-2	Diethyl Phthalate	4	0	0.0%	UG/L	1.4	1.4	--	--
131-11-3	Dimethyl Phthalate	4	0	0.0%	UG/L	1.3	1.3	--	--
84-74-2	Di-n-Butyl Phthalate	4	0	0.0%	UG/L	1.5	1.5	--	--
117-84-0	Di-n-Octyl Phthalate	4	0	0.0%	UG/L	1	1	--	--
206-44-0	Fluoranthene	4	0	0.0%	UG/L	0.038	0.038	--	--
86-73-7	Fluorene	4	0	0.0%	UG/L	0.035	0.035	--	--
87-68-3	Hexachloro-1,3-Butadiene	4	0	0.0%	UG/L	1.2	1.2	--	--
118-74-1	Hexachlorobenzene	4	0	0.0%	UG/L	1.2	1.2	--	--
77-47-4	Hexachlorocyclopentadiene	4	0	0.0%	UG/L	0.44	0.44	--	--
67-72-1	Hexachloroethane	4	0	0.0%	UG/L	0.98	0.98	--	--
193-39-5	Indeno (1,2,3-c,d) Pyrene	4	0	0.0%	UG/L	0.036	0.036	--	--
78-59-1	Isophorone	4	0	0.0%	UG/L	1.2	1.2	--	--
91-20-3	Naphthalene	36	3	8.3%	UG/L	0.037	2.5	0.047	0.07
98-95-3	Nitrobenzene	4	0	0.0%	UG/L	1.3	1.3	--	--
62-75-9	N-Nitrosodimethylamine	4	0	0.0%	UG/L	1.1	1.1	--	--
621-64-7	N-Nitroso-di-n-propylamine	4	0	0.0%	UG/L	1.3	1.3	--	--
86-30-6	N-Nitrosodiphenylamine	4	0	0.0%	UG/L	1.4	1.4	--	--
87-86-5	Pentachlorophenol	4	0	0.0%	UG/L	0.75	0.75	--	--
85-01-8	Phenanthrene	4	0	0.0%	UG/L	0.038	0.038	--	--
108-95-2	Phenol	4	0	0.0%	UG/L	1.2	1.2	--	--
129-00-0	Pyrene	4	0	0.0%	UG/L	0.05	0.05	--	--
110-86-1	Pyridine	4	0	0.0%	UG/L	1.4	1.4	--	--
TPH									
TPHC11C12	Carbon Chain C11-C12	36	1	2.8%	UG/L	14	14	18	18
TPHC13C14	Carbon Chain C13-C14	36	1	2.8%	UG/L	16	16	16	16
TPHC15C16	Carbon Chain C15-C16	36	4	11.1%	UG/L	17	17	17	33
TPHC17C18	Carbon Chain C17-C18	36	1	2.8%	UG/L	17	17	37	37
TPHC19C20	Carbon Chain C19-C20	36	1	2.8%	UG/L	18	18	24	24
TPHC21C22	Carbon Chain C21-C22	36	4	11.1%	UG/L	18	18	19	34
TPHC23C24	Carbon Chain C23-C24	36	4	11.1%	UG/L	18	18	20	63
TPHC25C28	Carbon Chain C25-C28	36	11	30.6%	UG/L	16	16	17	79

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
TPHC29C32	Carbon Chain C29-C32	36	8	22.2%	UG/L	8.5	8.5	9	46
TPHC33C36	Carbon Chain C33-C36	36	5	13.9%	UG/L	7.9	7.9	8.1	32
TPHC37C40	Carbon Chain C37-C40	36	4	11.1%	UG/L	6.8	6.8	8.2	10
TPHC41C44	Carbon Chain C41-C44	36	0	0.0%	UG/L	6.6	6.6	--	--
TPHC6	Carbon Chain C6	36	9	25.0%	UG/L	1.4	1.4	1.5	4.8
TPHC7	Carbon Chain C7	36	0	0.0%	UG/L	6.1	6.1	--	--
TPHC8	Carbon Chain C8	36	0	0.0%	UG/L	9.9	9.9	--	--
TPHC9C10	Carbon Chain C9-C10	36	7	19.4%	UG/L	13	13	14	33
TPHC6C44	Total Petroleum Hydrocarbons (C6-C44)	36	8	22.2%	UG/L	47	47	53	350
68334-30-5	TPH as Diesel	36	29	80.6%	UG/L	33	33	34	330
PHCG	TPH as Gasoline	36	0	0.0%	UG/L	46	46	--	--
TPHMOIL	TPH as Motor Oil	36	1	2.8%	UG/L	210	210	330	330
VOCs									
630-20-6	1,1,1,2-Tetrachloroethane	36	0	0.0%	UG/L	0.4	0.4	--	--
71-55-6	1,1,1-Trichloroethane	36	0	0.0%	UG/L	0.3	0.3	--	--
79-34-5	1,1,2,2-Tetrachloroethane	36	0	0.0%	UG/L	0.41	0.41	--	--
79-00-5	1,1,2-Trichloroethane	36	0	0.0%	UG/L	0.38	0.38	--	--
75-34-3	1,1-Dichloroethane	36	0	0.0%	UG/L	0.28	0.28	--	--
75-35-4	1,1-Dichloroethene	36	0	0.0%	UG/L	0.43	0.43	--	--
563-58-6	1,1-Dichloropropene	36	0	0.0%	UG/L	0.46	0.46	--	--
87-61-6	1,2,3-Trichlorobenzene	36	0	0.0%	UG/L	0.51	0.51	--	--
96-18-4	1,2,3-Trichloropropane	36	0	0.0%	UG/L	0.64	0.64	--	--
95-63-6	1,2,4-Trimethylbenzene	36	0	0.0%	UG/L	0.36	0.36	--	--
96-12-8	1,2-Dibromo-3-Chloropropane	36	0	0.0%	UG/L	1.2	1.2	--	--
106-93-4	1,2-Dibromoethane (EDB)	36	0	0.0%	UG/L	0.36	0.36	--	--
107-06-2	1,2-Dichloroethane	36	1	2.8%	UG/L	0.24	0.24	0.31	0.31
78-87-5	1,2-Dichloropropane	36	0	0.0%	UG/L	0.42	0.42	--	--
108-67-8	1,3,5-Trimethylbenzene	36	0	0.0%	UG/L	0.28	0.28	--	--
142-28-9	1,3-Dichloropropane	36	0	0.0%	UG/L	0.3	0.3	--	--
594-20-7	2,2-Dichloropropane	36	0	0.0%	UG/L	0.36	0.36	--	--
78-93-3	2-Butanone (Methyl Ethyl Ketone)	36	0	0.0%	UG/L	2.2	2.2	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
95-49-8	2-Chlorotoluene	36	0	0.0%	UG/L	0.24	0.24	--	--
591-78-6	2-Hexanone	36	0	0.0%	UG/L	2.1	2.1	--	--
106-43-4	4-Chlorotoluene	36	0	0.0%	UG/L	0.13	0.13	--	--
108-10-1	4-Methyl-2-Pentanone	36	0	0.0%	UG/L	4.4	4.4	--	--
67-64-1	Acetone	36	2	5.6%	UG/L	6	10	6.7	8.3
71-43-2	Benzene	36	6	16.7%	UG/L	0.14	0.14	0.16	0.89
108-86-1	Bromobenzene	36	0	0.0%	UG/L	0.3	0.3	--	--
74-97-5	Bromochloromethane	36	2	5.6%	UG/L	0.48	0.48	0.79	1.5
75-27-4	Bromodichloromethane	36	0	0.0%	UG/L	0.21	0.21	--	--
75-25-2	Bromoform	36	0	0.0%	UG/L	0.5	0.5	--	--
74-83-9	Bromomethane	36	0	0.0%	UG/L	3.9	3.9	--	--
75-15-0	Carbon Disulfide	36	15	41.7%	UG/L	0.41	0.41	0.45	9.3
56-23-5	Carbon Tetrachloride	36	0	0.0%	UG/L	0.23	0.23	--	--
108-90-7	Chlorobenzene	36	0	0.0%	UG/L	0.17	0.17	--	--
75-00-3	Chloroethane	36	0	0.0%	UG/L	2.3	2.3	--	--
67-66-3	Chloroform	36	2	5.6%	UG/L	0.46	0.46	0.5	0.67
74-87-3	Chloromethane	36	0	0.0%	UG/L	1.8	1.8	--	--
156-59-2	cis-1,2-Dichloroethene	36	7	19.4%	UG/L	0.48	0.48	0.93	11
10061-01-5	cis-1,3-Dichloropropene	36	0	0.0%	UG/L	0.25	0.25	--	--
98-82-8	Cumene (Isopropylbenzene)	36	0	0.0%	UG/L	0.58	0.58	--	--
124-48-1	Dibromochloromethane	36	0	0.0%	UG/L	0.25	0.25	--	--
74-95-3	Dibromomethane	36	3	8.3%	UG/L	0.46	0.46	0.71	2.1
108-20-3	Diisopropyl Ether (DIPE)	36	0	0.0%	UG/L	0.33	0.33	--	--
64-17-5	Ethanol	36	0	0.0%	UG/L	50	50	--	--
100-41-4	Ethylbenzene	36	0	0.0%	UG/L	0.14	0.14	--	--
637-92-3	Ethyl-t-Butyl Ether (ETBE)	36	0	0.0%	UG/L	0.44	0.44	--	--
75-69-4	Freon 11	36	0	0.0%	UG/L	1.7	1.7	--	--
76-13-1	Freon 113	36	0	0.0%	UG/L	0.78	0.78	--	--
75-71-8	Freon 12	36	0	0.0%	UG/L	0.46	0.46	--	--
75-09-2	Methylene Chloride	36	0	0.0%	UG/L	0.64	0.64	--	--
1634-04-4	Methyl-tert-Butyl Ether	36	0	0.0%	UG/L	0.31	0.31	--	--

Table 4-4
Statistical Summary of Groundwater Data
Former Kast Property
Carson, CA

CAS Number	Chemical	Number of Samples	Number of Detects	Percent Detected	Units	Minimum DL of NDs	Maximum DL of NDs	Minimum Detected Value	Maximum Detected Value
104-51-8	n-Butylbenzene	36	0	0.0%	UG/L	0.23	0.23	--	--
95-47-6	o-Xylene	4	0	0.0%	UG/L	0.23	0.23	--	--
1330-20-7-1	p/m-Xylene	4	0	0.0%	UG/L	0.24	0.24	--	--
99-87-6	p-Isopropyltoluene	36	0	0.0%	UG/L	0.16	0.16	--	--
103-65-1	Propylbenzene	36	0	0.0%	UG/L	0.17	0.17	--	--
135-98-8	sec-Butylbenzene	36	0	0.0%	UG/L	0.25	0.25	--	--
100-42-5	Styrene	36	0	0.0%	UG/L	0.17	0.17	--	--
994-05-8	tert-Amyl-Methyl Ether (TAME)	36	0	0.0%	UG/L	0.22	0.22	--	--
75-65-0	tert-Butyl Alcohol (TBA)	36	2	5.6%	UG/L	4.6	4.6	6.6	8.5
98-06-6	tert-Butylbenzene	36	0	0.0%	UG/L	0.28	0.28	--	--
127-18-4	Tetrachloroethene	36	0	0.0%	UG/L	0.39	0.39	--	--
108-88-3	Toluene	36	0	0.0%	UG/L	0.24	0.24	--	--
156-60-5	trans-1,2-Dichloroethene	36	0	0.0%	UG/L	0.37	0.37	--	--
10061-02-6	trans-1,3-Dichloropropene	36	0	0.0%	UG/L	0.25	0.25	--	--
79-01-6	Trichloroethene	36	0	0.0%	UG/L	0.37	0.37	--	--
108-05-4	Vinyl Acetate	36	0	0.0%	UG/L	2.8	2.8	--	--
75-01-4	Vinyl Chloride	36	0	0.0%	UG/L	0.3	0.3	--	--
1330-20-7	Xylenes, Total	36	0	0.0%	UG/L	0.23	0.24	--	--

Notes:
All data through August 31, 2013
" -- " not available
" DL " detection limit; "NDs " nondetects
MG/L: milligram per liter
UG/L: microgram per liter

Table 4-5
Soil Matrix Constituent of Concern Screening
Former Kast Property
Carson, California

CAS Number	Chemical[1]	Maximum Concentration	Units	RBSLc	RBSLnc	RBSLc x 0.1	RBSLnc x 0.1	Background Concentration	COC Selection Rationale[2]	COC	Site-Related COC
Metals											
7440-36-0	Antimony	6.5E+00	mg/kg	--	3.1E+01	--	3.1E+00	7.4E-01	RBSLnc, background	Yes	No
7440-38-2	Arsenic	6.3E+01	mg/kg	3.9E-01	2.2E+01	3.9E-02	2.2E+00	1.2E+01	RBSLc, RBSLnc, background	Yes	Yes
7440-39-3	Barium	1.0E+03	mg/kg	--	1.6E+04	--	1.6E+03	2.7E+02		No	No
7440-41-7	Beryllium	1.2E+00	mg/kg	1.2E+05	1.6E+02	1.2E+04	1.6E+01	5.6E-01		No	No
7440-43-9	Cadmium	9.0E+00	mg/kg	6.7E+04	7.0E+01	6.7E+03	7.0E+00	3.8E+00	RBSLnc, background	Yes	No
7440-47-3	Chromium	7.4E+01	mg/kg	--	1.2E+05	--	1.2E+04	3.3E+01		No	No
CR6	Chromium, Hexavalent[3]	4.8E+00	mg/kg	1.9E+03	2.3E+02	1.9E+02	2.3E+01	--	--	Yes	No
7440-48-4	Cobalt	3.1E+01	mg/kg	3.1E+04	2.3E+01	3.1E+03	2.3E+00	1.1E+01	RBSLnc, background	Yes	No
7440-50-8	Copper	1.2E+03	mg/kg	--	3.1E+03	--	3.1E+02	5.9E+01	RBSLnc, background	Yes	No
7439-92-1	Lead	1.3E+03	mg/kg	--	8.0E+01	--	8.0E+00	6.2E+01	RBSLnc, background	Yes	Yes
7439-97-6	Mercury	1.3E+00	mg/kg	--	2.3E+01	--	2.3E+00	1.3E-01		No	No
7439-98-7	Molybdenum	2.4E+01	mg/kg	--	3.9E+02	--	3.9E+01	4.1E-01		No	No
7440-02-0	Nickel	4.3E+01	mg/kg	1.1E+06	1.6E+03	1.1E+05	1.6E+02	2.0E+01		No	No
7782-49-2	Selenium	9.0E+00	mg/kg	--	3.9E+02	--	3.9E+01	7.8E-01		No	No
7440-22-4	Silver	3.8E+00	mg/kg	--	3.9E+02	--	3.9E+01	1.3E+00		No	No
7440-28-0	Thallium	3.5E+00	mg/kg	--	7.8E-01	--	7.8E-02	2.3E-01	RBSLnc, background	Yes	No
7440-62-2	Vanadium	8.6E+01	mg/kg	--	5.5E+02	--	5.5E+01	4.6E+01	RBSLnc, background	Yes	No
7440-66-6	Zinc	5.8E+03	mg/kg	--	2.3E+04	--	2.3E+03	2.9E+02	RBSLnc, background	Yes	No
PAHs											
83-32-9	Acenaphthene	1.7E+01	mg/kg	--	3.2E+03	--	3.2E+02	--		No	No
208-96-8	Acenaphthylene	4.5E+00	mg/kg	--	1.7E+04	--	1.7E+03	--		No	No
120-12-7	Anthracene	2.6E+01	mg/kg	--	1.7E+04	--	1.7E+03	--		No	No
56-55-3	Benzo (a) Anthracene	4.7E+01	mg/kg	1.6E+00	--	1.6E-01	--	--	RBSLc	Yes	Yes
50-32-8	Benzo (a) Pyrene	2.2E+01	mg/kg	1.6E-01	--	1.6E-02	--	9.0E-01	RBSLc, background	Yes	Yes
205-99-2	Benzo (b) Fluoranthene	1.6E+01	mg/kg	1.6E+00	--	1.6E-01	--	--	RBSLc	Yes	Yes
191-24-2	Benzo (g,h,i) Perylene	1.3E+01	mg/kg	--	1.7E+03	--	1.7E+02	--		No	No
207-08-9	Benzo (k) Fluoranthene	4.6E+00	mg/kg	1.6E+00	--	1.6E-01	--	--	RBSLc	Yes	Yes
218-01-9	Chrysene	1.3E+02	mg/kg	1.6E+01	--	1.6E+00	--	--	RBSLc	Yes	Yes
53-70-3	Dibenz (a,h) Anthracene	3.4E+00	mg/kg	1.1E-01	--	1.1E-02	--	--	RBSLc	Yes	Yes

Table 4-5
Soil Matrix Constituent of Concern Screening
Former Kast Property
Carson, California

CAS Number	Chemical[1]	Maximum Concentration	Units	RBSLc	RBSLnc	RBSLc x 0.1	RBSLnc x 0.1	Background Concentration	COC Selection Rationale[2]	COC	Site-Related COC
206-44-0	Fluoranthene	2.9E+01	mg/kg	--	2.3E+03	--	2.3E+02	--		No	No
86-73-7	Fluorene	2.3E+01	mg/kg	--	2.2E+03	--	2.2E+02	--		No	No
193-39-5	Indeno (1,2,3-c,d) Pyrene	3.2E+00	mg/kg	1.6E+00	--	1.6E-01	--	--	RBSLc	Yes	Yes
90-12-0	1-Methylnaphthalene	1.6E+02	mg/kg	2.2E+01	5.5E+03	2.2E+00	5.5E+02	--	RBSLc	Yes	Yes
91-57-6	2-Methylnaphthalene	2.8E+02	mg/kg	--	3.1E+02	--	3.1E+01	--	RBSLnc	Yes	Yes
91-20-3	Naphthalene	9.2E+04	ug/kg	4.1E+00	3.7E+02	4.1E-01	3.7E+01	--	RBSLc, RBSLnc	Yes	Yes
85-01-8	Phenanthrene	1.0E+02	mg/kg	--	1.7E+03	--	1.7E+02	--		No	No
129-00-0	Pyrene	2.4E+02	mg/kg	--	1.7E+03	--	1.7E+02	--	RBSLnc	Yes	Yes
SVOCs											
121-14-2	2,4-Dinitrotoluene	3.1E+00	mg/kg	1.6E+00	1.2E+02	1.6E-01	1.2E+01	--	RBSLc	Yes	No
MEPH4	4-Methylphenol (p-Cresol)	2.2E-01	mg/kg	--	6.1E+03	--	6.1E+02	--		No	No
62-53-3	Aniline	4.0E+00	mg/kg	8.5E+01	4.3E+02	8.5E+00	4.3E+01	--		No	No
65-85-0	Benzoic Acid	1.5E+00	mg/kg	--	2.4E+05	--	2.4E+04	--		No	No
117-81-7	Bis(2-Ethylhexyl) Phthalate	2.2E+01	mg/kg	3.5E+01	1.2E+03	3.5E+00	1.2E+02	--	RBSLc	Yes	No
85-68-7	Butyl Benzyl Phthalate	3.1E+00	mg/kg	2.6E+02	1.2E+04	2.6E+01	1.2E+03	--		No	No
132-64-9	Dibenzofuran	1.2E+00	mg/kg	--	1.5E+02	--	1.5E+01	--		No	No
84-66-2	Diethyl Phthalate	3.1E+00	mg/kg	--	4.9E+04	--	4.9E+03	--		No	No
131-11-3	Dimethyl Phthalate	2.7E+00	mg/kg	--	6.1E+05	--	6.1E+04	--		No	No
84-74-2	Di-n-Butyl Phthalate	3.3E-01	mg/kg	--	6.1E+03	--	6.1E+02	--		No	No
TPH											
68334-30-5	TPH as Diesel	1.4E+05	mg/kg	--	1.3E+03	--	1.3E+02	--	RBSLnc	Yes	Yes
PHCG	TPH as Gasoline	9.8E+03	mg/kg	--	7.6E+02	--	7.6E+01	--	RBSLnc	Yes	Yes
TPHMOIL	TPH as Motor Oil	3.2E+05	mg/kg	--	3.3E+03	--	3.3E+02	--	RBSLnc	Yes	Yes
VOCs											
79-34-5	1,1,2,2-Tetrachloroethane	4.2E+02	ug/kg	4.8E+02	1.3E+05	4.8E+01	1.3E+04	--	RBSLc	Yes	No
79-00-5	1,1,2-Trichloroethane	5.9E+01	ug/kg	8.9E+02	7.4E+04	8.9E+01	7.4E+03	--		No	No
87-61-6	1,2,3-Trichlorobenzene	3.4E+02	ug/kg	--	6.3E+04	--	6.3E+03	--		No	No
96-18-4	1,2,3-Trichloropropane	1.8E+02	ug/kg	2.1E+01	2.5E+03	2.1E+00	2.5E+02	--	RBSLc	Yes	No
120-82-1	1,2,4-Trichlorobenzene	3.2E+02	ug/kg	1.8E+05	1.5E+05	1.8E+04	1.5E+04	--		No	No
95-63-6	1,2,4-Trimethylbenzene	8.4E+04	ug/kg	--	1.4E+05	--	1.4E+04	--	RBSLnc	Yes	Yes

Table 4-5
Soil Matrix Constituent of Concern Screening
Former Kast Property
Carson, California

CAS Number	Chemical[1]	Maximum Concentration	Units	RBSLc	RBSLnc	RBSLc × 0.1	RBSLnc × 0.1	Background Concentration	COC Selection Rationale[2]	COC	Site-Related COC
95-50-1	1,2-Dichlorobenzene	3.3E+02	ug/kg	--	2.1E+06	--	2.1E+05	--		No	No
107-06-2	1,2-Dichloroethane	7.3E+00	ug/kg	4.4E+02	8.0E+05	4.4E+01	8.0E+04	--		No	No
78-87-5	1,2-Dichloropropane	1.0E+02	ug/kg	8.0E+02	1.5E+04	8.0E+01	1.5E+03	--	RBSLc	Yes	No
108-67-8	1,3,5-Trimethylbenzene	3.1E+04	ug/kg	--	4.9E+04	--	4.9E+03	--	RBSLnc	Yes	Yes
106-46-7	1,4-Dichlorobenzene	4.4E+02	ug/kg	2.8E+03	3.6E+06	2.8E+02	3.6E+05	--	RBSLc	Yes	No
78-93-3	2-Butanone (Methyl Ethyl Ketone)	2.7E+03	ug/kg	--	2.8E+07	--	2.8E+06	--		No	No
95-49-8	2-Chlorotoluene	1.8E+02	ug/kg	--	6.1E+05	--	6.1E+04	--		No	No
591-78-6	2-Hexanone	3.1E+01	ug/kg	--	2.0E+05	--	2.0E+04	--		No	No
108-10-1	4-Methyl-2-Pentanone	1.5E+01	ug/kg	--	5.3E+06	--	5.3E+05	--		No	No
67-64-1	Acetone	1.8E+03	ug/kg	--	6.0E+07	--	6.0E+06	--		No	No
71-43-2	Benzene	3.3E+04	ug/kg	2.2E+02	1.1E+05	2.2E+01	1.1E+04	--	RBSLc, RBSLnc	Yes	Yes
75-27-4	Bromodichloromethane	1.3E+03	ug/kg	5.0E+02	4.4E+05	5.0E+01	4.4E+04	--	RBSLc	Yes	No
75-25-2	Bromoform	1.4E+02	ug/kg	2.4E+04	7.1E+05	2.4E+03	7.1E+04	--		No	No
74-83-9	Bromomethane	1.3E+03	ug/kg	--	8.9E+03	--	8.9E+02	--	RBSLnc	Yes	No
75-15-0	Carbon Disulfide	1.2E+02	ug/kg	--	8.9E+05	--	8.9E+04	--		No	No
108-90-7	Chlorobenzene	1.5E+02	ug/kg	--	1.3E+06	--	1.3E+05	--		No	No
75-00-3	Chloroethane	1.8E+00	ug/kg	--	1.4E+07	--	1.4E+06	--		No	No
67-66-3	Chloroform	1.1E+02	ug/kg	1.1E+03	4.1E+05	1.1E+02	4.1E+04	--		No	No
74-87-3	Chloromethane	5.2E+02	ug/kg	--	9.8E+04	--	9.8E+03	--		No	No
156-59-2	cis-1,2-Dichloroethene	4.4E+02	ug/kg	--	9.3E+04	--	9.3E+03	--		No	No
98-82-8	Cumene (Isopropylbenzene)	1.6E+04	ug/kg	--	4.3E+05	--	4.3E+04	--		No	No
124-48-1	Dibromochloromethane	6.8E+00	ug/kg	1.1E+03	5.9E+05	1.1E+02	5.9E+04	--		No	No
108-20-3	Diisopropyl Ether (DIPE)	1.4E+00	ug/kg	--	1.2E+06	--	1.2E+05	--		No	No
64-17-5	Ethanol	1.0E+05	ug/kg	--	2.5E+07	--	2.5E+06	--		No	No
100-41-4	Ethylbenzene	4.2E+04	ug/kg	4.9E+03	4.6E+06	4.9E+02	4.6E+05	--	RBSLc	Yes	Yes
75-71-8	Freon 12	1.7E+01	ug/kg	--	2.7E+05	--	2.7E+04	--		No	No
75-09-2	Methylene Chloride	2.1E+03	ug/kg	5.4E+03	8.6E+05	5.4E+02	8.6E+04	--	RBSLc	Yes	No
1634-04-4	Methyl-tert-Butyl Ether	1.4E+02	ug/kg	3.5E+04	2.9E+07	3.5E+03	2.9E+06	--		No	No
104-51-8	n-Butylbenzene	1.3E+04	ug/kg	--	8.8E+05	--	8.8E+04	--		No	No
95-47-6	o-Xylene	1.5E+04	ug/kg	--	4.5E+06	--	4.5E+05	--		No	No

Table 4-5

Soil Matrix Constituent of Concern Screening

Former Kast Property

Carson, California

CAS Number	Chemical[1]	Maximum Concentration	Units	RBSLc	RBSLnc	RBSLc x 0.1	RBSLnc x 0.1	Background Concentration	COC Selection Rationale[2]	COC	Site-Related COC
1330-20-7-1	p/m-Xylene	3.4E+04	ug/kg	--	4.0E+06	--	4.0E+05	--		No	No
99-87-6	p-Isopropyltoluene	1.2E+04	ug/kg	--	3.8E+06	--	3.8E+05	--		No	No
103-65-1	Propylbenzene	2.4E+04	ug/kg	--	7.3E+05	--	7.3E+04	--		No	No
135-98-8	sec-Butylbenzene	9.8E+03	ug/kg	--	9.9E+05	--	9.9E+04	--		No	No
100-42-5	Styrene	7.8E+01	ug/kg	--	7.1E+06	--	7.1E+05	--		No	No
75-65-0	tert-Butyl Alcohol (TBA)	4.3E+02	ug/kg	--	8.4E+06	--	8.4E+05	--		No	No
98-06-6	tert-Butylbenzene	4.2E+02	ug/kg	--	7.9E+05	--	7.9E+04	--		No	No
127-18-4	Tetrachloroethene	1.9E+04	ug/kg	5.6E+02	8.4E+04	5.6E+01	8.4E+03	--	RBSLc, RBSLnc	Yes	No
108-88-3	Toluene	5.7E+04	ug/kg	--	1.1E+06	--	1.1E+05	--		No	No
79-01-6	Trichloroethene	7.2E+02	ug/kg	3.9E+03	2.3E+04	3.9E+02	2.3E+03	--	RBSLc	Yes	No
75-01-4	Vinyl Chloride	4.9E+01	ug/kg	3.2E+01	7.4E+04	3.2E+00	7.4E+03	--	RBSLc	Yes	No
1330-20-7	Xylenes, Total	1.4E+05	ug/kg	--	3.4E+06	--	3.4E+05	--		No	No

Notes:

-- not available or not applicable

mg/kg: milligram per kilogram

ug/kg: microgram per kilogram

[1] Chemicals included if greater than 5 detects in soil from 0-10 feet below ground surface.

[2] COC when maximum Site-wide concentration exceeded 0.1 x Residential RBSL or background. The exceeded criterion or criteria are noted in this column. For metals and PAHs, a compound is selected as a COC only when the maximum concentration exceeds both the RBSL and the background concentration (when data available)

[3] Due to change in oral cancer assessment not reflected in RBSLs from HHSRE Work Plan hexavalent chromium included as COC.

RBSLc = Risk-based Screening Level for carcinogenic effects; RBSLnc = Risk-based Screening Level for noncarcinogenic effects

Site-Related COCs may be related to site activities associated with crude oil storage prior to redevelopment

Table 4-6
Soil Vapor Constituent of Concern Screening
Former Kast Property
Carson, California

Matrix	Series	CAS Number	Chemical	Units	Maximum Concentration	RBSLc	RBSLnc	RBSLc × 0.1	RBSLnc × 0.1	COC Selection Rationale[2]	COC	Site-Related COC
Soil Vapor	Sub-Slab	71-55-6	1,1,1-Trichloroethane	ug/m3	1.0E+02	--	1.0E+05	--	1.0E+04	--	No	No
Soil Vapor	Sub-Slab	95-63-6	1,2,4-Trimethylbenzene	ug/m3	2.2E+03	--	7.3E+02	--	7.3E+01	RBSLnc	Yes	Yes
Soil Vapor	Sub-Slab	95-50-1	1,2-Dichlorobenzene	ug/m3	7.8E+02	--	2.1E+04	--	2.1E+03	--	No	No
Soil Vapor	Sub-Slab	107-06-2	1,2-Dichloroethane	ug/m3	4.7E+01	1.2E+01	4.2E+04	1.2E+00	4.2E+03	RBSLc	Yes	No
Soil Vapor	Sub-Slab	78-87-5	1,2-Dichloropropane	ug/m3	2.2E+01	2.4E+01	4.2E+02	2.4E+00	4.2E+01	RBSLc	Yes	No
Soil Vapor	Sub-Slab	108-67-8	1,3,5-Trimethylbenzene	ug/m3	1.0E+03	--	6.3E+02	--	6.3E+01	RBSLnc	Yes	Yes
Soil Vapor	Sub-Slab	106-46-7	1,4-Dichlorobenzene	ug/m3	1.1E+02	2.2E+01	8.3E+04	2.2E+00	8.3E+03	RBSLc	Yes	No
Soil Vapor	Sub-Slab	123-91-1	1,4-Dioxane	ug/m3	2.0E+02	3.2E+01	3.1E+05	3.2E+00	3.1E+04	RBSLc	Yes	No
Soil Vapor	Sub-Slab	540-84-1	2,2,4-Trimethylpentane	ug/m3	1.4E+05	--	1.1E+05	--	1.1E+04	RBSLnc	Yes	No
Soil Vapor	Sub-Slab	78-93-3	2-Butanone (Methyl Ethyl Ketone)	ug/m3	2.1E+02	--	5.2E+05	--	5.2E+04	--	No	No
Soil Vapor	Sub-Slab	591-78-6	2-Hexanone	ug/m3	3.6E+02	--	3.1E+03	--	3.1E+02	RBSLnc	Yes	No
Soil Vapor	Sub-Slab	622-96-8	4-Ethyltoluene	ug/m3	1.3E+03	--	7.3E+04	--	7.3E+03	--	No	Yes
Soil Vapor	Sub-Slab	108-10-1	4-Methyl-2-Pentanone	ug/m3	1.4E+01	--	3.1E+05	--	3.1E+04	--	No	No
Soil Vapor	Sub-Slab	67-64-1	Acetone	ug/m3	1.3E+03	--	3.2E+06	--	3.2E+05	--	No	No
Soil Vapor	Sub-Slab	71-43-2	Benzene	ug/m3	6.2E+04	8.4E+00	6.3E+03	8.4E-01	6.3E+02	RBSLc, RBSLnc	Yes	Yes
Soil Vapor	Sub-Slab	75-27-4	Bromodichloromethane	ug/m3	3.7E+02	6.6E+00	7.3E+03	6.6E-01	7.3E+02	RBSLc	Yes	No
Soil Vapor	Sub-Slab	75-25-2	Bromoform	ug/m3	3.1E+00	2.2E+02	7.3E+03	2.2E+01	7.3E+02	--	No	No
Soil Vapor	Sub-Slab	74-83-9	Bromomethane	ug/m3	9.5E+01	--	5.2E+02	--	5.2E+01	RBSLnc	Yes	No
Soil Vapor	Sub-Slab	75-15-0	Carbon Disulfide	ug/m3	2.3E+02	--	8.3E+04	--	8.3E+03	--	No	No
Soil Vapor	Sub-Slab	56-23-5	Carbon Tetrachloride	ug/m3	9.9E+01	5.8E+00	4.2E+03	5.8E-01	4.2E+02	RBSLc	Yes	No
Soil Vapor	Sub-Slab	108-90-7	Chlorobenzene	ug/m3	4.8E+01	--	1.0E+05	--	1.0E+04	--	No	No
Soil Vapor	Sub-Slab	75-00-3	Chloroethane	ug/m3	6.6E+01	--	3.1E+06	--	3.1E+05	--	No	No
Soil Vapor	Sub-Slab	67-66-3	Chloroform	ug/m3	8.4E+03	4.6E+01	3.1E+04	4.6E+00	3.1E+03	RBSLc, RBSLnc	Yes	No
Soil Vapor	Sub-Slab	74-87-3	Chloromethane	ug/m3	2.0E+02	--	9.4E+03	--	9.4E+02	--	No	No
Soil Vapor	Sub-Slab	156-59-2	cis-1,2-Dichloroethene	ug/m3	1.3E+02	--	3.7E+03	--	3.7E+02	--	No	No
Soil Vapor	Sub-Slab	98-82-8	Cumene (Isopropylbenzene)	ug/m3	1.0E+02	--	4.2E+04	--	4.2E+03	--	No	Yes
Soil Vapor	Sub-Slab	110-82-7	Cyclohexane	ug/m3	1.4E+04	--	6.3E+05	--	6.3E+04	--	No	Yes
Soil Vapor	Sub-Slab	124-48-1	Dibromochloromethane	ug/m3	1.1E+02	9.0E+00	7.3E+03	9.0E-01	7.3E+02	RBSLc	Yes	No
Soil Vapor	Sub-Slab	64-17-5	Ethanol	ug/m3	1.6E+03	--	4.2E+05	--	4.2E+04	--	No	No
Soil Vapor	Sub-Slab	100-41-4	Ethylbenzene	ug/m3	5.3E+03	9.7E+01	2.1E+05	9.7E+00	2.1E+04	RBSLc	Yes	Yes

Table 4-6
Soil Vapor Constituent of Concern Screening
Former Kast Property
Carson, California

Matrix	Series	CAS Number	Chemical	Units	Maximum Concentration	RBSLc	RBSLnc	RBSLc × 0.1	RBSLnc × 0.1	COC Selection Rationale[2]	COC	Site-Related COC
Soil Vapor	Sub-Slab	75-69-4	Freon 11	ug/m3	7.2E+01	--	7.3E+04	--	7.3E+03	--	No	No
Soil Vapor	Sub-Slab	76-13-1	Freon 113	ug/m3	1.5E+02	--	3.1E+06	--	3.1E+05	--	No	No
Soil Vapor	Sub-Slab	75-71-8	Freon 12	ug/m3	1.2E+02	--	2.1E+04	--	2.1E+03	--	No	No
Soil Vapor	Sub-Slab	142-82-5	Heptane	ug/m3	3.5E+03	--	7.3E+05	--	7.3E+04	--	No	Yes
Soil Vapor	Sub-Slab	110-54-3	Hexane	ug/m3	7.5E+03	--	7.3E+05	--	7.3E+04	--	No	Yes
Soil Vapor	Sub-Slab	67-63-0	Isopropanol	ug/m3	1.7E+04	--	7.3E+05	--	7.3E+04	--	No	No
Soil Vapor	Sub-Slab	75-09-2	Methylene Chloride	ug/m3	2.8E+04	2.4E+02	4.2E+04	2.4E+01	4.2E+03	RBSLc, RBSLnc	Yes	No
Soil Vapor	Sub-Slab	1634-04-4	Methyl-tert-Butyl Ether	ug/m3	4.4E+02	9.4E+02	8.3E+05	9.4E+01	8.3E+04	RBSLc	Yes	No
Soil Vapor	Sub-Slab	91-20-3	Naphthalene	ug/m3	2.6E+02	7.2E+00	9.4E+02	7.2E-01	9.4E+01	RBSLc, RBSLnc	Yes	Yes
Soil Vapor	Sub-Slab	95-47-6	o-Xylene	ug/m3	1.9E+02	--	7.3E+04	--	7.3E+03	--	No	Yes
Soil Vapor	Sub-Slab	1330-20-7-1	p/m-Xylene	ug/m3	5.2E+03	--	7.3E+04	--	7.3E+03	--	No	Yes
Soil Vapor	Sub-Slab	103-65-1	Propylbenzene	ug/m3	2.8E+02	--	1.5E+04	--	1.5E+03	--	No	Yes
Soil Vapor	Sub-Slab	100-42-5	Styrene	ug/m3	2.0E+01	--	9.4E+04	--	9.4E+03	--	No	No
Soil Vapor	Sub-Slab	127-18-4	Tetrachloroethene	ug/m3	9.5E+02	4.1E+01	3.7E+03	4.1E+00	3.7E+02	RBSLc, RBSLnc	Yes	No
Soil Vapor	Sub-Slab	109-99-9	Tetrahydrofuran	ug/m3	7.7E+01	1.3E+02	3.1E+04	1.3E+01	3.1E+03	RBSLc	Yes	No
Soil Vapor	Sub-Slab	108-88-3	Toluene	ug/m3	1.8E+03	--	3.1E+04	--	3.1E+03	--	No	Yes
Soil Vapor	Sub-Slab	156-60-5	trans-1,2-Dichloroethene	ug/m3	1.2E+01	--	6.3E+03	--	6.3E+02	--	No	No
Soil Vapor	Sub-Slab	10061-02-6	trans-1,3-Dichloropropene	ug/m3	8.4E+00	1.5E+01	2.1E+03	1.5E+00	2.1E+02	RBSLc	Yes	No
Soil Vapor	Sub-Slab	79-01-6	Trichloroethene	ug/m3	7.2E+02	1.2E+02	6.3E+04	1.2E+01	6.3E+03	RBSLc	Yes	No
Soil Vapor	Sub-Slab	120-82-1	1,2,4-Trichlorobenzene	ug/m3	1.3E+03	--	4.2E+02	--	4.2E+01	RBSLnc	Yes	No
Soil Vapor	Sub-Slab	106-99-0	1,3-Butadiene	ug/m3	2.2E+00	1.4E+00	2.1E+03	1.4E-01	2.1E+02	RBSLc	Yes	No
Soil Vapor	Sub-Slab	75-35-4	1,1-Dichloroethene	ug/m3	1.8E+01	--	7.3E+03	--	7.3E+02	--	No	No
Soil Vapor	Sub-Slab	541-73-1	1,3-Dichlorobenzene	ug/m3	3.6E+01	--	1.1E+04	--	1.1E+03	--	No	No
Soil Vapor	Sub-Slab	76-14-2	Freon 114	ug/m3	2.7E+01	--	3.1E+06	--	3.1E+05	--	No	No
Soil Vapor	Sub-Slab	75-01-4	Vinyl Chloride	ug/m3	2.7E+01	3.1E+00	1.0E+04	3.1E-01	1.0E+03	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	71-55-6	1,1,1-Trichloroethane	ug/m3	6.2E+00	--	1.0E+05	--	1.0E+04	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	79-34-5	1,1,2,2-Tetrachloroethane	ug/m3	9.0E+03	4.2E+00	1.5E+03	4.2E-01	1.5E+02	RBSLc, RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	79-00-5	1,1,2-Trichloroethane	ug/m3	7.1E+00	1.5E+01	1.5E+03	1.5E+00	1.5E+02	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-34-3	1,1-Dichloroethane	ug/m3	2.0E+02	1.5E+02	7.3E+04	1.5E+01	7.3E+03	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-35-4	1,1-Dichloroethene	ug/m3	1.8E+00	--	7.3E+03	--	7.3E+02	--	No	No

Table 4-6
Soil Vapor Constituent of Concern Screening
Former Kast Property
Carson, California

Matrix	Series	CAS Number	Chemical	Units	Maximum Concentration	RBSLc	RBSLnc	RBSLc × 0.1	RBSLnc × 0.1	COC Selection Rationale[2]	COC	Site-Related COC
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-37-6	1,1-Difluoroethane	ug/m3	1.5E+01	--	--	--	--	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	95-63-6	1,2,4-Trimethylbenzene	ug/m3	9.9E+05	--	7.3E+02	--	7.3E+01	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	107-06-2	1,2-Dichloroethane	ug/m3	1.7E+03	1.2E+01	4.2E+04	1.2E+00	4.2E+03	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	108-67-8	1,3,5-Trimethylbenzene	ug/m3	4.5E+05	--	6.3E+02	--	6.3E+01	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	106-46-7	1,4-Dichlorobenzene	ug/m3	1.7E+02	2.2E+01	8.3E+04	2.2E+00	8.3E+03	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	540-84-1	2,2,4-Trimethylpentane	ug/m3	1.4E+01	--	1.1E+05	--	1.1E+04	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	78-93-3	2-Butanone (Methyl Ethyl Ketone)	ug/m3	1.6E+05	--	5.2E+05	--	5.2E+04	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	591-78-6	2-Hexanone	ug/m3	1.6E+04	--	3.1E+03	--	3.1E+02	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	622-96-8	4-Ethyltoluene	ug/m3	4.4E+05	--	7.3E+04	--	7.3E+03	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	108-10-1	4-Methyl-2-Pentanone	ug/m3	1.6E+01	--	3.1E+05	--	3.1E+04	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	67-64-1	Acetone	ug/m3	2.4E+05	--	3.2E+06	--	3.2E+05	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	71-43-2	Benzene	ug/m3	3.8E+06	8.4E+00	6.3E+03	8.4E-01	6.3E+02	RBSLc, RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-27-4	Bromodichloromethane	ug/m3	1.2E+04	6.6E+00	7.3E+03	6.6E-01	7.3E+02	RBSLc, RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	74-83-9	Bromomethane	ug/m3	1.4E+00	--	5.2E+02	--	5.2E+01	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-15-0	Carbon Disulfide	ug/m3	1.7E+05	--	8.3E+04	--	8.3E+03	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	108-90-7	Chlorobenzene	ug/m3	5.9E+00	--	1.0E+05	--	1.0E+04	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-00-3	Chloroethane	ug/m3	6.7E+00	--	3.1E+06	--	3.1E+05	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	67-66-3	Chloroform	ug/m3	3.7E+02	4.6E+01	3.1E+04	4.6E+00	3.1E+03	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	74-87-3	Chloromethane	ug/m3	9.8E+01	--	9.4E+03	--	9.4E+02	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	156-59-2	cis-1,2-Dichloroethene	ug/m3	6.9E+02	--	3.7E+03	--	3.7E+02	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	98-82-8	Cumene (Isopropylbenzene)	ug/m3	3.1E+04	--	4.2E+04	--	4.2E+03	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	110-82-7	Cyclohexane	ug/m3	2.7E+06	--	6.3E+05	--	6.3E+04	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	64-17-5	Ethanol	ug/m3	5.4E+04	--	4.2E+05	--	4.2E+04	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	100-41-4	Ethylbenzene	ug/m3	1.8E+06	9.7E+01	2.1E+05	9.7E+00	2.1E+04	RBSLc, RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-69-4	Freon 11	ug/m3	1.9E+01	--	7.3E+04	--	7.3E+03	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	76-13-1	Freon 113	ug/m3	2.0E+02	--	3.1E+06	--	3.1E+05	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-71-8	Freon 12	ug/m3	2.1E+02	--	2.1E+04	--	2.1E+03	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	142-82-5	Heptane	ug/m3	1.0E+06	--	7.3E+05	--	7.3E+04	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	87-68-3	Hexachloro-1,3-Butadiene	ug/m3	2.0E+03	1.1E+01	3.7E+02	1.1E+00	3.7E+01	RBSLc, RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	110-54-3	Hexane	ug/m3	1.9E+06	--	7.3E+05	--	7.3E+04	RBSLnc	Yes	Yes

Table 4-6
Soil Vapor Constituent of Concern Screening
Former Kast Property
Carson, California

Matrix	Series	CAS Number	Chemical	Units	Maximum Concentration	RBSLc	RBSLnc	RBSLc x 0.1	RBSLnc x 0.1	COC Selection Rationale[2]	COC	Site-Related COC
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	67-63-0	Isopropanol	ug/m3	4.5E+05	--	7.3E+05	--	7.3E+04	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-09-2	Methylene Chloride	ug/m3	7.3E+03	2.4E+02	4.2E+04	2.4E+01	4.2E+03	RBSLc, RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	1634-04-4	Methyl-tert-Butyl Ether	ug/m3	2.8E+03	9.4E+02	8.3E+05	9.4E+01	8.3E+04	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	91-20-3	Naphthalene	ug/m3	5.2E+03	7.2E+00	9.4E+02	7.2E-01	9.4E+01	RBSLc, RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	95-47-6	o-Xylene	ug/m3	2.1E+04	--	7.3E+04	--	7.3E+03	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	1330-20-7-1	p/m-Xylene	ug/m3	1.7E+05	--	7.3E+04	--	7.3E+03	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	103-65-1	Propylbenzene	ug/m3	3.7E+04	--	1.5E+04	--	1.5E+03	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	100-42-5	Styrene	ug/m3	5.9E+03	--	9.4E+04	--	9.4E+03	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	75-65-0	tert-Butyl Alcohol (TBA)	ug/m3	1.4E+02	--	1.1E+03	--	1.1E+02	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	127-18-4	Tetrachloroethene	ug/m3	5.3E+03	4.1E+01	3.7E+03	4.1E+00	3.7E+02	RBSLc, RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	109-99-9	Tetrahydrofuran	ug/m3	1.2E+01	1.3E+02	3.1E+04	1.3E+01	3.1E+03	--	No	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	108-88-3	Toluene	ug/m3	3.7E+06	--	3.1E+04	--	3.1E+03	RBSLnc	Yes	Yes
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	156-60-5	trans-1,2-Dichloroethene	ug/m3	5.6E+03	--	6.3E+03	--	6.3E+02	RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	10061-02-6	trans-1,3-Dichloropropene	ug/m3	6.5E+00	1.5E+01	2.1E+03	1.5E+00	2.1E+02	RBSLc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	79-01-6	Trichloroethene	ug/m3	6.6E+03	1.2E+02	6.3E+04	1.2E+01	6.3E+03	RBSLc, RBSLnc	Yes	No
Soil Vapor	Non-Sub-Slab ≤10 ft bgs	108-05-4	Vinyl Acetate	ug/m3	5.1E+00	--	2.1E+04	--	2.1E+03	--	No	No

Notes:

-- not available or not applicable

ug/m3: microgram per cubic meter

COC when maximum Site-wide concentration exceeded 0.1 x Residential RBSL or background. Selection criterion or criteria are listed in this column.

Site-Related COCs may be related to site activities associated with crude oil storage prior to redevelopment

RBSLc = Risk-based Screening Level for carcinogenic effects; RBSLnc = Risk-based Screening Level for noncarcinogenic effects

Table 6-1
Site-Specific Cleanup Goals, Soil
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Background Threshold Value (BTV)[3] (mg/kg)	Soil Cleanup Goals[1] (mg/kg)		
			Onsite Resident		Construction and Utility Maintenance Worker
			EF = 350 d/y	EF = 4 d/y	
	Metals				
7440-36-0	Antimony	7.4E-01	3.1E+01	2.7E+03	3.1E+03
7440-38-2	Arsenic	1.2E+01	6.1E-02	5.4E+00	1.5E+01
7440-43-9	Cadmium	3.8E+00	7.0E+01	6.1E+03	2.4E+02
18540-29-9	Chromium VI	--	1.2E+00	1.1E+02	6.7E+00
7440-48-4	Cobalt	1.1E+01	2.3E+01	2.1E+03	1.1E+02
7440-50-8	Copper	5.9E+01	3.1E+03	*2.7E+05*	*3.1E+05*
7439-92-1	Lead	6.1E+01	8.0E+01	0.0E+00	1.2E+03
7440-28-0	Thallium	2.3E-01	7.8E-01	6.8E+01	7.7E+01
7440-62-2	Vanadium	4.6E+01	3.9E+02	3.4E+04	3.3E+03
7440-66-6	Zinc	2.9E+02	2.3E+04	*2.1E+06*	*2.3E+06*
	PAHs				
56-55-3	Benz[a]anthracene	--	1.6E+00	1.4E+02	2.6E+02
50-32-8	Benzo[a]pyrene	9.0E-01	1.6E-01	1.4E+01	2.6E+01
205-99-2	Benzo[b]fluoranthene	--	1.6E+00	1.4E+02	2.6E+02
207-08-9	Benzo[k]fluoranthene	--	1.6E+00	1.4E+02	2.6E+02
218-01-9	Chrysene	--	1.6E+01	1.4E+03	2.6E+03
53-70-3	Dibenz[a,h]anthracene	--	1.1E-01	9.7E+00	1.9E+01
193-39-5	Indeno[1,2,3-cd]pyrene	--	1.6E+00	1.4E+02	2.6E+02
90-12-0	Methylnaphthalene, 1-	--	1.6E+01	1.4E+03	2.7E+03
91-57-6	Methylnaphthalene, 2-	--	2.3E+02	2.0E+04	1.1E+04
91-20-3	Naphthalene	--	4.0E+00	3.5E+02	3.9E+01
129-00-0	Pyrene	--	1.7E+03	*1.5E+05*	6.7E+04
	TPH				
	TPHg	--	7.6E+02	*6.6E+04*	8.6E+02
	TPHd	--	1.3E+03	*1.1E+05*	1.9E+03
	TPHmo	--	3.3E+03	*2.9E+05*	*1.6E+05*
	SVOCs				
121-14-2	2,4-Dinitrotoluene	--	1.6E+00	1.4E+02	2.8E+02
117-81-7	Bis(2-Ethylhexyl) Phthalate	--	3.5E+01	3.0E+03	6.4E+03
	VOCs				
79-34-5	1,1,2,2-Tetrachloroethane	--	4.7E-01	4.1E+01	5.7E+00
96-18-4	1,2,3-Trichloropropane	--	2.1E-02	1.9E+00	2.0E+00
95-63-6	1,2,4-Trimethylbenzene	--	8.3E+01	*7.2E+03*	7.5E+01
78-87-5	1,2-Dichloropropane	--	8.3E-01	7.2E+01	8.5E+00
108-67-8	1,3,5-Trimethylbenzene	--	8.5E+01	*7.4E+03*	7.7E+01
106-46-7	1,4-Dichlorobenzene	--	2.8E+00	2.4E+02	2.8E+01
71-43-2	Benzene	--	2.2E-01	1.9E+01	2.2E+00
75-27-4	Bromodichloromethane	--	4.9E-01	4.2E+01	5.3E+00
74-83-9	Bromomethane	--	8.8E+00	7.7E+02	7.8E+00
100-41-4	Ethylbenzene	--	4.8E+00	4.2E+02	5.1E+01

Table 6-1
Site-Specific Cleanup Goals, Soil
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Background Threshold Value (BTV)[3] (mg/kg)	Soil Cleanup Goals[1] (mg/kg)		
			Onsite Resident		Construction and Utility Maintenance Worker
			EF = 350 d/y	EF = 4 d/y	
75-09-2	Methylene chloride	--	5.3E+00	4.7E+02	5.9E+01
127-18-4	Tetrachloroethene	--	5.5E-01	4.9E+01	1.0E+01
79-01-6	Trichloroethene	--	1.2E+00	1.0E+02	5.5E+00
75-01-4	Vinyl chloride	--	3.2E-02	2.8E+00	3.1E-01

Notes:

" -- " not applicable

1 See Section 6 for how these cleanup goals were developed.

2 See Section 4 for discussion of Constituents of Concern.

3 The higher value between the health-based SSCG and BTV will be selected as the cleanup goal

TPHg = Total Petroleum Hydrocarbons- gasoline range

TPHd = Total Petroleum Hydrocarbons- diesel range

TPHmo = Total Petroleum Hydrocarbons- motor oil range

4 Values in italics are above Csat, $1E10^{+5}$ or Cres

Table 6-2
Site-Specific Cleanup Goals for Soil Leaching to Groundwater
Former Kast Property
Carson, CA

Constituents of Concern	Site Specific Kd (L/kg)	Groundwater Quality Criterion (µg/L)	Source	Dilution Attenuation Factor (DAF)	Soil Cleanup Goals (mg/kg)
Site-related Soil COCs					
Arsenic	NM	10	MCL	6.2	1.8
Benzene	28	1.0	MCL	6.2	0.13
Naphthalene	1093	17	CDPH NL	6.2	88
TPH as Diesel	4119	200	ESL-nc	6.2	3900
TPH as Gasoline	374	410	ESL-nc	6.2	730
TPH as Motor Oil	6957	6200	ESL-nc	6.2	50,000 **
Non-site-related Soil COC					
1,2,3-Trichloropropane	NM	0.005	CDPH NL	6.2	0.000026
1,2-Dichloroethane	NM	0.5	MCL	6.2	0.0020
1,4-Dichlorobenzene	NM	5.0	MCL	6.2	0.077
Antimony	NM	6.0	MCL	6.2	1.7
cis-1,2-Dichloroethylene	NM	6	MCL	6.2	0.024
tert-Butyl Alcohol	NM	12	CDPH NL	6.2	0.049
Tetrachloroethene	NM	5.0	MCL	6.2	0.036
Thallium	NM	2.0	MCL	6.2	0.89
Trichloroethene	NM	5.0	MCL	6.2	0.020
Vinyl Chloride	NM	0.50	MCL	6.2	0.0020

Notes:

NM - Not measured

MCL - Maximum Contaminant Level.

ESL: San Francisco Bay Regional Water Quality Control Board Environmental Screening Levels, Groundwater Screening Levels for Drinking Water.

ESL -nc: ESL level based on non-cancer health effect.

CDPH NL - California Department of Public Health Notification Level.

** Calculated cleanup level exceeded the maximum immobile residual NAPL phase concentration of 53,067 mg/kg ($C_{res,soil}$), therefore $C_{res,soil}$ was used. Cres,soil obtained from: Brost, E.J. and Devaull, G.E., Non-Aqueous Phase Liquid (NAPL) Mobility Limits in Soil. American Petroleum Institute Research Bulletin No. 9. June 2000.

Table 7-1
Background Sources of Chemicals in Indoor Air
Former Kast Property
Carson, CA

Analyte	CAS Number	Common Sources[1,2,3]	Typical Value[4] (ug/m^3)	Max Value[5,6] (ug/m^3)
1,1,1-Trichloroethane	71-55-6	Automotive adhesive, lubricant, wood parquet adhesive, silicone lubricant, floor adhesive, furniture cleaner, horticulture spreader/sticker	1.9	150
1,1,2,2-Tetrachloroethane	79-34-5	Paint, pesticide, adhesives, lubricant	NR	NR
1,1,2-Trichloroethane	79-00-5	Electronics lubricant, automotive adhesive, glass cleaner	NR	NR
1,1-Dichloroethane	75-34-3	Air freshener	NR	0.9
1,2,4-Trimethylbenzene	95-63-6	Gasoline, paints, automotive parts cleaners, wood floor wax, pesticides	3.9	71
1,2-Dichloroethane	107-06-2	Molded plastic consumer products (e.g., toys and holiday decorations), Dorersol (Dexol Industries), home defense fogger (pepper spray)	0.04	1.1
1,3,5-Trimethylbenzene	108-67-8	Gasoline, paints, automotive parts cleaners, wood floor wax, pesticides	1.2	32
1,4-Dichlorobenzene	106-46-7	Mothballs, bathroom fresheners. A common fumigant for moths, molds and mildews; minor use for control of tree-boring insects	0.54	160
2-Butanone	78-93-3	Paint, automotive parts cleaners, adhesives	NR	NR
4-Methyl-2-Pentanone (MIBK)	108-10-1	Paint, shellac, dry erase marker	NR	NR
Acetone	67-64-1	Paints, laquers, paint thinners, adhesives, automotive parts cleaners, nail polish remover, air fresheners, super glue remover, household cleaners, pet care, foggers	36	670
Benzene	71-43-2	Gasoline, other petroluem products, natural gas, tobacco smoke, solvents	2.9	58
Bromodichloromethane [7]	75-27-4	Byproduct of municipal water chlorination process	0.027	8.7
Bromomethane	74-83-9	Byproduct of municipal water chlorination process	NR	2.8
Carbon Tetrachloride	56-23-5	Automotive trim/detail adhesive, Radio Shack plastic bonder, adhesive remover, byproduct of chemical bleach reacting with surfactants, auto brake cleaner, Clorox cleanup, Formula 44/40, Lysol toilet bowl cleaner with bleach	0.57	1.8
Chloroform	67-66-3	Byproduct of municipal water chlorination process, solvent (adhesive remover), Fix-a-Flat, Clorox Cleanup, Lysol toilet bowl cleaner with bleach	1.1	13
Chloromethane	74-87-3	Static guard, aerosol	NR	NR
Cyclohexane	110-87-7	Adhesive/glue, laquer thinner, degreaser, paint	0.62	NR
Ethanol	64-17-5	Paints, cleaners, air fresheners, adhesives, windshield treatment/glass cleaners, soaps/detergents, aerosol sprays, personal care products, insecticides, pet care products, beverages	NR	NR
Ethylbenzene	100-41-4	Gasoline, other petroluem products, paints, degreaser, pesticides	2.3	48
Freon 11	75-69-4	Refrigerant, electronics cleaner (flux stripper)	NR	NR
Freon 113	76-13-1	Refrigerant, solvent	NR	7
Freon 12	75-71-8	Refrigerant	NR	NR

Table 7-1
Background Sources of Chemicals in Indoor Air
Former Kast Property
Carson, CA

Analyte	CAS Number	Common Sources[1,2,3]	Typical Value[4] (ug/m^3)	Max Value[5,6] (ug/m^3)
Heptane	142-82-5	Gasoline, other petroleum products, adhesive, laquer, automotive cleaner and lubricant, water repellant, pesticide	1.1	NR
Hexane	110-54-3	Gasoline, other petroleum products, adhesive, automotive parts cleaner, solvent, flea treatment for pets	1.8	NR
Isopropanol	67-63-0	Personal care products, paints, adhesive, cleaning products, water repellant, automotive parts cleaner, ink cartridges, household cleaning products	NR	NR
Methylene Chloride	75-09-2	Automotive cleaner/lubricant/degreaser, adhesive and paint remover, herbicide	4.9	260
Naphthalene	91-20-3	Gasoline, other petroluem products, mothballs, automotive parts cleaner, paint, herbicide, pesticide	0.47	5.0
n-Propylbenzene	103-65-1	Gasoline, other petroleum products	0.54	17
o-Xylene	95-47-6	Gasoline, other petroleum products, paint, automotive parts cleaner, adhesive, pesticide, pet care products	2.2	61
p/m-Xylene	1330-20-7-1	Gasoline, other petroleum products, paint, automotive parts cleaner, adhesive, pesticide, pet care products	5.7	290
Styrene	100-42-5	Gasoline, other petroleum products, automotive care, adhesive	0.98	23
Tetrachloroethene	127-18-4	Dry cleaner solvent, adhesive, automotive parts cleaner/degreaser/lubricant, stain remover, garage door lubricant, gutter seal, electrical parts, Gunk cleaner/lubricants, Shoo Goo, tire inflator and sealer, windshield cleaner	0.95	47
Tetrahydrofuran	109-99-9	Solvent, primer, cement,	2.1 [6]	180
Toluene	108-88-3	Gasoline, other petroleum products, paints, adhesives, automotive parts cleaner, pesticide	12	180
Trichloroethene	79-01-6	Dry cleaner solvent, automotive parts-solvent cleaner/degreaser garage door lubricant, auto brake cleaner, fabric stain remover/cleaner, electronics cleaner, gun cleaner/lubricant, insecticide, pepper spray, rain and stain guard, rubber cement, leather finish, windshield cleaner	0.38	10

All concentrations reported in ug/m^3 (micrograms per cubic meter)

NR Not reported

1. Taken from NIH Household Products Database (http://householdproducts.nlm.nih.gov/index.htm)

2. Taken from ATSDR Toxic Substances Database (http://www.atsdr.cdc.gov/substances/index.asp)

3. Gorder and Dettenmaier. Department of Defense Hill Air Force Base, Detailed Indoor Air Characterization and Interior Source Identification by Portable GC/MS. AWMA, 30 September 2010 (http://events.awma.org/education/vapor-proceed.html)

4. "Best Estimate" average value from Hodgson and Levin, 2003. Volatile Organic Compounds in Indoor Air: A Review of Concentrations Measured in North America Since 1990, LBNL-51715, except as noted

5. Maximum value from Hodgson and Levin, 2003. Volatile Organic Compounds in Indoor Air: A Review of Concentrations Measured in North America Since 1990, LBNL-51716. When available geometric mean of maximum values reported among studies

6. Maximum values from USEPA, 2011 Background Indoor Air Concentrations of Volatile Organic Compounds in North American Residences (1990-2005): A Compilation of Statistics for Assessing Vapor Intrusion, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, EPA 530-R-10-001. June 2011.

7. Typical and maximum value for bromodichloromethane taken from USEPA 2010 Ambient Urban Air Database.

Table 7-2
Site-Specific Cleanup Goals, Soil Vapor
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Soil Vapor Cleanup Goals (μg/m³)[1]	
		Onsite Resident[3]	Construction and Utility Maintenance Worker[3]
71-55-6	1,1,1-Trichloroethane	5.2E+06	7.4E+09
79-34-5	1,1,2,2-Tetrachloroethane	4.2E+01	1.2E+05
79-00-5	1,1,2-Trichloroethane	1.5E+02	1.0E+05
75-34-3	1,1-Dichloroethane	1.5E+03	2.5E+07
120-82-1	1,2,4-Trichlorobenzene	2.1E+03	3.9E+05
95-63-6	1,2,4-Trimethylbenzene	7.3E+03	2.3E+06
107-06-2	1,2-Dichloroethane	1.2E+02	8.5E+05
78-87-5	1,2-Dichloropropane	2.4E+02	2.5E+06
108-67-8	1,3,5-Trimethylbenzene	7.3E+03	2.3E+06
106-99-0	1,3-Butadiene	1.4E+01	3.0E+05
106-46-7	1,4-Dichlorobenzene	2.2E+02	7.2E+05
123-91-1	1,4-Dioxane	3.2E+02	1.6E+05
540-84-1	2,2,4-Trimethylpentane	1.0E+06	6.5E+08
591-78-6	2-Hexanone	3.1E+04	7.9E+06
622-96-8	4-Ethyltoluene	1.0E+05	2.5E+07
71-43-2	Benzene	8.4E+01	1.0E+06
75-27-4	Bromodichloromethane	6.6E+01	7.8E+05
74-83-9	Bromomethane	5.2E+03	9.5E+06
75-15-0	Carbon disulfide	7.3E+05	1.4E+09
56-23-5	Carbon tetrachloride	5.8E+01	1.1E+06
67-66-3	Chloroform	4.6E+02	4.9E+06
74-87-3	Chloromethane	9.4E+04	1.7E+08
110-82-7	Cyclohexane	6.3E+06	1.8E+10
124-48-1	Dibromochloromethane	9.0E+01	8.8E+05
156-59-2	Dichloroethene, cis-1,2-	7.3E+03	8.3E+06
156-60-5	Dichloroethene, trans-1,2-	6.3E+04	9.3E+07
10061-02-6	Dichloropropene, trans-1,3-	1.5E+02	3.9E+06
64-17-5	Ethanol	4.2E+06	1.9E+08
100-41-4	Ethylbenzene	9.7E+02	7.0E+06
142-82-5	Heptane	7.3E+05	2.3E+09
87-68-3	Hexachloro-1,3-butadiene	1.1E+02	8.0E+04
110-54-3	Hexane	7.3E+05	1.7E+09
67-63-0	Isopropanol	7.3E+06	5.7E+08
98-82-8	Isopropylbenzene (cumene)	4.2E+05	1.5E+09
78-93-3	Methyl ethyl ketone (2-butanone)	5.2E+06	1.1E+09
75-09-2	Methylene chloride	2.4E+03	2.8E+07
1634-04-4	Methyl-tert-butyl ether	9.4E+03	6.5E+07
91-20-3	Naphthalene	7.2E+01	6.3E+04
103-65-1	Propylbenzene	1.0E+06	6.6E+08
75-65-0	tert-Butyl Alcohol (TBA)	1.1E+06	2.6E+08
127-18-4	Tetrachloroethene	4.1E+02	6.6E+06

Table 7-2
Site-Specific Cleanup Goals, Soil Vapor
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Soil Vapor Cleanup Goals (μg/m³)[1]	
		Onsite Resident[3]	Construction and Utility Maintenance Worker[3]
109-99-9	Tetrahydrofuran	2.1E+06	4.9E+08
108-88-3	Toluene	5.2E+06	3.7E+09
79-01-6	Trichloroethene	5.9E+02	2.0E+06
75-01-4	Vinyl chloride	3.1E+01	8.3E+05
108-38-3	Xylene, m-	1.0E+05	6.0E+07
95-47-6	Xylene, o-	1.0E+05	4.8E+07
106-42-3	Xylene, p-	1.0E+05	5.9E+07
	TPH		
	Aliphatic: C5-C8	7.3E+05	1.2E+09
	Aliphatic: C9-C18	3.1E+05	1.2E+08
	Aliphatic: C19-C32	--	--
	Aromatic: C6-C8	--	--
	Aromatic: C9-C16	5.2E+04	6.7E+06
	Aromatic: C17-C32	--	--
	OTHER		
	TPH Nuisance[4]	1.0E+02	1.0E+02

Note: " -- " not applicable or not available

1 See Section 7 for discussion of how these cleanup goals were derived. Residential SV SSCGs based on a conservative upper-bound estimate for a site-specific vapor intrusion attenuation factor, calculated for corrective action planning purposes.

2 See Section 4 for discussion of Constituents of Concern.

3 Value is lowest between noncancer and cancer endpoint, see Appendix A for all SSCGs to evaluate risk.

4 Value from the San Francisco Regional Water Quality Control Board Environmental Screening Levels (SFRWQCB, May 2013)

Table 8-1
Summary of Potential SSCGs for Groundwater
Former Kast Property
Carson, CA

Chemical Group	Chemical	Maximum On-Site Concentration Detected (µg/L)	Primary MCL (µg/L)	Secondary MCL, NL or ESL (µg/L	Background Concentration (µg/L)	Highest Available Upgradient Reported Concentrations[1] (µg/L)
TPH	Benzene	680	1	--	0	4600[2]/1.4[3]
	Naphthalene	82	--	17	0	17[2]
	tert-Butyl Alcohol (TBA)	250	--	12	0	390[2]/17[3]
	TPH- Gasoline	3,200	--	410	0	190[3]
	TPH- Diesel	3,000	--	200	0	700[3]
	TPH – Motor Oil	1,700	--	6,200	0	500[3]
Chlorinated	1,1-Dichloroethane	22	5	--	0	33[2]/33[3]
	1,1-Dichloroethene	33	6	--	0	35[2]/100[3]
	1,2,3-Trichloropropane	27	--	0.005	0	6.7[2]/4[3]
	1,2-Dichloroethane	6.1	0.5	--	0	65[2]/0.63[3]
	cis-1,2-Dichloroethene	510	6	--	0	4200[2]/230[3]
	Tetrachloroethene	260	5	--	0	9,200[2]/3.3[3]
	trans-1,2-Dichloroethene	120	10	--	0	45[2]
	Trichloroethene	400	5	--	0	5,500[2]/87[3]
	Vinyl Chloride	0.71	0.5	--	0	980[2]/0.91[3]
	1,4-Dichlorobenzene	11	5	--	0	4.3[3]
Trace Metals	Antimony	19.3	6	--	?	24.8[3]
	Thallium	4.24J	2	--	?	<5.4[3]
	Arsenic	900	10	--	?	38.8[3]
General Mineral	Iron	67,000	--	300	?	15,400[3]
	Manganese	2,550	--	50	?	3,300[3]
	Chloride	1,400 mg/L	--	500 mg/L	?	4,700 mg/L[3]
	Nitrate (as N)	14 mg/L	--	10 mg/L	?	3.1 mg/L[3]
	Total Dissolved Solids	3,320 mg/L	--	1,000 mg/L	?	9,700 mg/L[3]
	Specific Conductance	4,200 µS/cm	--	4,000 µs/cm	?	10,000 µs/cm[3]

1: Highest available concentration detected in upgradient wells located immediately west of the Site. Some concentrations may pre-date start of remediation operations on Turco property.
2: Maximum reported concentration in Turco monitoring well located adjacent to Site – Turco Wells: MW-1, MW-2, MW-3, MW-8, MW-11 S/D. MW-12 S/D and MW-13 S/D (Leymaster, 2013)
3: Maximum reported concentration in upgradient Site monitoring well MW-7.
µg/L: micrograms per liter
mg/L: milligrams per liter
MCL: State of Maximum Contaminant Level for drinking water
NL: Notification Level
ESL: Environmental Screening Levels – Non Cancerous, San Francisco Regional Water Quality Control Board, Region 2
µS/cm: microsimens per centimeter

Table 9-1
Remedial Alternative and Technological and Economic Feasibility Evaluation of Clean Up Goals
Former Kast Property
Carson, CA

CRITERIA		ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 3A	ALTERNATIVE 3B	ALTERNATIVE 4	ALTERNATIVE 4A	ALTERNATIVE 4B
		* Remove all site features. * Excavate entire site to remove impacted soils (excavation may locally extend to GW). * Limited removal or remediation of impacted GW. * MNA remedy for remaining GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	* Remove all site features. * Excavate upper 10 feet to remove impacted soils. * MNA remedy for remaining GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	* Excavate exposed soils and soils under residential hardscape[A] to 2 feet where HH350 goals are exceeded. * No excavation beneath streets. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	Same as Alt 3 except excavate to 5 feet.	Same as Alt 3 except excavate to 10 feet.	* Excavate exposed site soils from 0 to 2 feet where HH350 goals are exceeded at residential properties. * No excavation beneath residential hardscape [A], streets and sidewalks. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	Same as Alt 4 except excavate exposed soils to 5 feet.	Same as Alt 4 except excavate exposed soils to 10 feet.
Cleanup Goal Achieved[B]	Soil - Groundwater Protection[C]	All soils at site	Upper 10 ft	Upper 2 ft of exposed/res. hardscape areas	Upper 5 ft (where poss.) of exposed/res. Hardscape areas	Upper 10 ft (where poss.) of exposed/res. Hardscape areas	Upper 2 ft of exposed areas	Upper 5 ft (where possible) of exposed areas	Upper 10 feet (where possible) of exposed areas
	Soil - Human Health 350 d/yr or Background	All soils at site	Upper 10 ft	Upper 2 ft of exposed/res. hardscape areas	Upper 5 ft (where poss.) of exposed/res. Hardscape areas	Upper 10 ft (where poss.) of exposed/res. Hardscape areas	Upper 2 ft of exposed areas	Upper 5 ft (where possible) of exposed areas	Upper 10 feet (where possible) of exposed areas
	Soil - Human Health 4 d/yr	All soils at site	All soils at site	All soils at site	All soils at site	All soils at site	All soils at site	All soils at site	All soils at site
	Soil - Nuisance	All soils at site	Upper 10 ft	Upper 2 ft of exposed/res. hardscape areas	Upper 5 ft (where poss.) of exposed/res. Hardscape areas	Upper 10 ft (where poss.) of exposed/res. Hardscape areas	Upper 2 ft of exposed areas	Upper 5 ft (where possible) of exposed areas	Upper 10 feet (where possible) of exposed areas
	Soil Vapor - Vapor Intrusion	Yes	Yes	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation
	Soil Vapor - Nuisance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Soil Vapor - Methane	Yes	Yes	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation	Yes through subslab mitigation
	Groundwater - Background	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed
	Groundwater - MCLs	Meets in medium to long term assuming upgradient sources addressed	Meets in medium to long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed
	LNAPL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Implementability		Very Difficult 225 homes and all roads/utilities removed. Debris hauling = ~1,000 trucks Soil removal = ~320,000 trucks Import fill = ~180,000 trucks Significant engineering challenges (supporting railroad ROW, shoring, other). Estimated remedial implementation time - 4-1/2 years	Very Difficult 285 homes and all roads/utilities removed. Debris hauling = ~1,000 trucks Soil removal = ~80,000 trucks Import fill = ~70,000 trucks Significant engineering challenges (supporting railroad ROW, shoring, other). Estimated remedial implementation time - 2-1/2 years ICs for soils below 10 feet	Moderate ~100 homes require excavation. Soil removal = ~3,900 trucks Import fill = ~2,000 trucks Subslab mitigation on ~30 homes Hardscape replaced "in kind." Estimated remedial implementation time - 2-1/2 years ICs required to address residual COCs beneath homes, and/or depths >2 ft bgs	Moderate-Difficult ~190 homes require excavation. Soil removal = ~4,500 trucks Import fill = ~9,000 trucks Subslab mitigation on ~30 homes Hardscape replaced "in kind." Estimated remedial implementation time - 8 years No excavation around public water supply lines. ICs required to address residual COCs beneath homes, and/or depths >5 ft bgs	Very Difficult ~210 homes require excavation. Soil removal = ~18,500 trucks Import fill = ~19,500 trucks Subslab mitigation on ~30 homes Hardscape replaced "in kind." Estimated remedial implementation time - 14 years No excavation around public water supply lines. ICs required to address residual COCs beneath homes, and/or depths >10 ft bgs.	Moderate ~300 homes require excavation. Soil removal = ~320 trucks Import fill = ~550 trucks Subslab mitigation on ~30 homes Estimated remedial implementation time - 2 years ICs required to address residual COCs beneath hardscape, homes, and/or depths >2 ft bgs	Moderate-Difficult ~190 homes require excavation. Soil removal = ~3,900 trucks Import fill = ~4,200 trucks Subslab mitigation on ~30 homes Estimated remedial implementation time - 7 years No excavation around public water supply lines. ICs required to address residual COCs beneath hardscape, homes, and/or depths >5 ft bgs	Very Difficult ~210 homes require excavation. Soil removal = ~8,800 trucks Import fill = ~9,000 trucks Subslab mitigation on ~30 homes Estimated remedial implementation time - 10 years No excavation around public water supply lines. ICs required to address residual COCs beneath hardscape, homes, and/or depths >10 ft bgs
Environmental Considerations		Long Term: Meet RAOs for Site Short Term: Potentially significant impacts: - Air quality (emissions from excavation equipment and 250,000 truck trips for both adjacent community health risks and greenhouse gas issues etc.) - Noise - Traffic Will be difficult or impossible to permit under CEQA.	Long Term: Meet RAOs for Site Short Term: Potentially significant impacts: - Air quality (emissions from excavation equipment and 130,000 truck trips, greenhouse gas issues etc.) - Noise - Traffic Will be difficult or impossible to permit under CEQA	Long Term: Meet RAOs for Site Short Term: Potentially significant short-term impacts to community (noise, air quality, traffic, water service interruption). Mitigatable based on pilot test results.	Long Term: Meet RAOs for Site Short Term: Potentially significant short-term impacts to community (noise, air quality, traffic). Mitigatable based on pilot test results.	Long Term: Meet RAOs for Site Short Term: Potentially significant short-term impacts to community (noise, air quality, traffic). Partially mitigatable based on pilot test results.	Long Term: Meet RAOs for Site Short Term: Potentially significant short-term impacts to community (noise, air quality, traffic). Mitigatable based on pilot test results.	Long Term: Meet RAOs for Site Short Term: Potentially significant short-term impacts to community (noise, air quality, traffic). Mitigatable based on pilot test results.	Long Term: Meet RAOs for Site Short Term: Potentially significant short-term impacts to community (noise, air quality, traffic). Partially mitigatable based on pilot test results.

Table 9-1
Remedial Alternative and Technological and Economic Feasibility Evaluation of Clean Up Goals
Former Kast Property
Carson, CA

CRITERIA		ALTERNATIVE 1 * Remove all site features. * Excavate entire site to remove impacted soils (excavation may locally extend to GW). * Limited removal or remediation of impacted GW. * MNA remedy for remaining GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	ALTERNATIVE 2 * Remove all site features. * Excavate upper 10 feet to remove impacted soils. * MNA remedy for remaining GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	ALTERNATIVE 3 * Excavate exposed soils and soils under residential hardscape[A] to 2 feet where HH350 goals are exceeded. * No excavation beneath streets. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	ALTERNATIVE 3A Same as Alt 3 except excavate to 5 feet.	ALTERNATIVE 3B Same as Alt 3 except excavate to 10 feet.	ALTERNATIVE 4 * Excavate exposed site soils from 0 to 2 feet where HH350 goals are exceeded at residential properties. * No excavation beneath residential hardscape[A], streets and sidewalks. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	ALTERNATIVE 4A Same as Alt 4 except excavate exposed soils to 5 feet.	ALTERNATIVE 4B Same as Alt 4 except excavate exposed soils to 10 feet.
Reduction of Toxicity, Mobility, and Volume		High. All COCs in soil/soil vapor removed. Source removal facilitates GW restoration.	High. All COCs in soil/soil vapor removed in upper 10 feet. Source removal facilitates GW restoration.	High for exposed soils in upper 2 feet. None for remaining soils. Moderate to high reduction in mobility for potential soil vapor intrusion to indoor air. Low for GW.	Moderate to high for soils in upper 5 feet. Cannot remove all soils to 5 feet due to setback and sloping requirements. None for remaining soils. Moderate to high reduction in mobility for potential soil vapor intrusion to indoor air. Low for GW.	Moderate for soils in upper 10 feet due to limited amount of soil removal possible at depth due to setback and sloping requirements and equipment access limitations. None for remaining soils. Moderate to high reduction in mobility for potential soil vapor intrusion to indoor air.	High for soils in upper 2 feet. None for remaining soils. Moderate to high reduction in mobility for potential soil vapor intrusion to indoor air. Low for GW.	Moderate to high for exposed soils in upper 5 feet. Cannot remove all soils to 5 feet due to setback and sloping requirements. None for remaining soils. Moderate to high reduction in mobility for potential soil vapor intrusion to indoor air. Low for GW.	Low for exposed soils in upper 10 feet; limited amount of soil removal possible at depth due to setback and sloping requirements and equipment access limitations. None for remaining soils. Moderate to high reduction in mobility for potential soil vapor intrusion to indoor air.
Social Considerations		Significant long-term impact to the community and environment: - Elimination of an existing community - Significant disruption to surrounding community - Loss of tax base in community	Significant long term impact to the community and environment: - Elimination of an existing community - Significant disruption to surrounding community - Loss of tax base in community	Potentially significant short-term disruption to the community. Greater community short-term disruption due to removal/replacement of hardscape. No long-term loss of tax base.	Potentially significant short-term disruption to the community. Greater community short-term disruption due to larger soil volume excavated and removal/replacement of hardscape. No long-term loss of tax base.	Potentially significant short-term disruption to the community. Greater community short-term disruption due to larger soil volume excavated and removal/replacement of hardscape. No long-term loss of tax base.	Potentially significant short-term disruption to the community. No long-term loss of tax base.	Potentially significant short-term disruption to the community. Greater community short-term disruption due to larger soil volume excavated. No long-term loss of tax base.	Potentially significant short-term disruption to the community. Greater community short-term disruption due to larger soil volume excavated. No long-term loss of tax base.
Other Issues		Reservoir slabs removed.	Reservoir slabs removed.	Requires soil IC. Reservoir slabs remain in place.	Requires soil IC. Reservoir slabs remain in place.	Requires soil IC. Limited reservoir slab removal.	Requires soil IC. Reservoir slabs remain in place.	Requires soil IC. Reservoir slabs remain in place.	Requires soil IC. Limited reservoir slab removal.
Cost Range		Very High. $190MM to $630MM	Very High. $190MM to $410MM	Moderate. $22MM to $46MM	High. $60MM to $130MM Higher than Alt 3	Very High. $110MM to $240MM Higher than Alt 3A	Moderate. $15MM to $32MM	Moderate-High. $42MM to $90MM Higher than Alt 4	Very High. $67MM to $100MM Higher than Alt 4A

Notes:
A. Residential hardscape defined as driveways, city sidewalks, patios, walkways etc. on a residential property only. Excludes city streets.
B. Cleanup goals defined in Tables 6-1, 6-2, 7-2, and 8-1
3. HH350 - Frequent residential contact 350 days/year; HH4 - Infrequest residential contact 4 days/year

Table 9-1
Remedial Alternative and Technological and Economic Feasibility Evaluation of Clean Up Goals
Former Kast Property
Carson, CA

CRITERIA		ALTERNATIVE 5 * Remove all site features and cap site. * Remove LNAPL as feasible. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	ALTERNATIVE 6 * Cap all areas of exposed soil at the site. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening values. * Remove LNAPL as feasible. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	ALTERNATIVE 7 Add limited SVE to reduce VOC/TPH mass for Alternatives 2 through 6
Cleanup Goal Achieved[8]	Soil - Groundwater Protection[c]	No	No	Maybe, locally
	Soil - Human Health 330 d/yr or Background	No	No	Maybe, locally
	Soil - Human Health 4 d/yr	All soils at site	All soils at site	All soils at site
	Soil - Nuisance	All soils at site	All soils at site	Not Applicable
	Soil Vapor - Vapor Intrusion	No, but no receptors	Yes through subslab mitigation	Maybe, locally
	Soil Vapor - Nuisance	Yes	Yes	Yes
	Soil Vapor - Methane	No, but no receptors	Yes through subslab mitigation	Maybe, locally
	Groundwater - Background	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in medium to long term assuming upgradient sources addressed
	Groundwater - MCLs	Meets in long term assuming upgradient sources addressed	Meets in long term assuming upgradient sources addressed	Meets in medium to long term assuming upgradient sources addressed
	LNAPL	Yes	Yes	No
Implementability		Very Difficult 285 homes and all roads and most utilities removed. Engineered cap likely requires some excavation and import of materials. Debris hauling = ~1,500 trucks Soil removal = 0 trucks Import fill = ~11,000 trucks Estimated remedial implementation time - <1 year ICs required for soil	Moderate Replace all affected exposed areas with hardscape or equivalent. Could expand to all exposed areas of the site to address groundwater protection level for soil. Subslab mitigation on ~30 homes Estimated remedial implementation time - 1-1/2 years ICs required for soil	Moderate to Very Difficult Difficulty dependent on number and location of extraction wells and treatment systems. Objective to remove VOC/TPH/Methane mass from high concentration areas of site (need to define) Assume 1-3 blower/treatment systems required each with 5-25 associated extraction wells, assume requires home purchase to house blowers/treatment equipment. Will require significant permitting effort with AQMD; may not be permittable in residential area.
Environmental Considerations		Long Term: Meet RAOs for Site Short Term: Potentially significant impacts: - Air quality (emissions from excavation equipment and 12,000 truck trips, greenhouse gas issues etc.) - Noise - Traffic	Long Term: Meet RAOs for Site Short Term: Short-term impacts to community during implementation (noise, air quality, traffic). Potentially significant increase in runoff, could result in need to upgrade stormwater system.	Long Term: Meet RAOs for Site Short Term: Potentially significant short-term impacts to community from system installation (noise, air quality, traffic). Depending on length of time system operates, long-term impacts from noise.

Table 9-1
Remedial Alternative and Technological and Economic Feasibility Evaluation of Clean Up Goals
Former Kast Property
Carson, CA

CRITERIA		ALTERNATIVE 5 * Remove all site features and cap site. * Remove LNAPL as feasible. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	ALTERNATIVE 6 * Cap all areas of exposed soil at the site. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening values. * Remove LNAPL as feasible. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	ALTERNATIVE 7 Add limited SVE to reduce VOC/TPH mass for Alternatives 2 through 6
Reduction of Toxicity, Mobility, and Volume		Low for HH goals in soils, however exposure pathways eliminated. Low for soil vapor. High reduction in mobility of COCs to GW (limits leaching by controlling infiltration).	Low, however exposure pathways eliminated and potential for infiltration and leaching to GW greatly reduced.	Low. Will remove VOC/TPH mass, but likely not to cleanup goals especially for medium and long chain hydrocarbons. Some effect on methane reduction. Mass reduction hastens GW restoration.
Social Considerations		Significant long-term impact to the community and environment: - Elimination of an existing community - Significant disruption to surrounding community - Loss of tax base in community.	Potentially significant short-term impact to community during construction. Residents would lose existing landscaping; future landscaping would need to be above cap in planter boxes.	Potentially significant short-term disruption to the community during system installation (well drilling, trenching for piping). No long-term loss of tax base.
Other Issues		Requires soil IC. Reservoir slabs remain in place. Future site use limited due to need to maintain cap.	Requires soil IC and long-term soil management plan. Reservoir slabs remain in place. Future site use limited due to need to maintain cap.	No effect on reservoir slabs.
Cost Range		Very High. $91MM to $200MM	Moderate. $13MM to $28MM	Moderate. $7MM to $15MM (Cost is additive to Alts. 2, 3, 4, 5 and 6.)

Notes:
A. Residential hardscape defined as driveways, city sidewalks, patios, walkways etc. on a residential property only. Excludes city streets.
B. Cleanup goals defined in Tables 6-1, 6-2, 7-2, and 8-1
9. HH350 - Frequent residential contact 350 days/year; HH4 - Infrequent residential contact 4 days/year

Table 9-2
Site-Specific Cleanup Goals, Soil
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Soil Cleanup Goals[1] (mg/kg)					
		Excavated Areas				Non-excavated Areas	
		EF = 350 d/y[3]	Basis[4]	Soil Leaching to GW[3]	Basis[4,5]	EF = 4 d/y[3]	Basis[4,5]
	Inorganics						
7440-36-0	Antimony	3.1E+01		1.7E+00		2.7E+03	
7440-38-2	Arsenic	1.2E+01	BKG	1.2E+01	BKG	1.2E+01	BKG
7440-43-9	Cadmium	7.0E+01		--		6.1E+03	
18540-29-9	Chromium VI	1.2E+00		--		1.1E+02	
7440-48-4	Cobalt	2.3E+01		--		2.1E+03	
7440-50-8	Copper	3.1E+03		--		2.7E+05	
7439-92-1	Lead	8.0E+01		--		8.0E+02	
7440-28-0	Thallium	7.8E-01		8.9E-01		6.8E+01	
7440-62-2	Vanadium	3.9E+02		--		3.4E+04	
7440-66-6	Zinc	2.3E+04		--		2.1E+06	
	PAHs						
56-55-3	Benz[a]anthracene	1.6E+00		--		1.4E+02	
50-32-8	Benzo[a]pyrene	9.0E-01	BKG	--		1.4E+01	
205-99-2	Benzo[b]fluoranthene	1.6E+00		--		1.4E+02	
207-08-9	Benzo[k]fluoranthene	1.6E+00		--		1.4E+02	
218-01-9	Chrysene	1.6E+01		--		1.4E+03	
53-70-3	Dibenz[a,h]anthracene	1.1E-01		--		9.7E+00	
193-39-5	Indeno[1,2,3-cd]pyrene	1.6E+00		--		1.4E+02	
90-12-0	Methylnaphthalene, 1-	1.6E+01		--		1.4E+03	
91-57-6	Methylnaphthalene, 2-	2.3E+02		--		2.0E+04	
91-20-3	Naphthalene	4.0E+00		8.8E+01		3.5E+02	
129-00-0	Pyrene	1.7E+03		--		1.5E+05	
	TPH						
	TPHg	7.6E+02		7.3E+02		4.1E+04	Cres
	TPHd	1.3E+03		3.9E+03		3.4E+04	Cres
	TPHmo	3.3E+03		5.0E+04	Cres	5.0E+04	Cres
	SVOCs						
121-14-2	2,4-Dinitrotoluene	1.6E+00		--		1.4E+02	
117-81-7	Bis(2-Ethylhexyl) Phthalate	3.5E+01		--		3.0E+03	
	VOCs						
79-34-5	1,1,2,2-Tetrachloroethane	4.7E-01		--		4.1E+01	
	Cis-1,2-Dichloroethene	--		2.4E-02		--	
	1,2-Dichloroethane	--		2.0E-03		--	
96-18-4	1,2,3-Trichloropropane	2.1E-02		2.6E-05		1.9E+00	
95-63-6	1,2,4-Trimethylbenzene	8.3E+01				7.2E+03	
78-87-5	1,2-Dichloropropane	8.3E-01				7.2E+01	
108-67-8	1,3,5-Trimethylbenzene	8.5E+01				7.4E+03	
106-46-7	1,4-Dichlorobenzene	2.6E+00		7.7E-02		2.4E+02	
71-43-2	Benzene	2.2E-01		1.3E-01		1.9E+01	

Table 9-2
Site-Specific Cleanup Goals, Soil
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Soil Cleanup Goals[1] (mg/kg)					
		Excavated Areas				Non-excavated Areas	
		EF = 350 d/y[3]	Basis[4]	Soil Leaching to GW[3]	Basis[4,5]	EF = 4 d/y[3]	Basis[4,5]
75-27-4	Bromodichloromethane	4.9E-01				4.2E+01	
74-83-9	Bromomethane	8.8E+00				7.7E+02	
100-41-4	Ethylbenzene	4.8E+00				4.2E+02	
75-09-2	Methylene chloride	5.3E+00				4.7E+02	
	tert-Butyl Alcohol	--		4.9E-02		--	
127-18-4	Tetrachloroethene	5.5E-01		3.6E-02		4.9E+01	
79-01-6	Trichloroethene	1.2E+00		2.0E-02		1.5E+02	
75-01-4	Vinyl chloride	3.2E-02		2.0E-03		2.8E+00	

Notes:

" -- " not applicable

1 See Sections 6 for discussion of how these cleanup goals were derived.

2 See Section 4 for discussion of Constituents of Concern.

3 Value is lowest between noncancer and cancer endpoint or highest beween background and risk-based SSCG and background and soil leaching to groundwater SSCG, see Table 6-1 for all SSCGs to evaluate risk.

4 Bkg if noted, otherwise health-based value from Table 6-1 or leaching to groundwater value from Table 6-2.

5 Cres - Value based on calculated residual concentration according to API Researcgh Bullitin No. 9 June 2000.

TPHg = Total Petroleum Hydrocarbons- gasoline range

TPHd = Total Petroleum Hydrocarbons- diesel range

TPHmo = Total Petroleum Hydrocarbons- motor oil range

BKG - Background

Table 9-3
Site-Specific Cleanup Goals, Soil Vapor
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Soil Vapor Cleanup Goals[1] (µg/m³) Onsite Resident [3]
71-55-6	1,1,1-Trichloroethane	5.2E+06
79-34-5	1,1,2,2-Tetrachloroethane	4.2E+01
79-00-5	1,1,2-Trichloroethane	1.5E+02
75-34-3	1,1-Dichloroethane	1.5E+03
120-82-1	1,2,4-Trichlorobenzene	2.1E+03
95-63-6	1,2,4-Trimethylbenzene	7.3E+03
107-06-2	1,2-Dichloroethane	1.2E+02
78-87-5	1,2-Dichloropropane	2.4E+02
108-67-8	1,3,5-Trimethylbenzene	7.3E+03
106-99-0	1,3-Butadiene	1.4E+01
106-46-7	1,4-Dichlorobenzene	2.2E+02
123-91-1	1,4-Dioxane	3.2E+02
540-84-1	2,2,4-Trimethylpentane	1.0E+06
591-78-6	2-Hexanone	3.1E+04
622-96-8	4-Ethyltoluene	1.0E+05
71-43-2	Benzene	8.4E+01
75-27-4	Bromodichloromethane	6.6E+01
74-83-9	Bromomethane	5.2E+03
75-15-0	Carbon disulfide	7.3E+05
56-23-5	Carbon tetrachloride	5.8E+01
67-66-3	Chloroform	4.6E+02
74-87-3	Chloromethane	9.4E+04
110-82-7	Cyclohexane	6.3E+06
124-48-1	Dibromochloromethane	9.0E+01
156-59-2	Dichloroethene, cis-1,2-	7.3E+03
156-60-5	Dichloroethene, trans-1,2-	6.3E+04
10061-02-6	Dichloropropene, trans-1,3-	1.5E+02
64-17-5	Ethanol	4.2E+06
100-41-4	Ethylbenzene	9.7E+02
142-82-5	Heptane	7.3E+05
87-68-3	Hexachloro-1,3-butadiene	1.1E+02
110-54-3	Hexane	7.3E+05
67-63-0	Isopropanol	7.3E+06
98-82-8	Isopropylbenzene (cumene)	4.2E+05
78-93-3	Methyl ethyl ketone (2-butanone)	5.2E+06
75-09-2	Methylene chloride	2.4E+03
1634-04-4	Methyl-tert-butyl ether	9.4E+03
91-20-3	Naphthalene	7.2E+01
103-65-1	Propylbenzene	1.0E+06
75-65-0	tert-Butyl Alcohol (TBA)	1.1E+06
127-18-4	Tetrachloroethene	4.1E+02

Table 9-3
Site-Specific Cleanup Goals, Soil Vapor
Former Kast Property
Carson, California

CAS Number	Constituents of Concern[2]	Soil Vapor Cleanup Goals[1] (µg/m³) Onsite Resident[3]
109-99-9	Tetrahydrofuran	2.1E+06
108-88-3	Toluene	5.2E+06
79-01-6	Trichloroethene	5.9E+02
75-01-4	Vinyl chloride	3.1E+01
108-38-3	Xylene, m-	1.0E+05
95-47-6	Xylene, o-	1.0E+05
106-42-3	Xylene, p-	1.0E+05
	TPH	
	Aliphatic: C5-C8	7.3E+05
	Aliphatic: C9-C18	3.1E+05
	Aliphatic: C19-C32	--
	Aromatic: C6-C8	--
	Aromatic: C9-C16	5.2E+04
	Aromatic: C17-C32	--
	OTHER	
	TPH Nuisance[4]	1.0E+02

Note: " -- " not applicable or not available

1 See Section 7 for discussion of how these cleanup goals were derived. Based on a conservative upper-bound estimate for a site-specific vapor intrusion attenuation factor, calculated for corrective action planning purposes.

2 See Section 4 for discussion of Constituents of Concern.

3 Value is lowest between noncancer and cancer endpoint, see Table 7-2 for all SSCGs to evaluate risk.

4 Value from the San Francisco Regional Water Quality Control Board Environmental Screening Levels (SFRWQCB, May 2013)

Table 9-4
Proposed Cleanup Levels in Groundwater
Former Kast Property
Carson, CA

Chemical Group	Chemical	Maximum On-Site Concentration Detected (µg/L)	Proposed Clean Up SSCG (µg/L)	Rationale for Proposed SSCG
TPH	Benzene Naphthalene tert-Butyl Alcohol (TBA) TPH-Gasoline TPH-Diesel TPH-Motor Oil	689 82 250 3,200 3,000 1,700	1[1] 17[2] 12[2] 410[3] 200[3] 6200[3]	Primary MCL, NL,or ESL/zero natural background
Chlorinated	1,1-Dichloroethane 1,1-Dichloroethene 1,2,3-Trichloropropane 1,2-Dichloroethane cis-1,2-Dichloroethene Tetrachloroethene trans-1,2-Dichloroethene Trichloroethene Vinyl Chloride 1,4-Dichlorobenzene	22 33 27 6.1 510 260 120 400 0.71 11	5[1] 6[1] 0.005[2] 0.5[1] 6[1] 5[1] 10[1] 5[1] 0.5[1] 5[1]	Primary MCL/zero natural background
Trace Metals	Antimony Thallium Arsenic	19.3 4.24J 900	BKG BKG BKG	Can have natural sources and naturally elevated background concentrations
General Mineral	Iron Manganese Chloride Nitrate (as N) Total Dissolved Solids Specific Conductance	67 mg/L 2.55 mg/L 1,400 mg/L 14 mg/L 3,320 mg/L 4,200 µS/cm	NP NP NP BKG NP NP	Basin wide contaminant with natural sources and naturally elevated background concentrations

Notes:
[1]: Primary MCL (Maximum Contaminant Level for drinking water)
[2]: NL (Notification Level)
[3]: ESL (SFRWQCB Health Risk Environmental Screening Level)
BKG: Background Level
NP: Not Proposed
µg/L: micrograms per liter ; mg/L: milligrams per liter; µS/cm: microsimens per centimeter

Table 9-5
Summary of Preliminary Cost Estimates for Screening Feasibility Study
Former Kast Property
Carson, CA

Alternative	Criteria	Property Purchase Cost (285 properties)	Demolition Costs	Excavate, Backfill, & Assoc. Costs	PM, Planning, Field Mgmt, Monitoring, Reporting, Security	Post Excavation Construction and Long-Term O&M	Total Est. Costs	Low-End Costs (-30%)	High-End Costs (+50%)
1	ALTERNATIVE 1 * Remove all site features. * Excavate entire site to remove impacted soils (excavation may locally extend to GW). * Limited removal or remediation of impacted GW. * MNA remedy for remaining GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	$98,000,000	$18,000,000	$270,000,000	$27,000,000	$4,000,000	$420,000,000	$290,000,000	$630,000,000
2	ALTERNATIVE 2 * Remove all site features. * Excavate upper 10 feet to remove impacted soils. * MNA remedy for remaining GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	$98,000,000	$18,000,000	$130,000,000	$19,000,000	$4,800,000	$270,000,000	$190,000,000	$410,000,000
2+7	ALTERNATIVE 2+7 * Remove all site features. * Excavate upper 10 feet to remove any impacted soils. * MNA remedy for remaining GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible. * Add SVE to reduce VOC/TPH mass.	$98,000,000	$18,000,000	$140,000,000	$20,000,000	$7,200,000	$280,000,000	$200,000,000	$420,000,000
3	ALTERNATIVE 3 * Excavate exposed soils and soils under residential hardscape to 2 feet where HH350 goals are exceeded. * No excavation beneath streets. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	$0	$670,000	$9,400,000	$17,000,000	$4,400,000	$31,000,000	$22,000,000	$46,000,000

Table 9.5
Summary of Preliminary Cost Estimates for Screening Feasibility Study
Former Kast Property
Carson, CA

Alternative	Criteria	Property Purchase Cost (285 properties)	Demolition Costs	Excavate, Backfill, & Assoc. Costs	PM, Planning, Field Mgmt, Monitoring, Reporting, Security	Post Excavation Construction and Long-Term O&M	Total Est. Costs	Low-End Costs (-30%)	High-End Costs (+50%)
3+7	ALTERNATIVE 3+7 * Excavate exposed soils and soils under residential hardscape to 2 feet where HH350 goals are exceeded. * No excavation beneath streets. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible. * Add limited SVE to reduce VOC/TPH	$1,400,000	$890,000	$15,000,000	$17,000,000	$6,800,000	$41,000,000	$29,000,000	$61,000,000
3A	ALTERNATIVE 3A Same as Alt 3 except excavate to 5 feet	$0	$1,300,000	$33,000,000	$47,000,000	$4,400,000	$86,000,000	$60,000,000	$130,000,000
3A+7	ALTERNATIVE 3A+7 Same as Alt 3 except excavate to 5 feet * Add SVE to reduce VOC/TPH mass.	$1,400,000	$1,500,000	$39,000,000	$48,000,000	$6,800,000	$96,000,000	$67,000,000	$140,000,000
3B	ALTERNATIVE 3B Same as Alt 3 except excavate to 10 feet	$0	$1,400,000	$71,000,000	$84,000,000	$4,400,000	$160,000,000	$110,000,000	$240,000,000
3B+7	ALTERNATIVE 3B+7 Same as Alt 3 except excavate to 10 feet * Add SVE to reduce VOC/TPH mass.	$1,400,000	$1,600,000	$76,000,000	$85,000,000	$6,800,000	$170,000,000	$120,000,000	$260,000,000
4	ALTERNATIVE 4 * Excavate exposed site soils from 0 to 2 feet where HH350 goals are exceeded at residential properties. * No excavation beneath residential hardscape, streets and sidewalks. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	$0	$0	$4,400,000	$13,000,000	$4,400,000	$21,000,000	$15,000,000	$32,000,000

Table 9-5
Summary of Preliminary Cost Estimates for Screening Feasibility Study
Former Kast Property
Carson, CA

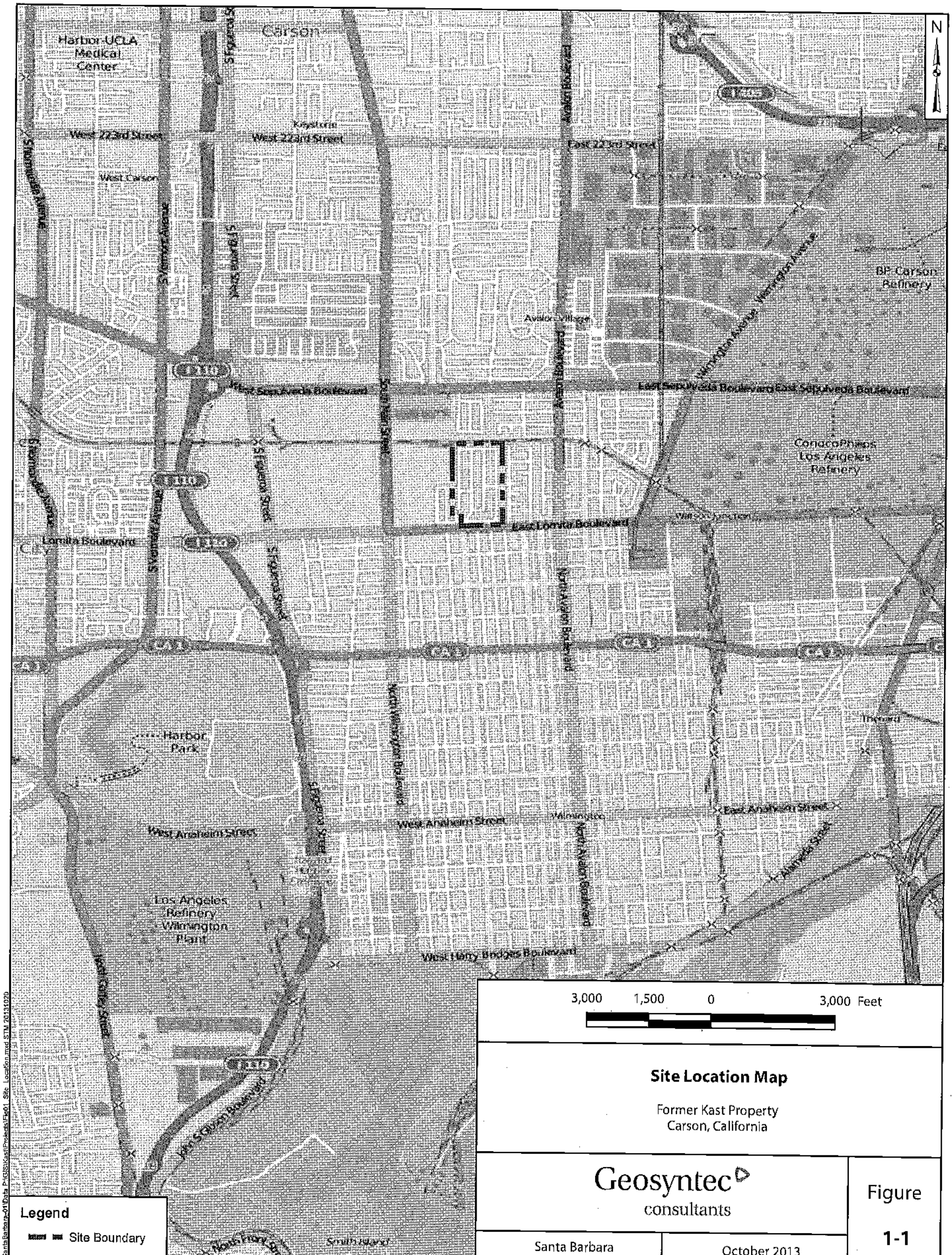
Alternative	Criteria	Property Purchase Cost (285 properties)	Demolition Costs	Excavate, Backfill, & Assoc. Costs	PM, Planning, Field Mgmt, Monitoring, Reporting, Security	Post Excavation Construction and Long-Term O&M	Total Est. Costs	Low-End Costs (-30%)	High-End Costs (+50%)
4+7	ALTERNATIVE 4+7 * Excavate exposed site soils from 0 to 2 feet where HH350 goals are exceeded at residential properties. * No excavation beneath residential hardscape, streets and sidewalks. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening value. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Remove LNAPL as feasible.	$1,400,000	$220,000	$9,500,000	$13,000,000	$6,800,000	$31,000,000	$22,000,000	$47,000,000
4A	ALTERNATIVE 4A Same as Alt 4 except excavate exposed soils to 5 feet.	$0	$0	$18,000,000	$38,000,000	$4,400,000	$60,000,000	$42,000,000	$90,000,000
4A+7	ALTERNATIVE 4A+7 Same as Alt 4 except excavate exposed soils to 5 feet. * Add SVE to reduce VOC/TPH mass.	$1,400,000	$220,000	$23,000,000	$39,000,000	$6,800,000	$70,000,000	$49,000,000	$110,000,000
4B	ALTERNATIVE 4B Same as Alt 4 except excavate exposed soils to 10 feet.	$0	$0	$47,000,000	$78,000,000	$4,400,000	$120,000,000	$87,000,000	$190,000,000
4B+7	ALTERNATIVE 4B+7 Same as Alt 4 except excavate exposed soils to 10 feet. * Add SVE to reduce VOC/TPH mass.	$1,400,000	$220,000	$52,000,000	$73,000,000	$6,800,000	$130,000,000	$94,000,000	$200,000,000
5	ALTERNATIVE 5 * Remove all site features and cap site. * Remove LNAPL as feasible. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	$98,000,000	$18,000,000	$7,000,000	$2,500,000	$4,400,000	$130,000,000	$91,000,000	$200,000,000
5+7	ALTERNATIVE 5+7 * Remove all site features and cap site. * Remove LNAPL as feasible. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals. * Add SVE to reduce VOC/TPH mass.	$98,000,000	$18,000,000	$12,000,000	$8,200,000	$6,800,000	$140,000,000	$97,000,000	$210,000,000

Table 9-5
Summary of Preliminary Cost Estimates for Screening Feasibility Study
Former Kast Property
Carson, CA

Alternative	Criteria	Property Purchase Cost (285 properties)	Demolition Costs	Excavate, Backfill, & Assoc. Costs	PM, Planning, Field Mgmt, Monitoring, Reporting, Security	Post Excavation Construction and Long-Term O&M	Total Est. Costs	Low-End Costs (-30%)	High-End Costs (+50%)
6	ALTERNATIVE 6 * Cap all areas of exposed soil at the site. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening values. * Remove LNAPL as feasible. * MNA remedy for GW. Could add limited hot spot remediation to reduce time to achieve cleanup goals.	$0	$0	$12,000,000	$2,600,000	$4,400,000	$19,000,000	$13,000,000	$28,000,000
6+7	ALTERNATIVE 6+7 * Cap all areas of exposed soil at the site. * Install subslab mitigation at homes where subslab VOC and methane concentrations exceed screening values. * Remove LNAPL as feasible. * MNA remedy for GW, could add limited hot spot remediation to reduce time to achieve cleanup goals. * Add SVE to reduce TPH/SVE mass.	$1,400,000	$220,000	$17,000,000	$3,300,000	$6,800,000	$28,000,000	$20,000,000	$43,000,000
7	ALTERNATIVE 7 Add limited SVE to reduce VOC/TPH mass for Alternatives 2 through 6	$1,400,000	$220,000	$5,200,000	$700,000	$2,400,000	$9,900,000	$7,000,000	$15,000,000

Geosyntec consultants

FIGURES



Legend

Site Boundary

Site Location Map

Former Kast Property
Carson, California

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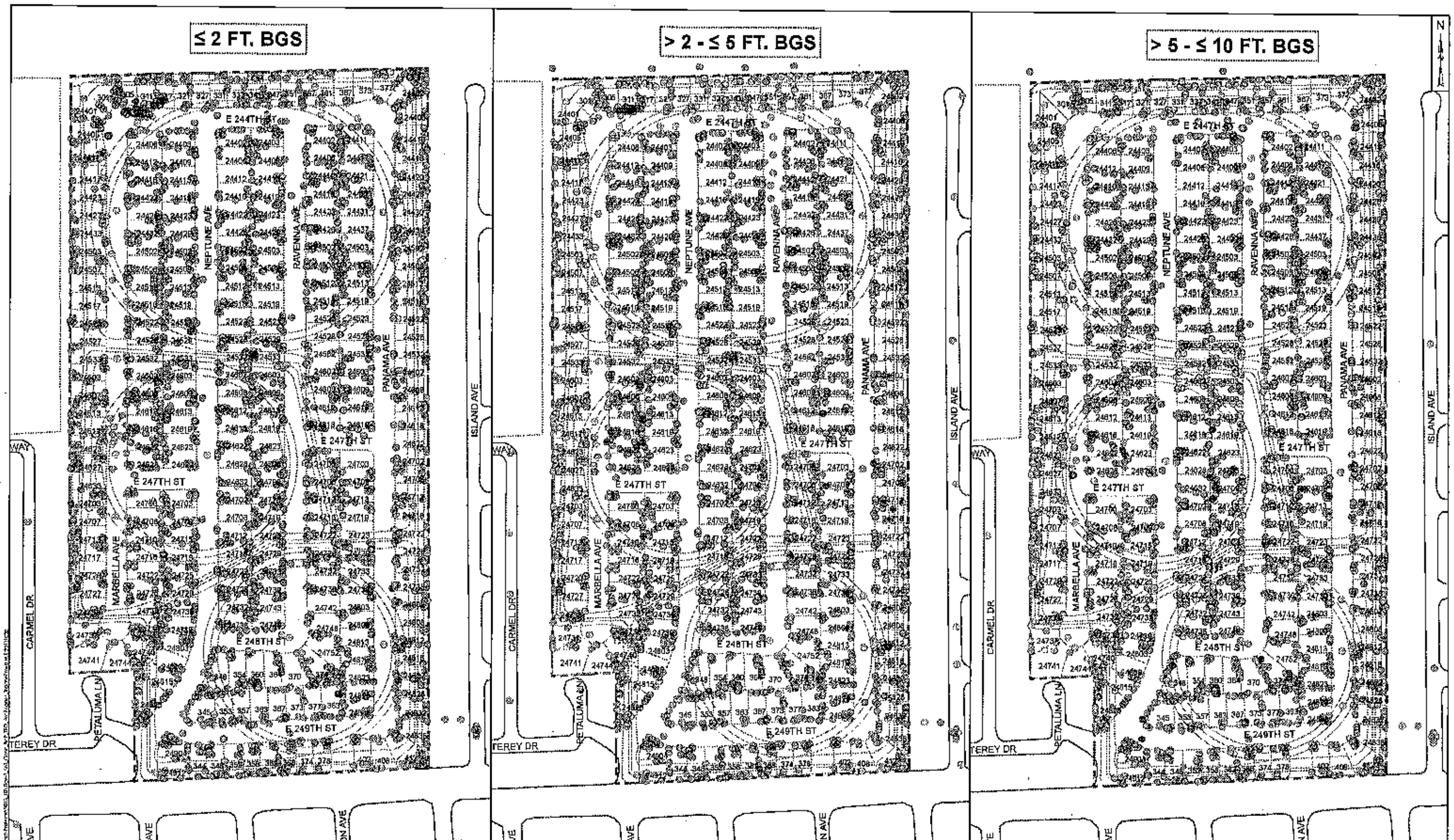
Santa Barbara

October 2013

Figure 1-1



Legend
- Non-Detect (ND)
- <= 0.16 mg/kg
- > 0.16 to 1.6 mg/kg
- > 1.6 to 16 mg/kg
- > 16 mg/kg

250 125 0 250 Feet

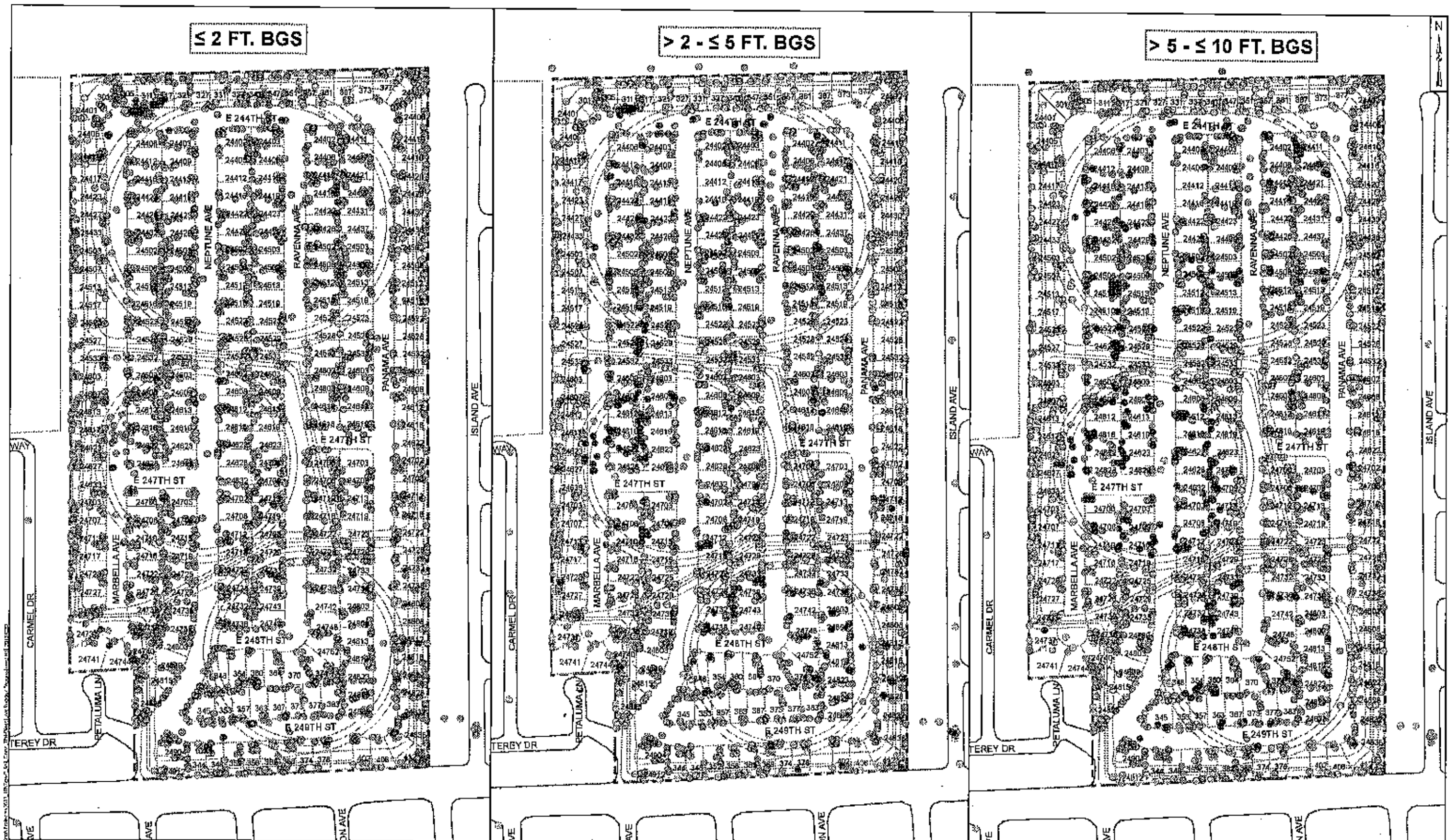
Geosyntec consultants

Santa Barbara, CA | October 2013

Summary of Benzo(a)pyrene Equivalents in Soil

Former Kast Property

Figure 6-1



Legend
- Non-Detect (ND)
- <= 1000 mg/kg
- > 1000 to 10000 mg/kg
- > 10000 mg/kg

250 125 0 250 Feet

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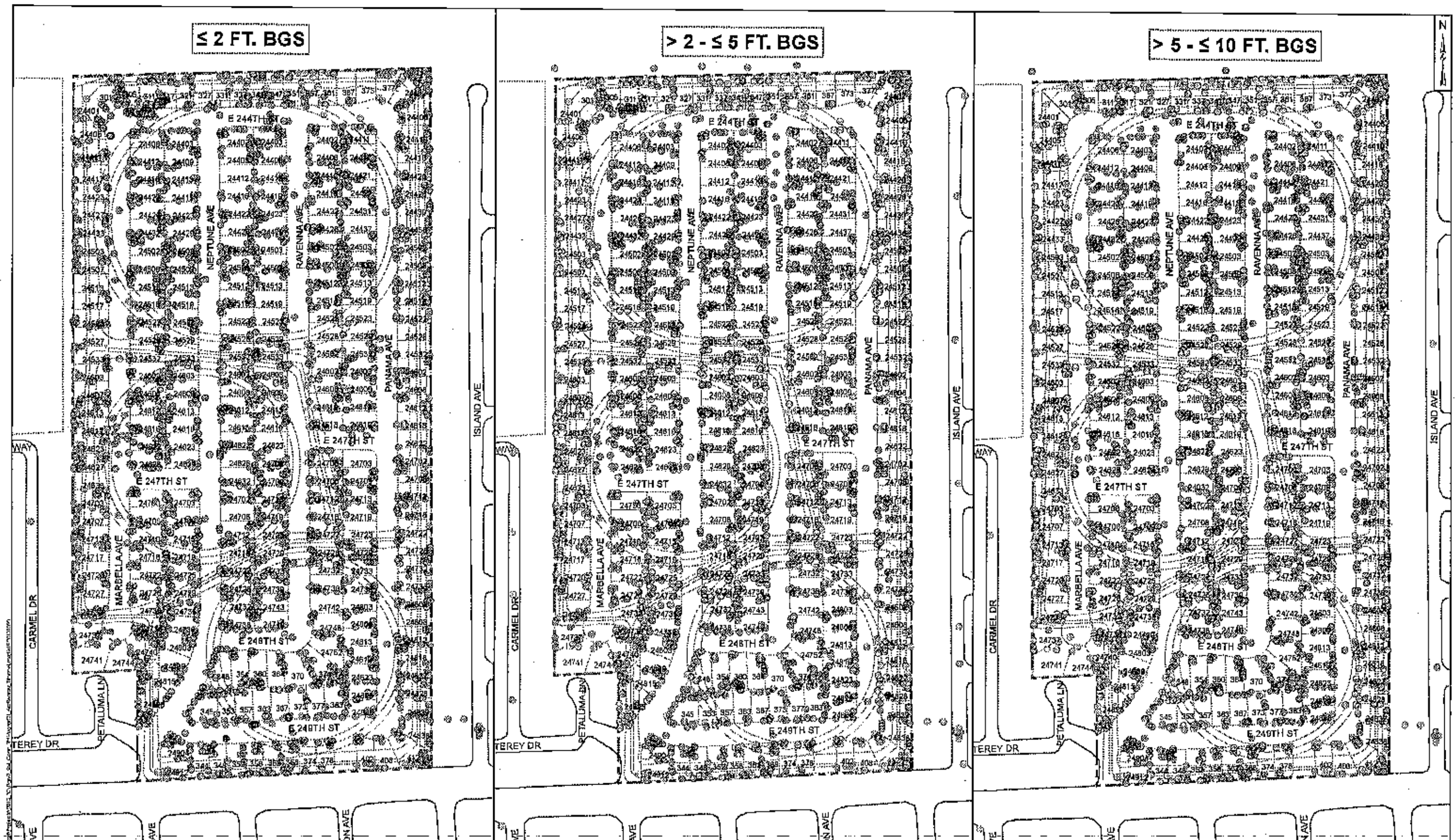
Summary of TPH-Diesel Concentrations in Soil

Former Kast Property

Figure 6-2



Legend
- Non-Detect (ND)
- <= 10000 mg/kg
- > 10000 to 100000 mg/kg
- > 100000 mg/kg

250 125 0 250 Feet

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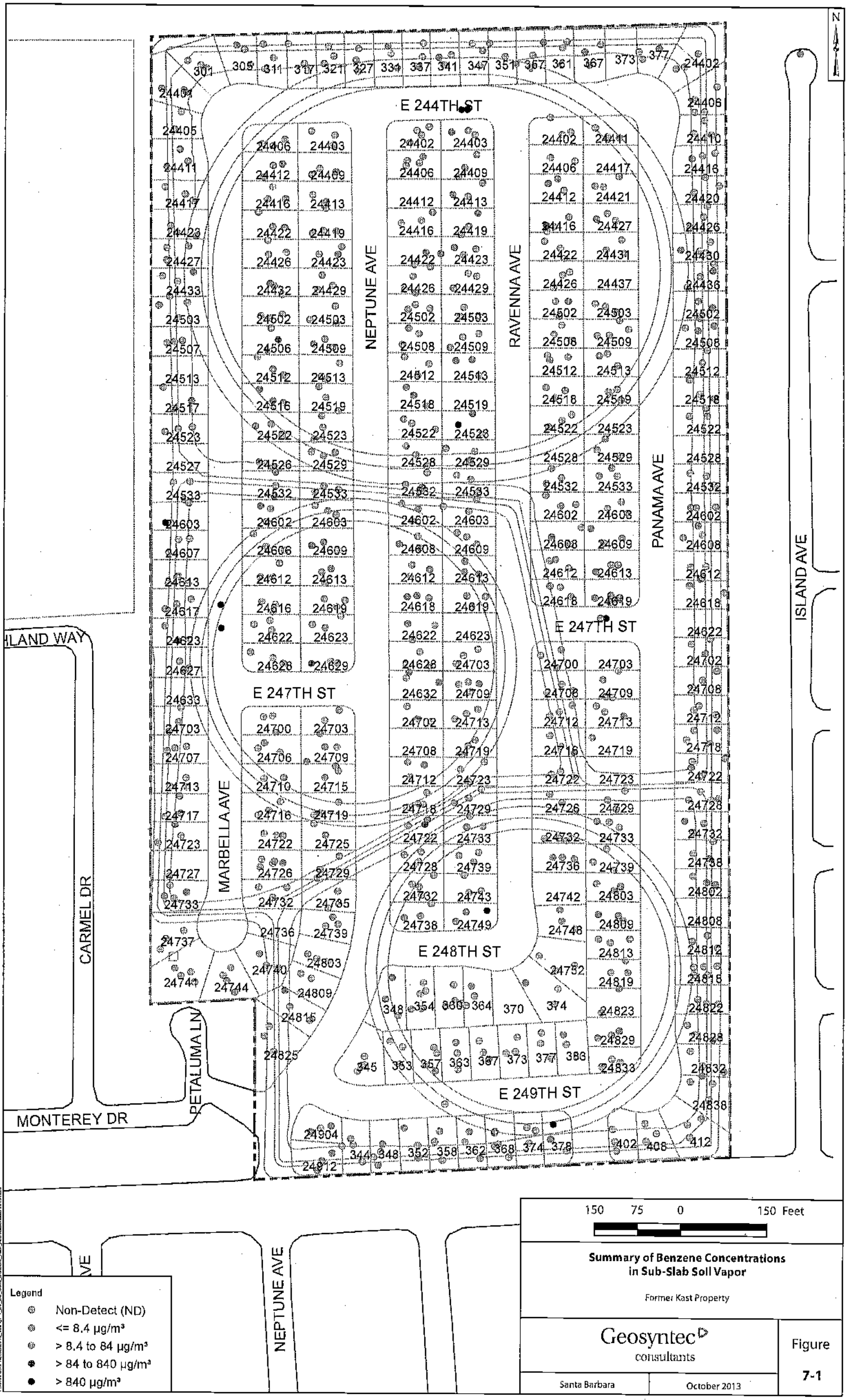
Summary of TPH-Motor Oil Concentrations in Soil

Former Kast Property

Figure **6-3**



Summary of Benzene Concentrations in Sub-Slab Soil Vapor

Former Kast Property

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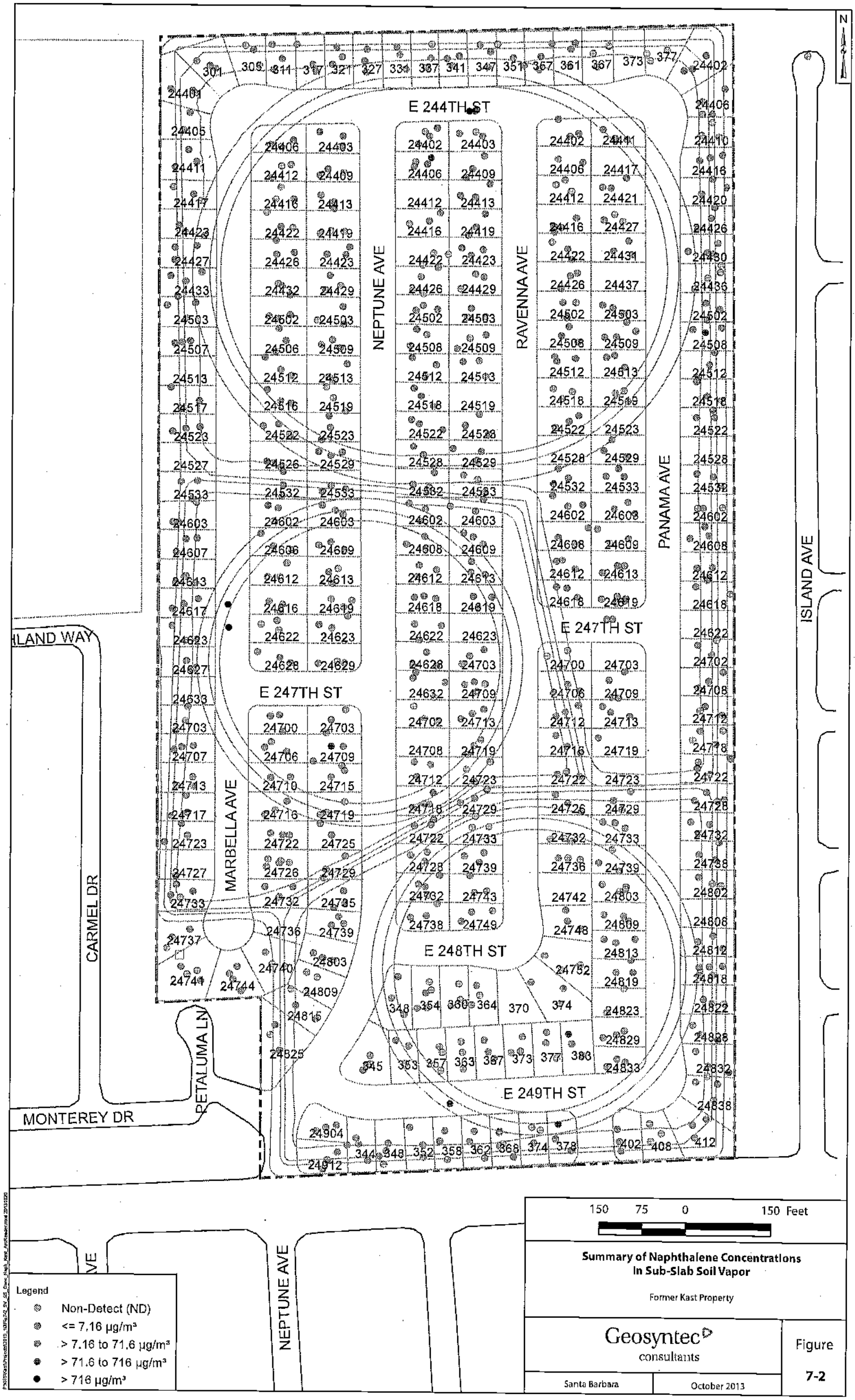
Figure 7-1



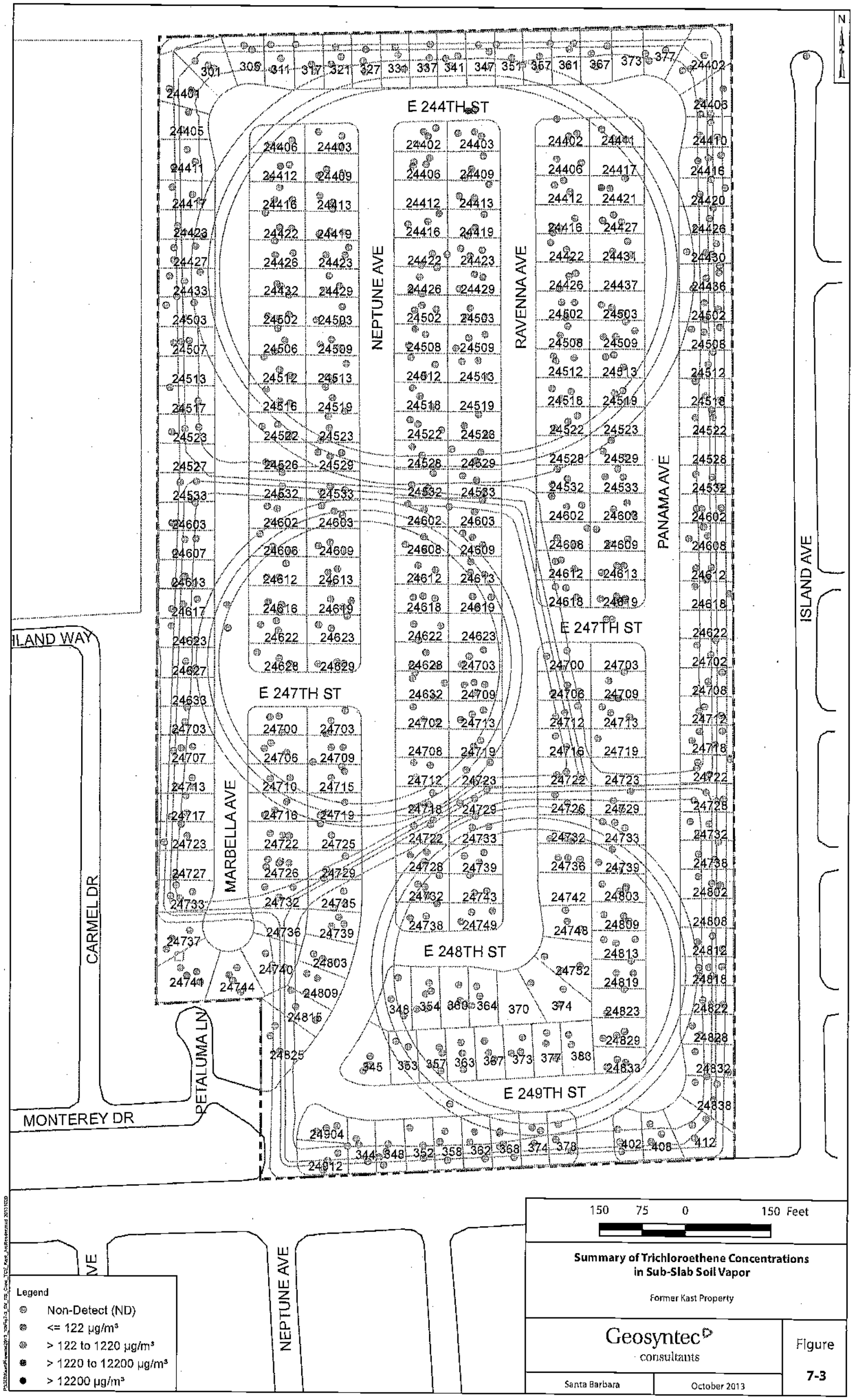
Summary of Naphthalene Concentrations in Sub-Slab Soil Vapor

Former Kast Property

Geosyntec consultants

Santa Barbara | October 2013

Figure 7-2



Legend

- Non-Detect (ND)
- <= 122 μg/m³
- > 122 to 1220 μg/m³
- > 1220 to 12200 μg/m³
- > 12200 μg/m³

Summary of Trichloroethene Concentrations in Sub-Slab Soil Vapor

Former Kast Property

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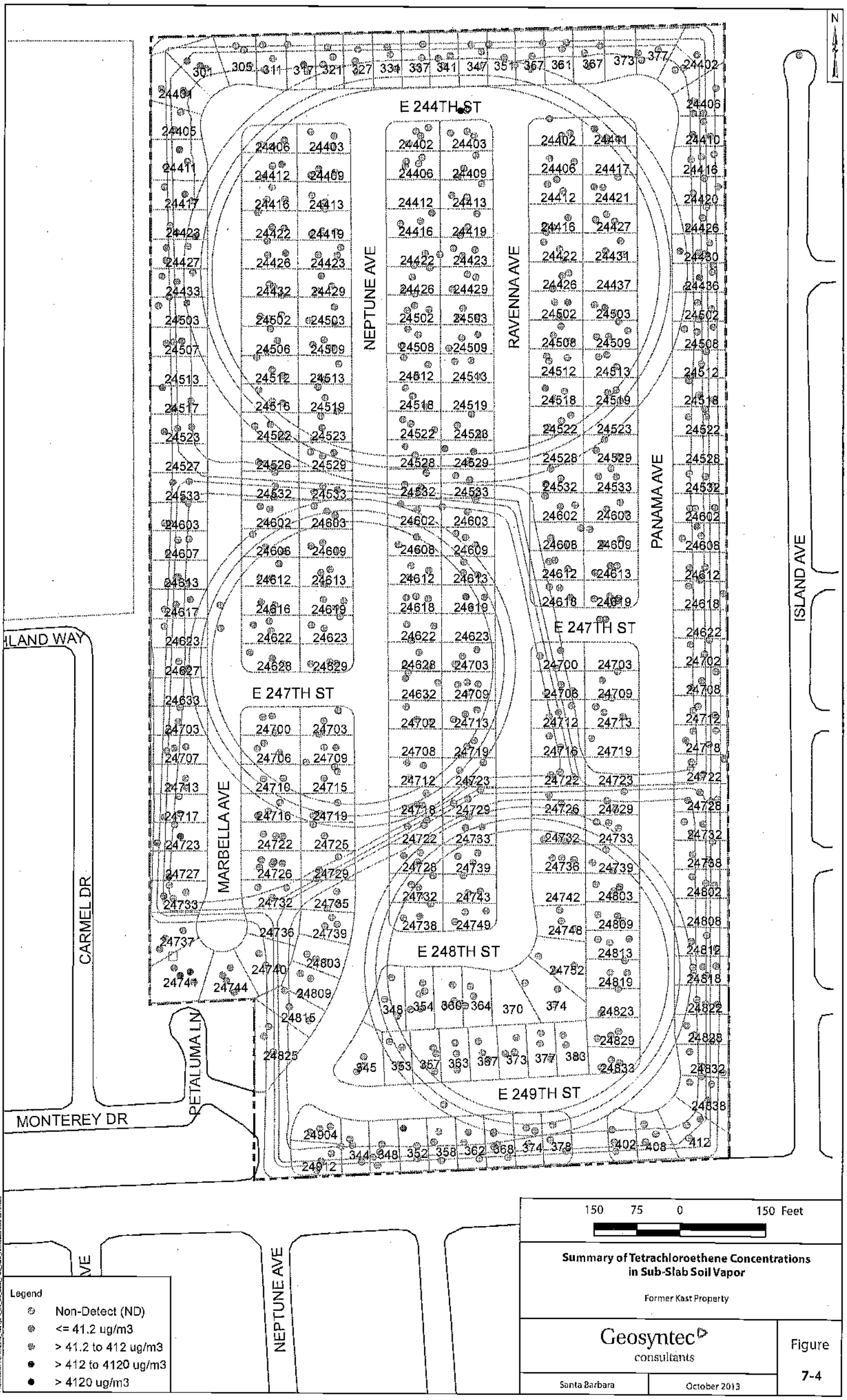
Santa Barbara | October 2013

Figure 7-3



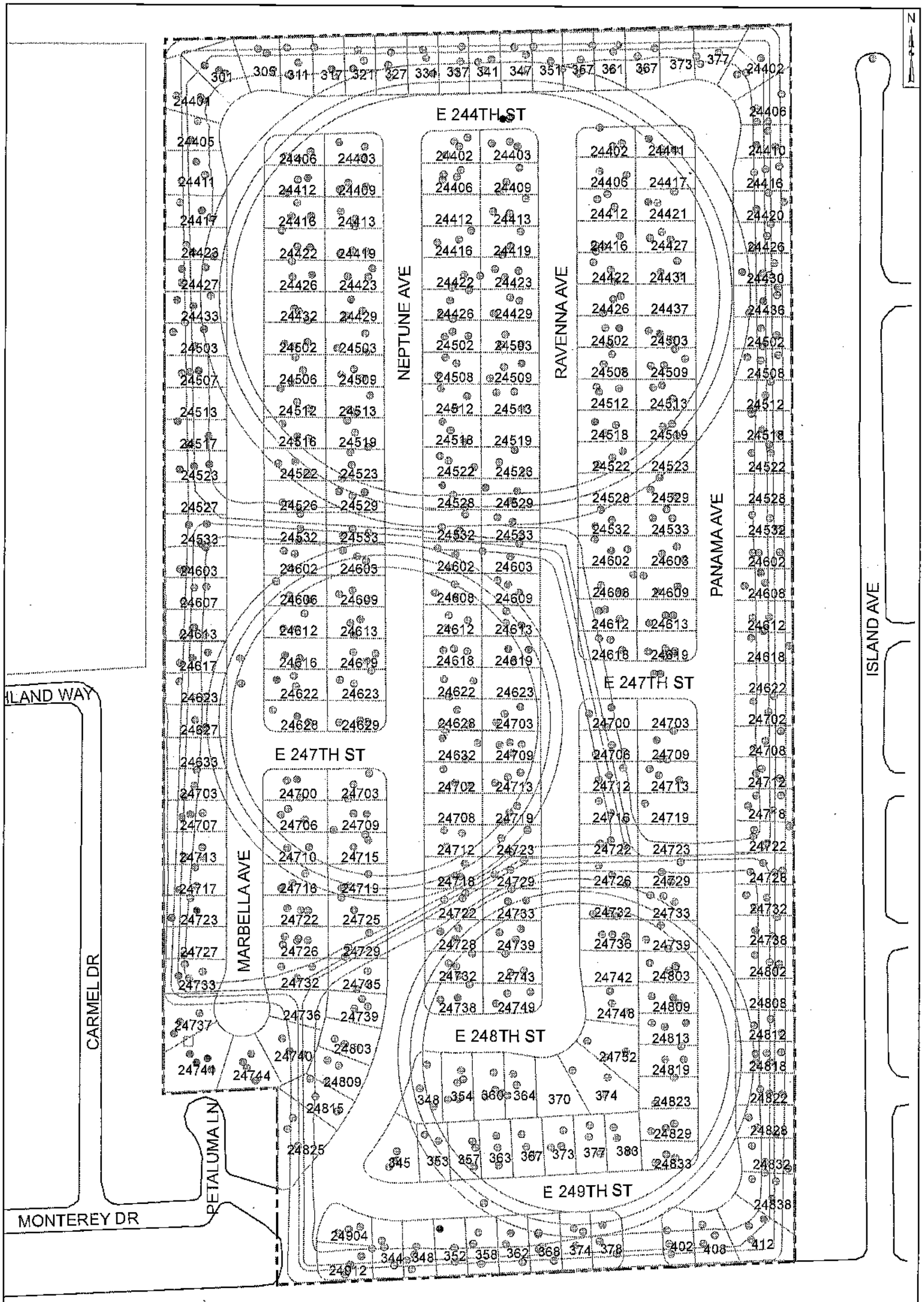
Summary of Tetrachloroethene Concentrations in Sub-Slab Soil Vapor

Former Kast Property

Geosyntec consultants

Santa Barbara | October 2013

Figure 7-4



Legend

- Non-Detect (ND)
- <= 41.2 µg/m³
- > 41.2 to 412 µg/m³
- > 412 to 4120 µg/m³
- > 4120 µg/m³

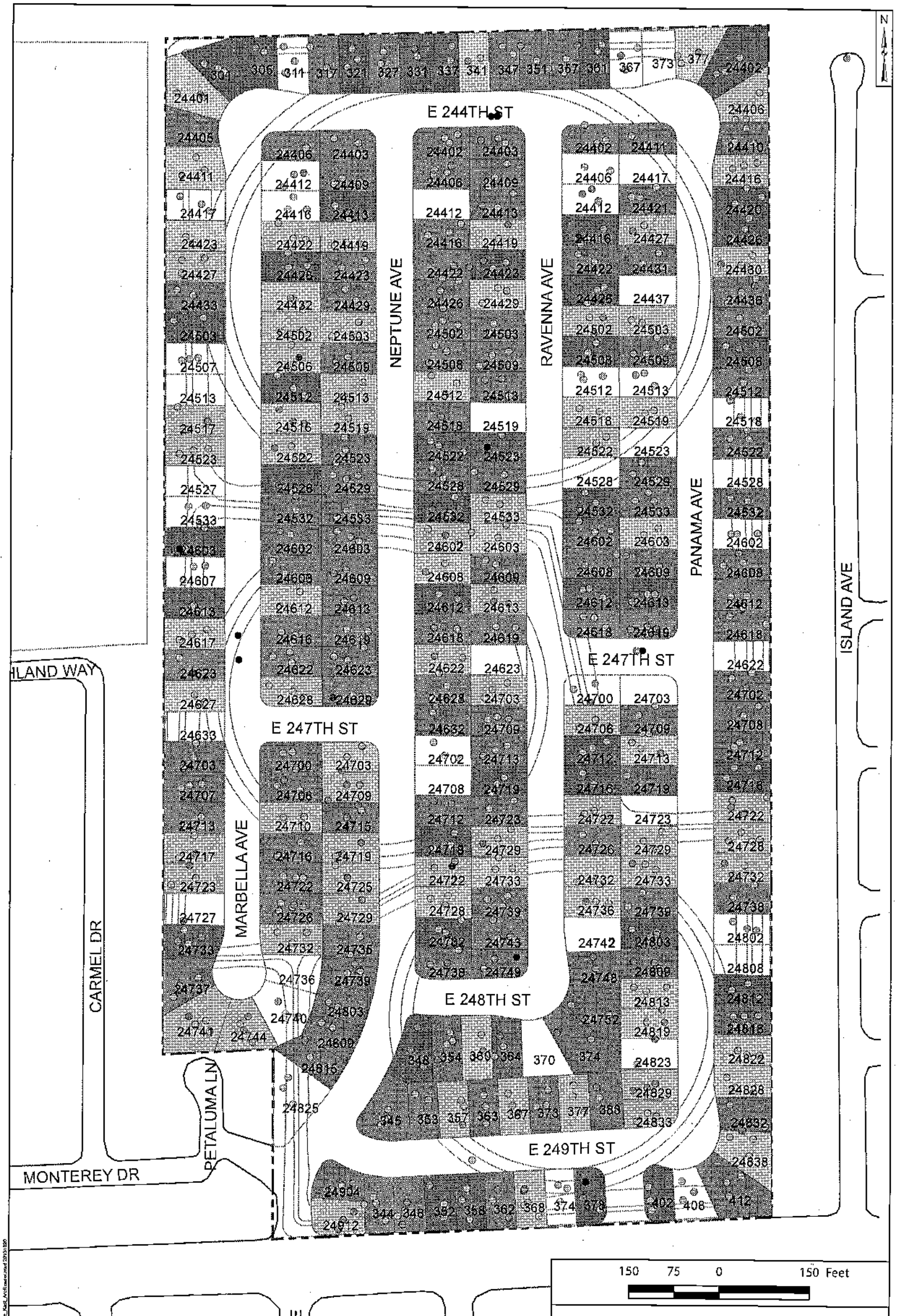
Summary of Tetrachloroethene Concentrations in Sub-Slab Soil Vapor

Former Kast Property

Geosyntec consultants

Figure 7-4

Santa Barbara | October 2013



Legend

Sub-Slab Soil Vapor	Indoor Air
Non-Detect (ND)	<= 25th Percentile (< 0.55 µg/m³)
<= 8.4 µg/m³	> 25th to <= 50th Percentile (0.55 - 0.85 µg/m³)
> 8.4 to 84 µg/m³	> 50th to <= 75th Percentile (0.85 - 0.1.4 µg/m³)
> 84 to 840 µg/m³	> 75th to <= 90th Percentile (1.4 - 2.7 µg/m³)
> 840 µg/m³	> 90th Percentile (>2.7 µg/m³)

Summary of Benzene Concentrations in Indoor Air and Sub-Slab Soil Vapor

Former Kast Property

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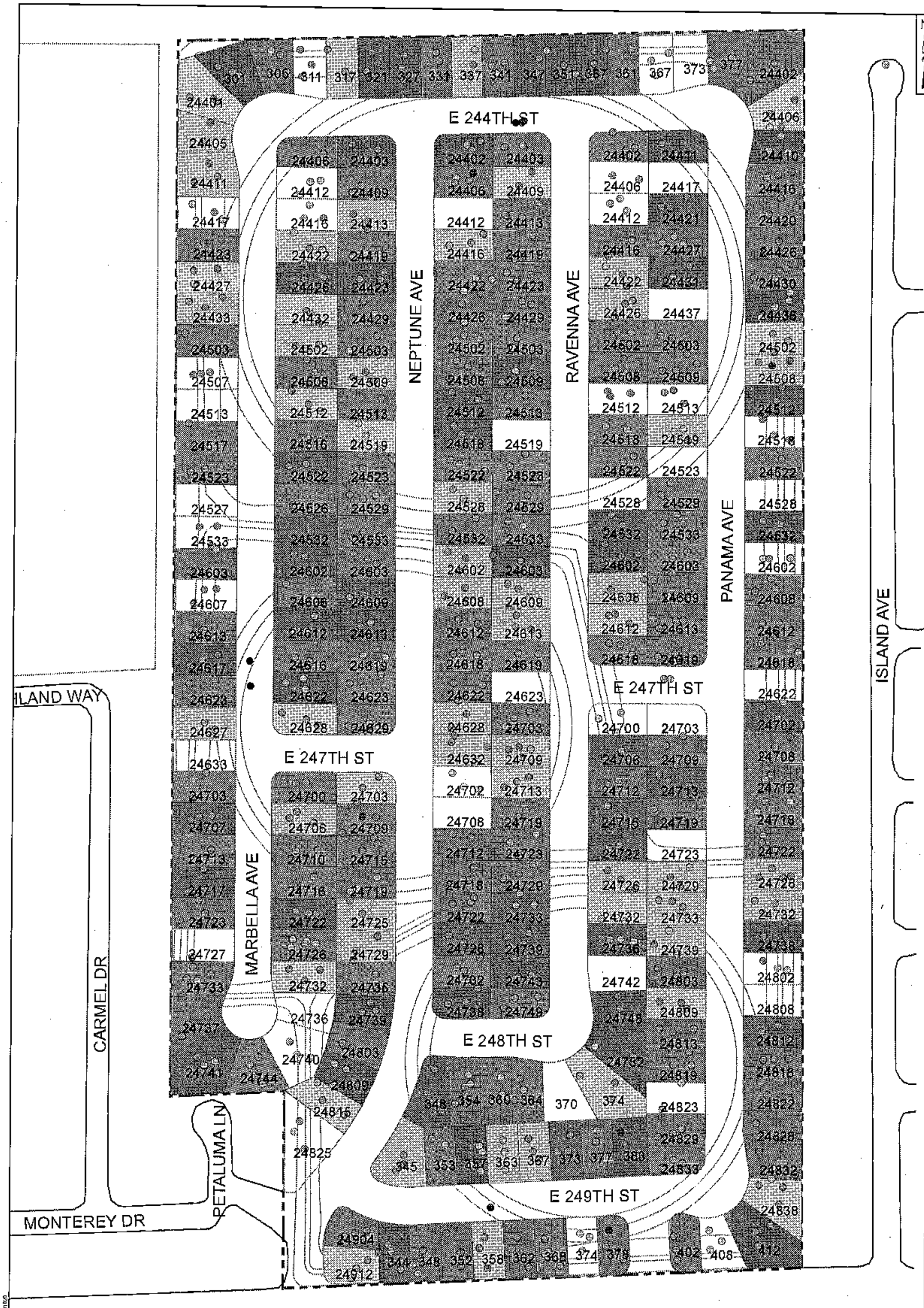
Figure 7-5

Santa Barbara

October 2013



150 75 0 150 Feet

Summary of Naphthalene Concentrations in Indoor Air and Sub-Slab Soil Vapor

Former Kast Property

Legend

Sub-Slab Soil Vapor

- Non-Detect (ND)
- <= 7.16 µg/m³
- > 7.16 to 71.6 µg/m³
- > 71.6 to 716 µg/m³
- > 716 µg/m³

Indoor Air

- <= 25th Percentile (< 0.57 µg/m³)
- > 25th to <= 50th Percentile (0.57 - 0.87 µg/m³)
- > 50th to <= 75th Percentile (0.87 - 1.5 µg/m³)
- > 75th to <= 90th Percentile (1.5 - 2.5 µg/m³)
- > 90th Percentile (>2.5 µg/m³)

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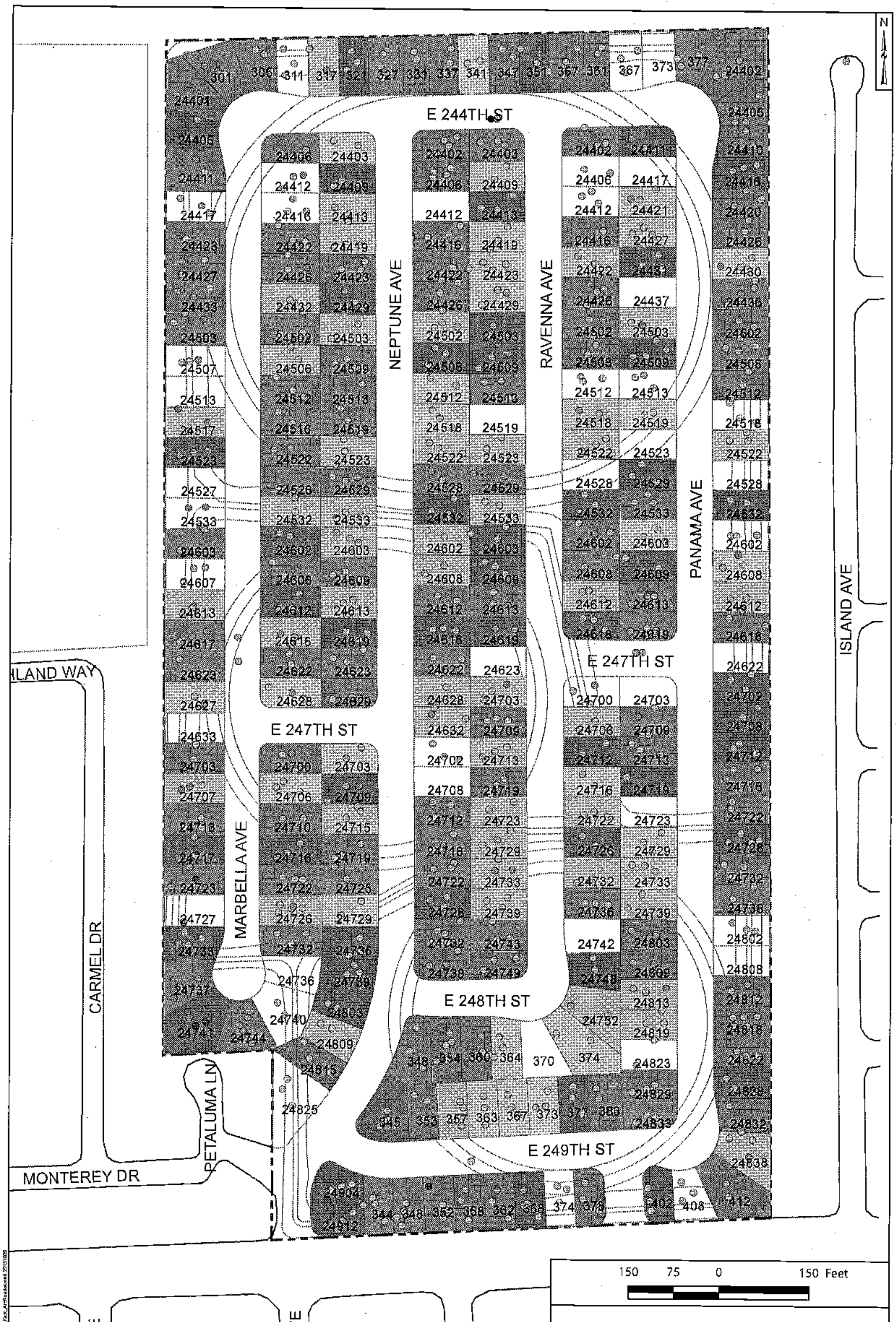
Figure 7-6



Legend

Sub-Slab Soil Vapor

- Non-Detect (ND)
- <= 41.2 µg/m³
- > 41.2 to 412 µg/m³
- > 412 to 4120 µg/m³
- > 4120 µg/m³

Indoor Air

- <= 25th Percentile (< 0.1 µg/m³)
- > 25th to <= 50th Percentile (0.1 - 0.21 µg/m³)
- > 50th to <= 75th Percentile (0.21 - 0.47 µg/m³)
- > 75th to <= 90th Percentile (0.47 - 1.2 µg/m³)
- > 90th Percentile (>1.2 µg/m³)

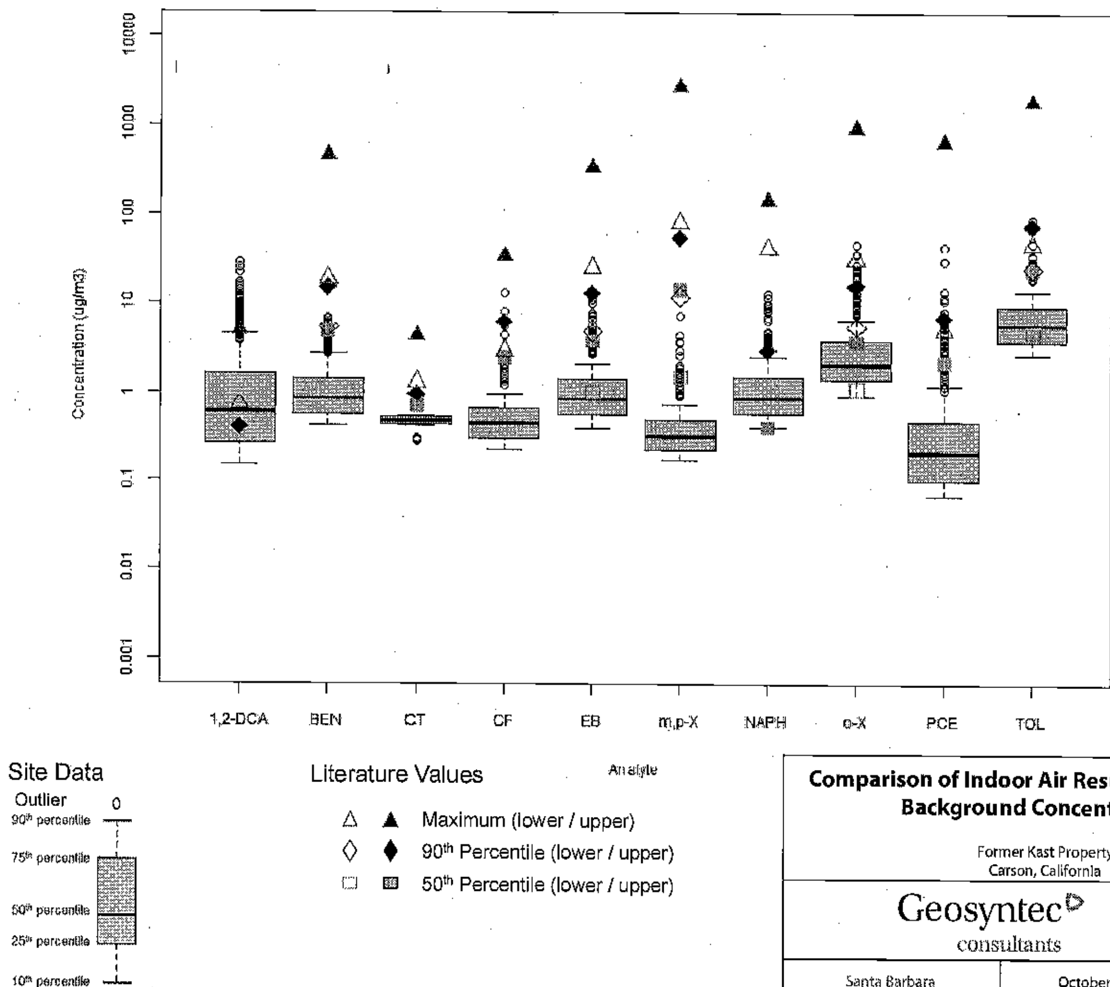
Summary of Tetrachloroethene Concentrations In Indoor Air and Sub-Slab Soil Vapor

Former Kast Property

Geosyntec consultants

Figure 7-7

Santa Barbara | October 2013



Comparison of Indoor Air Results to Literature Background Concentrations

Former Kast Property
Carson, California

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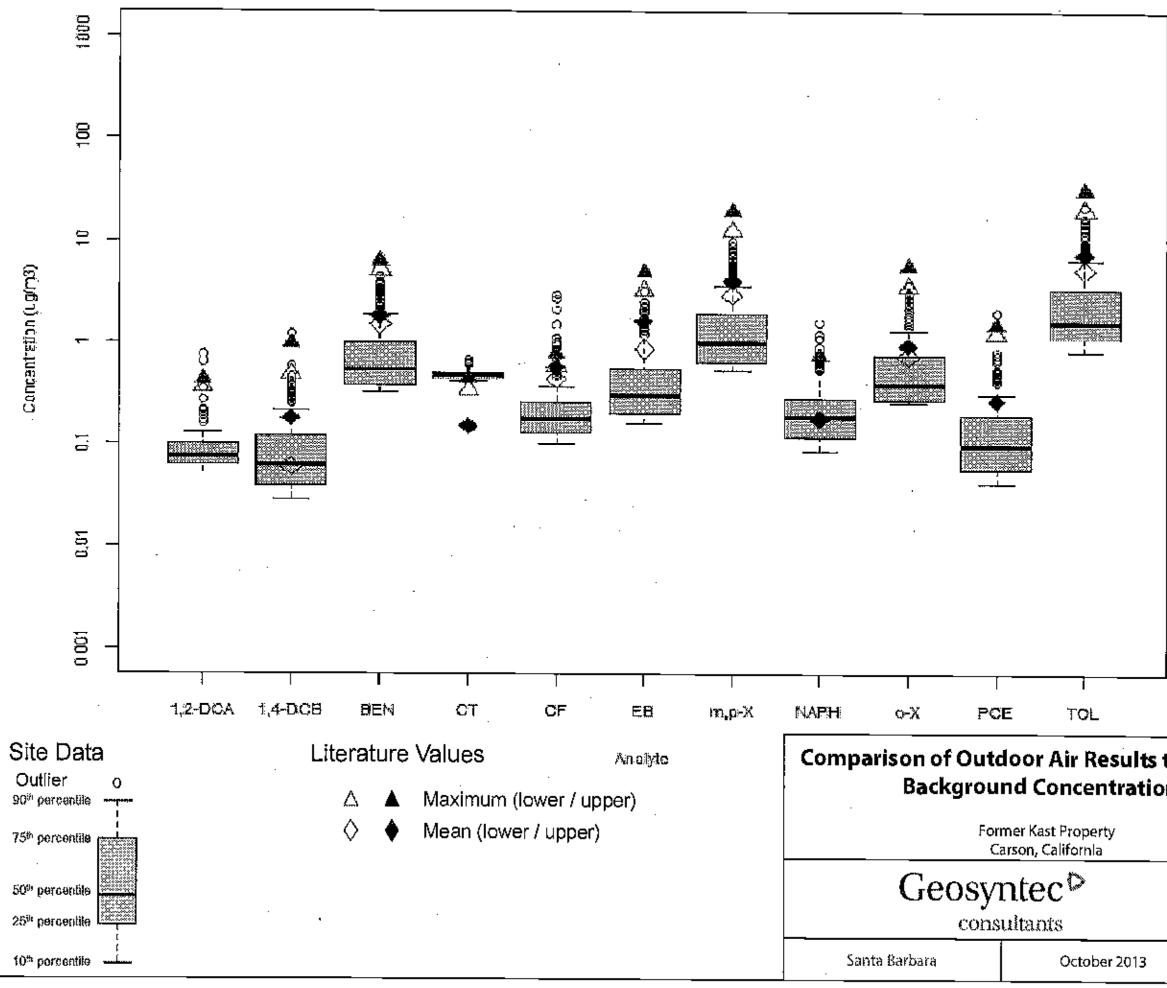
Santa Barbara | October 2013

Figure 7-8



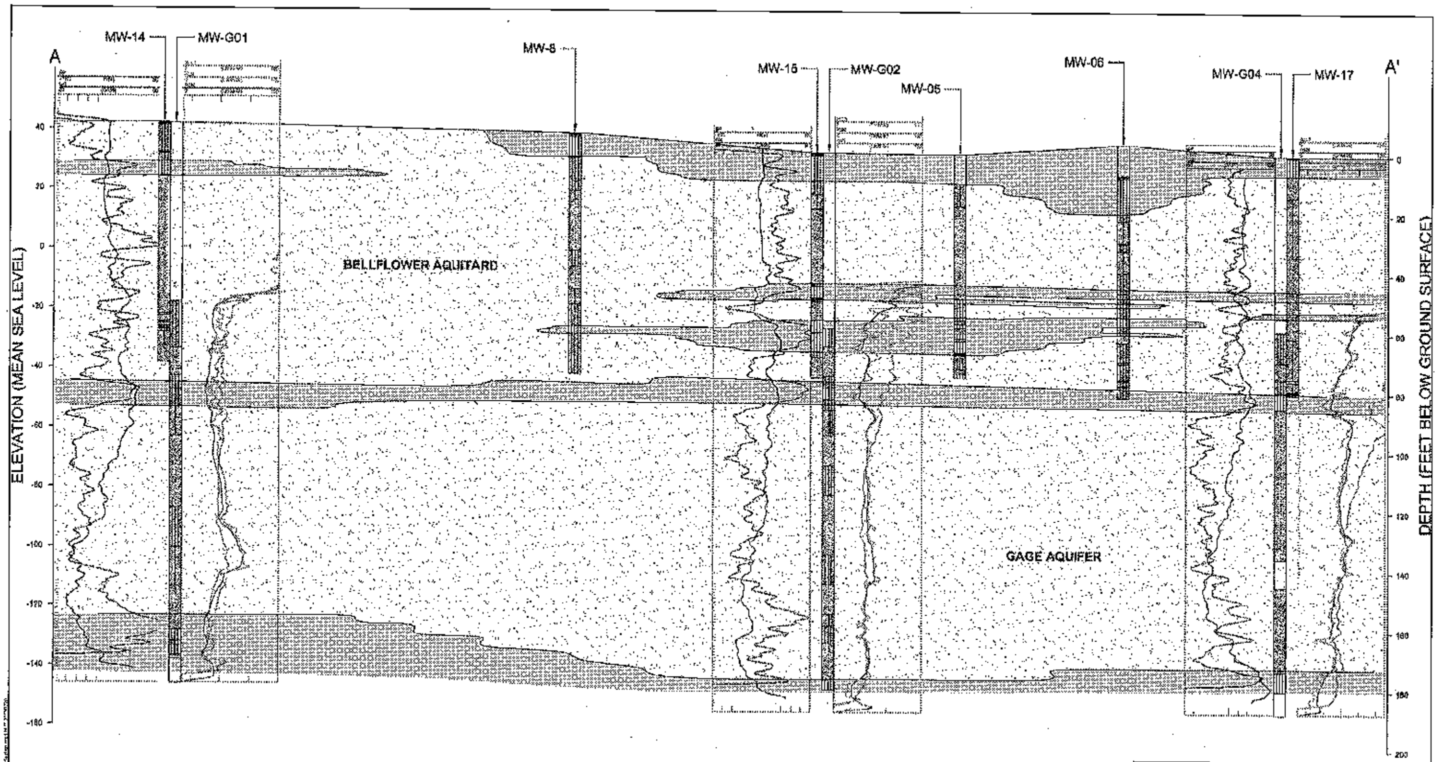
Comparison of Outdoor Air Results to Literature Background Concentrations

Former Kast Property
Carson, California

Geosyntec consultants

Santa Barbara | October 2013

Figure 7-9



EXPLANATION

PREDOMINANTLY SILTS

PREDOMINANTLY SANDS AND SILTS SANDS

APPROXIMATE VERTICAL SCALE, FT: 0, 15, 30

APPROXIMATE HORIZONTAL SCALE, FT: 0, 60, 120

Source: URS 2011

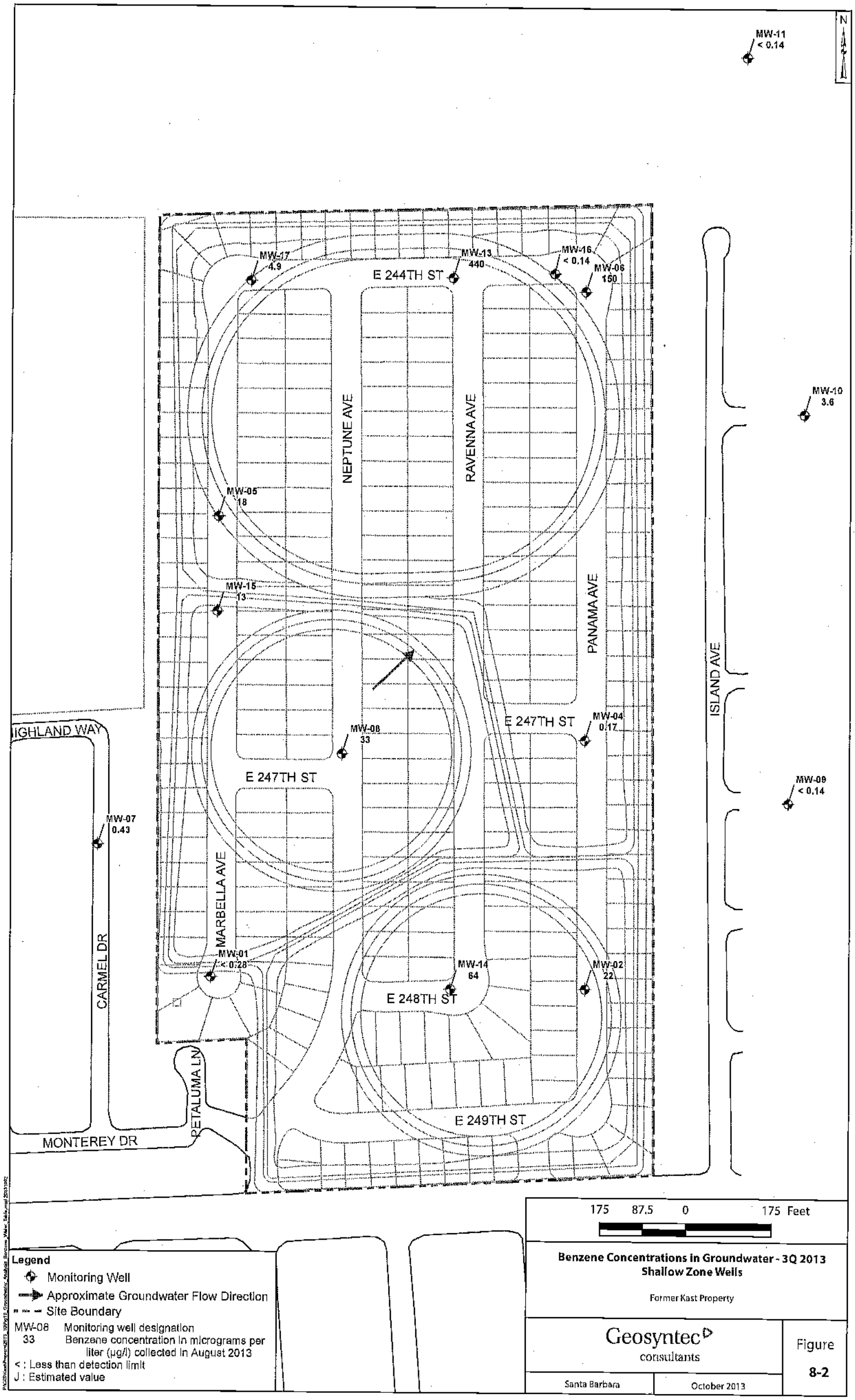
Geologic Cross Section A-A'

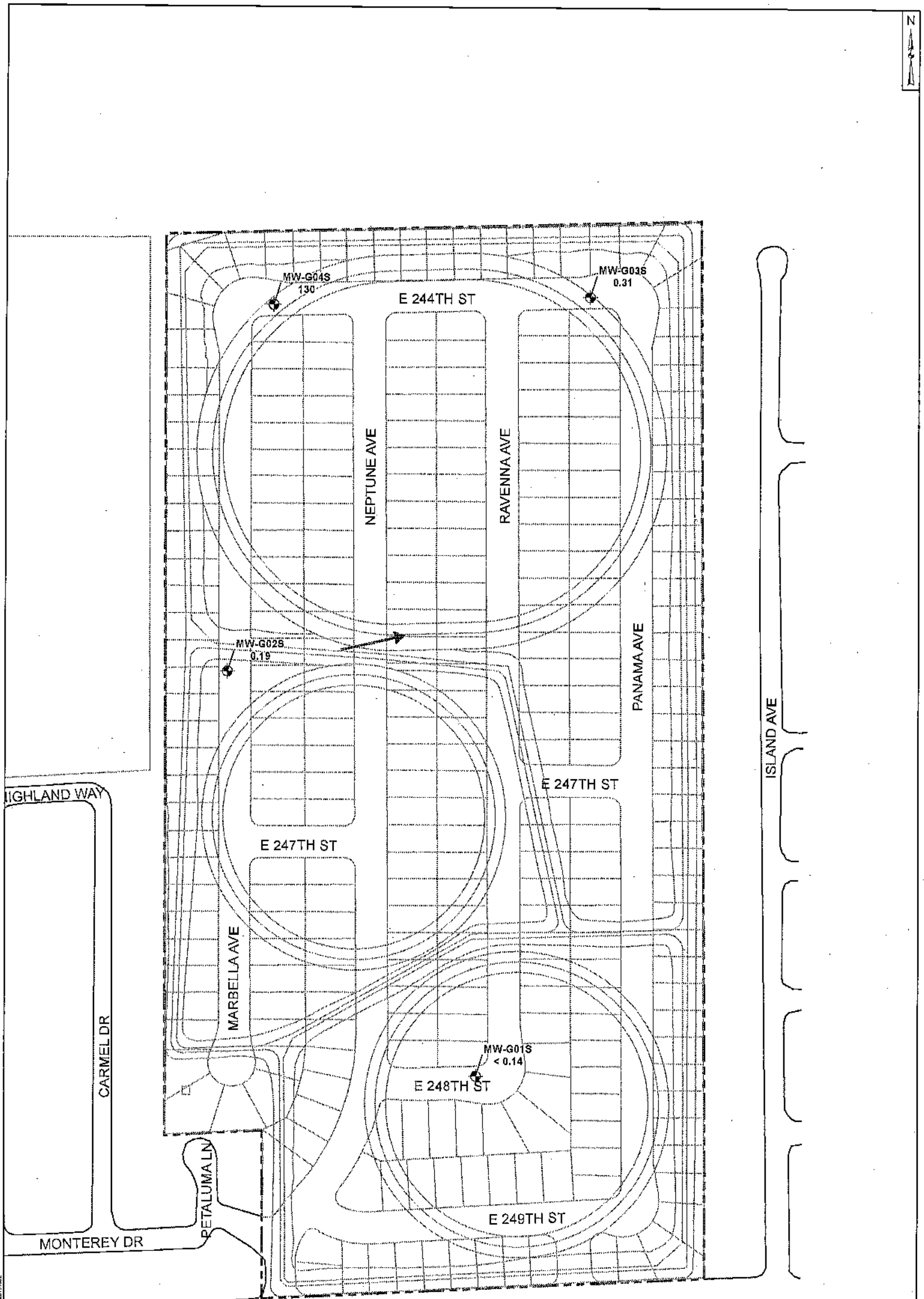
Former Kast Property

Geosyntec consultants

Santa Barbara | February 2013

Figure 8-1


MW-11
< 0.14
MW-17
4.9
MW-13
440
MW-16
< 0.14
MW-06
150
E 244TH ST
NEPTUNE AVE
RAVENNA AVE
MW-10
3.6
MW-05
18
MW-15
13
PANAMA AVE
ISLAND AVE
HIGHLAND WAY
MW-08
33
E 247TH ST
E 247TH ST
MW-04
0.17
MW-09
< 0.14
MW-07
0.43
MARBELLA AVE
CARMEL DR
MW-01
< 0.28
MW-14
64
MW-02
22
E 248TH ST
E 249TH ST
PETALUMA LN
MONTEREY DR
175 87.5 0 175 Feet
Legend
Monitoring Well
Approximate Groundwater Flow Direction
Site Boundary
MW-08 Monitoring well designation
33 Benzene concentration in micrograms per liter (µg/l) collected in August 2013
< : Less than detection limit
J : Estimated value
Benzene Concentrations in Groundwater - 3Q 2013
Shallow Zone Wells
Former Kast Property
Geosyntec consultants
Figure
8-2
Santa Barbara
October 2013



Legend

- Monitoring Well
- Approximate Groundwater Flow Direction
- Site Boundary

MW-G02S Monitoring well designation
0.19 Benzene concentration in micrograms per liter (µg/l) collected in August 2013

< : Less than detection limit
J : Estimated value

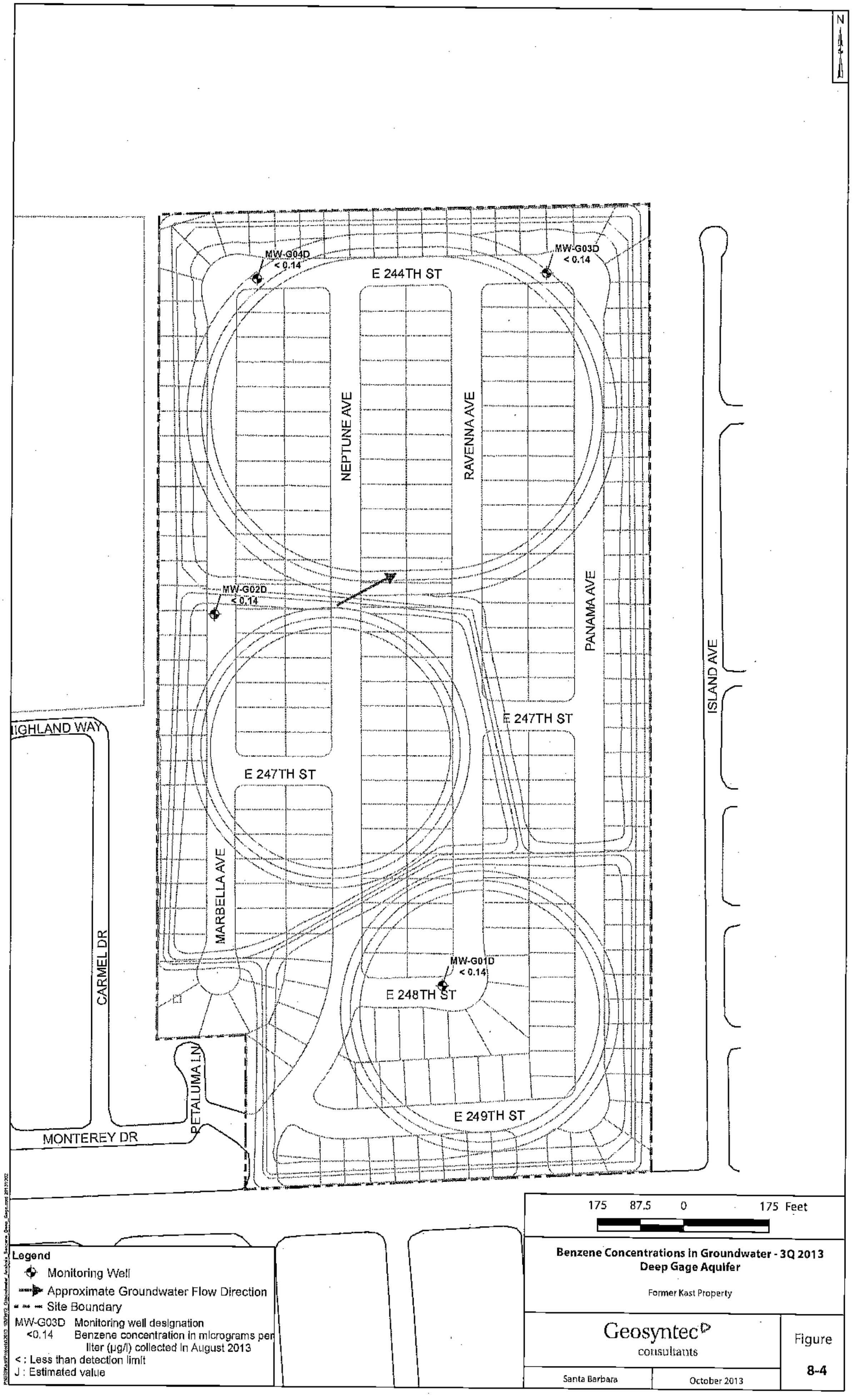
Benzene Concentrations in Groundwater - 3Q 2013
Shallow Gage Aquifer

Former Kast Property

Geosyntec consultants

Santa Barbara | October 2013

Figure 8-3



Benzene Concentrations in Groundwater - 3Q 2013
Deep Gage Aquifer

Former Kast Property

Geosyntec consultants

Figure **8-4**

Santa Barbara | October 2013

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

January 23, 2014

Mr. Douglas Weimer
Shell Oil Products, United States
Environmental Services Company
20945 S. Wilmington Avenue
Carson, CA 90810

SUBJECT: REVIEW OF REVISED SITE-SPECIFIC CLEANUP GOAL REPORT AND DIRECTIVE TO SUBMIT REMEDIAL ACTION PLAN, HUMAN HEALTH RISK ANALYSIS, AND ENVIRONMENTAL ANALYSIS FOR CLEANUP OF THE CAROUSEL TRACT PURSUANT TO CALIFORNIA WATER CODE SECTION 13304

SITE: FORMER KAST PROPERTY TANK FARM LOCATED SOUTHEAST OF THE INTERSECTION OF MARBELLA AVENUE AND EAST 244TH STREET, CARSON, CALIFORNIA (SCP NO. 1230, SITE ID NO. 2040330, CAO NO. R4-2011-0046)

Dear Mr. Weimer:

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) is the lead agency overseeing the environmental investigation and cleanup of the Former Kast property (Site) located in Carson, California. The Former Kast property was owned and operated by Shell Oil Company (Shell) as a crude oil storage facility from the 1920s to the 1960s when it was sold to developers and converted into a residential tract with 285 single family homes known as the Carousel Tract. Wastes associated with the tank farm activities, including crude oil in soils, were not fully removed from the site during its development and crude oil wastes remain in soil and groundwater underlying the Site.

The Site was brought to the attention of the Regional Board in 2008 by the California Department of Toxic Substances Control (DTSC). Soon thereafter, the Regional Board issued an investigative order in accordance with California Water Code section 13267 requiring Shell to delineate the nature and extent of wastes throughout the property, including wastes in soil vapor, indoor air within homes, and soil and groundwater beneath the Site. To date, Shell has collected extensive data to define the nature and extent of petroleum hydrocarbons and associated wastes on the Site.

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 continue to investigate the Site, continue to conduct groundwater monitoring and reporting, evaluate cleanup methodologies, propose site-specific cleanup goals (SSCGs) for Regional Board approval, submit a proposed remedial action plan (RAP), and upon approval of the RAP conduct remedial actions to cleanup and abate the waste in the soil, soil vapor, and groundwater at the Site. The site investigation under oversight by the Regional Board has been on-going since 2009 and has consisted of horizontal and vertical delineation of wastes beneath the Site, sub-slab and indoor air testing in most of the homes, and pilot remediation tests to determine the efficacy of different remedial technologies.

The CAO directed Shell to SSCGs for residential (i.e., unrestricted) land use for the Executive Officer's approval. The CAO required Shell to apply the following guidelines and policies in proposing SSCGs for wastes in soil and groundwater: (i) various state and federal policies and guidance regarding cleanup levels to address human health risks, including guidance specific to petroleum hydrocarbons; (ii) applicable water quality objectives in the Regional Board's 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"); and (iii) 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). See CAO Paragraph 3.c.II.

On February 22, 2013, Shell submitted a Site-Specific Cleanup Goal Report (Report) to the Regional Board proposing SSCGs. On August 13, 2013, the Regional Board issued a response to the Report notifying Shell that the proposed SSCGs were not approved and directed Shell to revise the SSCGs in accordance with comments and directives contained in the letter. The Regional Board also provided Shell comments from the Expert Panel (convened to provide input to the Regional Board regarding site cleanup) and the State of California Office of Environmental Health Hazard Assessment (OEHHA) and requested that Shell address those comments. As detailed in the August 21, 2013 letter, the Regional Board concluded that the proposed SSCGs did not meet the CAO requirement that the SSCGs must support residential standards for unrestricted use and that the Report had not taken into account State Water Board Resolution 92-49. The Regional Board also commented that the depth intervals proposed by Shell of zero to two feet below grade surface (bgs) and two feet to ten feet were not appropriate for setting cleanup goals in a residential setting, and that the initially proposed SSCGs for total petroleum hydrocarbons (TPH) would result in leaving significant amounts of waste in the soils beneath some portions of the Site.

On October 21, 2013, Shell submitted a revised SSCG Report (Revised Report) that included a screening feasibility study (FS) for the proposed SSCGs and provided a technological and economic feasibility analysis of several remediation scenarios for the Site. The screening FS was included in the Revised Report to address Regional Board comments that the SSCGs must address requirements of State Water Board Resolution 92-49 as required by the CAO. State Water Board Resolution 92-49 requires that SSCGs must be, in part, based on technological and economic feasibility, and the screening FS provides some information to address this requirement.[1] The Revised Report also contained four appendices that provide detailed rationale for development of the revised SSCGs, and responses to Regional Board, OEHHA, and Expert Panel comments in the Regional Board August 21, 2013 letter.

The Revised Report addressed many of the comments in the Regional Board August 21, 2013 letter. In particular, the Revised Report included numeric SSCGs for constituents of concern (COCs) in soil vapor; 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

[1] In the Revised Report, Shell commented on the interpretation of Resolution 92-49 in proposing SSCGs. Resolution 92-49 requires the Regional Board to assure that the cleanup promotes attainment of background water quality or the best water quality that is reasonable. In addition, the alternative cleanup level, other than background, must take into account the criteria set forth in Section 2550.4 of Title 23, California Code of Regulations, which includes criteria to protect human health; must address nuisance conditions, and must be consistent with the maximum benefit to the people of the state. In evaluating SSCGs and the remedies to be proposed in the RAP, the Regional Board will consider water quality, human health, and nuisance conditions.

limit and to the greatest extent technologically and economically feasible; revised the RAO for groundwater beneath the Site such that it attains the best quality that is technologically and economically feasible; and developed SSCGs for soil to address COCs leaching to groundwater.

The selected remedy must ensure compliance with the SSCGs for the long term and concludes that a cleanup based on the revised SSCGs proposed in the Revised Report may not fully support unrestricted residential land use, protect human health from exposure to COCs in the long term, and prevent further degradation of groundwater as required by the CAO. As discussed below under "Specific Comments", the Regional Board hereby approves SSCGs as revised to address groundwater and nuisance issues that were not fully addressed in the Revised Report.

SPECIFIC COMMENTS

For the Carousel Tract, SSCGs must result in:

- protecting residents from health risks due to potential exposure to COCs in soil vapors and direct contact with COCs in soil based on appropriate risk-based standards;
- abating nuisance conditions from COCs in soil and soil vapor; and
- restoring and protecting the beneficial uses of groundwater (i.e., attaining applicable water quality objectives in the groundwater).

The methodologies for deriving SSCGs are based on human health risk assessments, COC partitioning and migration analysis, quantification of COC leaching rates into groundwater, and the assessment of the potential for COC-caused nuisance. The Site investigation has provided site specific studies and extensive data[2] that are available for derivation of numeric SSCGs.

SSCGs for COCs in soil vapor must consider human health risks due to exposure through inhalation. SSCGs for COCs for soil must consider health risks and nuisance odor issues due to direct contact and odors and must consider leaching rates and water quality objectives to protect groundwater quality. The proposed SSCGs for COCs in soil are presented in Table 9-2 of the Revised Report. Proposed SSCGs for COCs in soil vapor are presented in Table 9-3 of the Revised Report. Proposed SSCGs for COCs in groundwater are presented in Table 9-4 of the Revised Report. Some of the proposed SSCGs set forth in Tables 9-2, 9-3, and 9-4 of the Revised Report do not meet all applicable criteria for selecting SSCGs, as described below. To address these comments, the Regional Board has developed Tables 1, 2, and 3 which are attached to this letter. Tables 1, 2, and 3 provide SSCGs for COCs in soil, soil vapor and groundwater and supersede Tables 9-2, 9-3, and 9-4 of the Revised Report. The SSCGs in Tables 1, 2, and 3 are protective of human health and groundwater quality, and will address potential nuisance from COCs at the Site. As set forth below under "Conclusions and Directives", Shell shall develop the RAP, the final Human Health Risk Assessment (HHRA) Report, and the environmental analysis using the SSCGs in Tables 1, 2 and 3.

<u>Soil Depth Intervals</u>

Shell provided SSCGs for COCs in soil to a depth of ten feet as required by the CAO. Based on the human health risk exposure scenarios for direct contact with COCs in soil in a residential setting, Shell

[2] See Attached Reference List.

divided the upper ten feet into two intervals of zero to two feet below grade surface (bgs), and from two feet to ten bgs. Shell based the proposed SSCGs on human health risk assessments from direct contact with soil in the upper two feet on an exposure scenario of 350 days per year over a period of 70 years. For the soil interval of two feet to ten feet Shell calculated risk to human health from direct contact with soil on an exposure scenario of four days per year. These exposure scenarios result in different SSCGs in the two soil intervals.

Regulatory guidance that incorporates a soil interval of zero to ten feet as appropriate for addressing risk in residential land use has been published by DTSC and the San Francisco Bay Regional Board. The *Supplemental Guidance For Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities* (CalEPA 1996), Human Health Risk Assessment Note 4 (DTSC, 2011) and the San Francisco Bay Regional Water Quality Control Board – *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater*, Interim Final (December 2013) (ESL) use the exposure scenario of zero to ten feet for 350 days per year as the default. It is reasonable, for the purpose of protecting residents from direct contact with soil and nuisance associated with odors,[3] to assume that residents will have less frequent exposure to soils in a deeper soil interval than to soils in a shallower interval as suggested by Shell. The depth interval proposed by Shell may not, however, support unrestricted residential use as required by the CAO. Residents can readily dig in soil at depths lower than two feet for gardening or other home improvements, at which point they may be exposed to COCs at a greater exposure frequency than that used in developing the proposed SSCGs. Regional Board staff concludes that defining the uppermost soil interval from zero to five feet is supportive of unrestricted residential use because institutional controls are already in place throughout Los Angeles County, including the City of Carson and Carousel Tract for excavations that are deeper than five feet. These controls require a soils investigation as well as grading and shoring permits in order to excavate at depths below five feet. In the Carousel Tract, the Los Angeles County building code is administered by the City of Carson. Because the City must be notified and approve excavations below five feet (Los Angeles County Building Code Sections 3304.1.2, 3307.1, 1803.5.7, J103, J104) the City could readily inform residents and workers of other appropriate precautions necessary for excavations below five feet through existing administrative processes. Consequently, the Regional Board concludes that soil depth intervals of zero to five and five to ten feet bgs provide unrestricted use for gardening and other activities to a depth that coincides with existing institutional measures (i.e. obtaining excavation permits) that are already in place.[4]

It is noted that the Expert Panel has opined on the issue of separating the shallow soil interval of zero to ten feet bgs with different direct contact exposure frequencies. The Expert Panel agrees with the use of separate shallow and deeper soil intervals proposed by Shell. The Expert Panel agrees with Shell's use of a zero to two feet bgs as acceptable, but also agrees with the Regional Board's approach of setting forth a zero to five feet shallow sub-interval based on the precautionary principle. See attached "Soil depth intervals used to calculate the Site Specific Cleanup Goals" (January 14, 2014) from the Expert Panel.

[3] In the course of conducting cleanup that involves excavation, Shell may encounter soils with detectable odors due to the presence of TPH. To assure protection of residents, the RAP will need to include a method to determine if TPH concentration in soil presents a detectable odor in accordance with the ESL and 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.

[4] The Regional Board agrees with the proposed risk-based scenario to address exposure of construction or utility workers in non-residential areas of the Site for four days per year. As noted above, the City of Carson implements ordinances to address excavation.

Table 9-2, Site Specific Cleanup Goals, Soil

Shell provided SSCGs for COCs in soil in Table 9-2 of the Revised Report. In response to the Regional Board's August 21, 2013 letter, Shell considered both risk to human health and restoration and protection of groundwater. To derive the most appropriate SSCGs for COCs in soil, the more stringent of the human health-based and groundwater-based SSCGs needs to be selected for each COC in both soil depth intervals to meet both goals of protecting human health and groundwater. As described above, Shell provided SSCGs based on two soil intervals (zero to two feet and from two feet to ten bgs). However, Table 9-2 omits consideration of the groundwater leaching SSCGs in the deeper soil interval. The Revised Report does not provide explanation for omitting the leaching potential analysis from the deeper soil interval. The COCs can leach from any soil depth above the groundwater table and at some Site locations, the groundwater already exceeds applicable water quality objectives. Waste present at deeper intervals is most likely contributing to continuing degradation of groundwater. The SSCGs for COCs in soil must consider leaching to groundwater for both depth intervals. Table 1 includes SSCGs for COCs in soil that protect both human health and groundwater in the entire soil interval of zero to ten feet and identifies the more stringent of the health risk based and leaching potential based SSCGs.

The Regional Board also finds an error in the Revised Report's calculations of the SSCGs for COCs in soil based on leaching potential. Shell calculated the SSCGs to address COC leaching to groundwater based on the *May 1996 Regional Board Interim Site Assessment & Cleanup Guidebook*. The proposed SSCGs in the Revised Report based on COCs leaching to groundwater used a Dilution Attenuation Factor (DAF) of 6.24. This DAF is not appropriate for the Site because groundwater beneath the Site is already polluted by COCs. See attached Regional Board Staff Internal Memorandum dated December 10, 2013.

Table 9-2 does not include two COCs – xylenes and toluene – that have been detected at the Site. The Expert Panel commented in the attached memorandum that the Revised Report describes the COC list as preliminary. With respect to Table 9-2, the Regional Board considers the list of COCs complete with the addition of xylenes and toluene. Table 1 includes xylenes and toluene as COCs in soil.

Finally, the clarity of Table 9-2 is compromised by referring to the shallow soil horizon as "Excavated Area" and the deeper soil horizon as the "Non-Excavated Area." Table 1 defines the soil intervals to be used based on soil depth. The Regional Board stated in the August 21, 2013 letter that the Regional Board does not distinguish between excavated and non-excavated areas in setting SSCGs and directed Shell to develop protective SSCGs for all site soils.

To address these comments, Table 1, attached to this letter, sets forth SSCGs that take into account leaching potential for both soil intervals, and adds xylenes and toluene to the list of COCs with appropriate SSCGs. Table 1 also includes soil intervals for zero to five feet below grade as discussed above under "Soil Depth Intervals."

Table 9-3, Site Specific Cleanup Goals, Soil Vapor

The proposed SSCGs for COCs in soil vapor are presented in Table 9-3 of the Revised Report. The SSCGs for COCs are intended to protect human health from inhalation of COCs and are based on DTSC guidance for protective concentrations in indoor air. The Revised Report uses an attenuation factor of 0.001 that ties indoor air standards to soil gas COC concentrations in soil vapor. Recent guidance entitled *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance), California Environmental Protection Agency, Department of Toxic Substances Control,* (DTSC. 2011) and *U.S. EPA's Vapor Intrusion Database: Preliminary Evaluation of*

Attenuation Factors, Office of Solid Waste (U.S. EPA. 2008.) recommend use of an attenuation factor of 0.002 (see also Section B.3. of the Expert Panel Memorandum dated December 18, 2013). The Regional Board hereby approves the SSCGs for COC in soil vapor based on the attenuation factor of 0.002. The approved SSCGs for COC in soil vapor are provided in Table 2, attached to this letter.

Table 9-4, Site Specific Cleanup Goals, Groundwater

The proposed SSCGs for groundwater are presented in Table 9-4 of the Revised Report. The groundwater beneath the Site is designated in the Regional Board's Basin Plan as municipal supply[5], and, therefore, water quality objectives to protect that beneficial use are the appropriate standards. The water quality objectives set forth in the Basin Plan, include primary and secondary MCLs (i.e., drinking water standards) adopted by the California Department of Public Health and incorporated into the Basin Plan and the narrative water quality objective for Chemical Constituents. The proposed SSCGs for groundwater are based on the primary MCLs, the Notification Level, a health based environmental screening level, or zero to represent natural background. Generally, the proposed SSCGs are acceptable with the exception of the SSCGs for TPH. The proposed SSCGs for TPH as gasoline, diesel, and motor oil are based on the ESL. To comply with the Basin Plan water quality objectives, the SSCGs for TPH as gasoline, diesel, and motor oil should be based on the secondary taste and odor threshold of 100 micrograms per liter for TPH as diesel. See State Water Board's "A Compilation of Water Quality Goals", 16th Edition (April 2011).[6] The approved SSCGs for COCs in groundwater are provided in Table 3 attached to this letter.

Methane

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. The proposed SSCG for methane is consistent with the DTSC guidance for addressing methane detected at school sites (CalEPA DTSC, 2005) and is applicable to concentrations measured in soil vapor, in vaults, or above ground. The SSCG for methane should be the more stringent of the lower explosive limit or the level that is technically and economically feasible. The "Response" on pages 16 and 78 of the Revised Report include response actions when the SSCG is exceeded. The Regional Board does not approve the response action at this time and will review the response actions that will be contained in the RAP.

The Screening Feasibility Study

The screening FS presented in the Revised Report sets forth several different cleanup alternatives that are based on excavation to different depths and implementation of soil vapor extraction. Shell developed a screening FS to address comments in the Regional Board's August 21, 2013 letter that information regarding the technological and economic feasibility of remedial alternatives was required in accordance with State Water Board Resolution 92-49 in order to approve SSCGs that are greater (i.e. less stringent) than necessary to attain background water quality.

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[5] It is important to note that the groundwater at the Site is not currently used for municipal supply. The residents of the Carousel Tract obtain their drinking water from municipal supply provided by California Water Service Company.

[6] http://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/

State Water Board Resolution 92-49 defines economic feasibility as follows:

> "Economic feasibility is an objective balancing of the incremental benefit of attaining further reductions in the concentrations of constituents of concern as compared with the incremental cost of achieving those reductions. The evaluation of economic feasibility will include consideration of current, planned, or future land use, social, and economic impacts to the surrounding community including property owners other than the discharger.
>
> Economic feasibility, in this Policy, does not refer to the discharger's ability to finance cleanup. Availability of financial resources should be considered in the establishment of reasonable compliance schedules."

The underlying basis for estimating remedial alternative costs is not provided in the Revised Report and cleanup metrics such as mass of wastes removed or risks abated is not provided. As discussed in further detail in the attached Regional Board staff memorandum titled *Comments on the Revised Site-Specific Cleanup Goal Report*, dated December 23, 2013, the range of accuracy is overly broad such that the economic differences between different alternatives may not be discernible. Additionally, the screening FS included statements that certain remedial scenarios might affect the tax basis of the City of Carson but did not provide a basis for this statement.

Resolution No. 92-49 defines technological feasibility as follows:

> "Technological feasibility is determined by assessing available technologies, which have shown to be effective under similar hydrogeologic conditions in reducing the concentration of the constituents of concern. Bench scale or pilot-scale studies may be necessary to make this feasibility assessment."[7]

Regional Board notes that Shell undertook bench-scale and pilot scale studies of a number of technologies, including in-situ bioremediation. These technologies have been documented in the pilot test (*Final Pilot Test Summary Report – Part 1*, [URS, May 30, 2013]). The pilot test indicated bioremediation is a potential technology to remediate residual petroleum hydrocarbons. However, the technology was not included in the remediation alternatives set forth in the Revised Report. In developing the RAP, Shell must consider all technologies that have demonstrated effectiveness in bench and pilot studies, including bioremediation as a potential remedial alternative.

<u>Chlorinated Solvents</u>

The Regional Board staff disagree with the Revised Report which suggested that the tetrachloroethylene (PCE) and trichloroethylene (TCE) detected in both on-site soils and soil vapor is from off-site sources exclusively. Although there may be off-site sources of PCE and TCE at the Site, those COCs are often associated with the petroleum industry and on-site sources should not be discounted. The USEPA Toxic Release Inventory for the Petroleum Industry includes the use of chlorinated solvents in large industrial process description. Therefore, the Regional Board cannot exclude PCE and TCE from the list of COCs for the Site. The Expert Panel also recommends that PCE and TCE should not be excluded from the list of COCs. See Expert Panel memorandum dated December 18, 2013.

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[7] Note that Shell has conducted numerous pilot studies and those can be used to evaluate technical feasibility. The Regional Board is not suggesting that additional pilot studies are necessary.

CONCLUSIONS AND DIRECTIVES

Upon review of the Revised Report and other relevant documents, the Regional Board approves the following SSCGs as set forth in the attached Tables 1, 2, and 3 with the understanding that the SSCGs may be further revised as necessary to address cumulative risks identified in the forthcoming HHRA that exceed the RAOs.

1. SSCGs for COCs in Soil: The approved revised SSCGs for COCs in soil are provided in Table 1. As described above, to address direct contact with soils, Table 1 provides SSCGs that consider a 350-day per year exposure scenario to soil zero to five feet bgs to be appropriate for unrestricted residential land use and a four- day per year exposure scenario to soil five to ten feet bgs to be appropriate for limited direct contact. To address potential leaching to groundwater, Table 1 provides SSCGs for a soil interval of zero to ten feet bgs. The more stringent of the SSCGs for each soil interval are the approved SSCGs. In addition, SSCGs for toluene and xylenes shall be developed in accordance with the comments above and added to the list of COCs .

2. SSCGs for COCs in Soil Vapor: The approved revised SSCGs for protection of human health are provided in Table 2. As described above, they have been adjusted to take into account recent guidance. In addition, SSCGs shall be revised if necessary to take into account cumulative risks and the final HHRA Report.

3. SSCGs for COCs in Groundwater: The approved revised SSCGs for groundwater are provided in Table 3. As described above, the SSCGs for TPH have been adjusted to address applicable water quality objectives.

The CAO required Shell to submit the RAP to the Executive Officer no later than 60 days after the Executive Officer's approval of the Pilot Test Report. In a letter dated April 25, 2013, the Regional Board revised the due date for the RAP to 45 days following approval of the SSCGs. Therefore, in accordance with the revised due date, Shell is now directed to submit the RAP on March 10, 2014 to the Executive Officer for review and approval. The RAP shall take into account the requirements set forth in the CAO under Paragraph 3, including an evaluation of all available options for remediation, and is based on the comments in this letter and the revised approved SSCGs set forth in Tables 1, 2, and 3 attached to this letter.

To be consistent with the CAO, the RAP shall include, at a minimum:

A. Remedial Alternatives: The RAP shall consider all technologies that were pilot tested, including bioventing, as alternatives. The RAP shall be developed to address COCs in soils in the soil intervals consistent with these comments. The screening FS alternatives in the Revised Report that address this requirement include Alternatives 3B and 4B. Although other alternatives set forth in the screening FS may also be addressed in the RAP, the RAP and environmental analysis must address Alternatives 3B or 4B to take into account the revised SSCGs set forth in Tables 1, 2, and 3. Consistent with State Water Board Resolution 92-49, the RAP shall evaluate the alternatives with respect to effectiveness, feasibility, and cost and propose a remedy or remedies that have a substantial likelihood to achieve compliance, within a reasonable time frame, with the cleanup goals and objectives.

B. Relocation Plan: The RAP shall provide a preliminary relocation plan for residents of the Carousel Tract during remedial activities. The relocation plan shall be based on the environmental analysis to be submitted in the RAP such that residents are not exposed to COCs or other environmental impacts during the cleanup. A final relocation plan shall be submitted following approval of the RAP.

C. Soil Remediation Boundaries: Shell developed site-wide shallow soil concentration contours for discrete depths of 2, 5, and 10 feet below ground surface in the Site Delineation Report. Shell shall consider the results in the Site Delineation Report, soil concentrations contours and the results of the property-by-property investigations in developing the RAP.

D. Residual Slabs: The RAP shall consider the removal of residual slabs as discussed in the Regional Board's response to the Assessment of Environmental Impact and Feasibility of Removal of Residual Concrete Reservoir Slabs in a letter dated, January 13, 2014 where necessary to protect human health and water quality and address nuisance concerns.

E. Soil Management Plan: The RAP shall include a proposed Soil Management Plan for all soils containing COCs. The RAP shall address on-going monitoring requirements and identification of other governmental agencies that may be responsible for implementing the Soil Management Plan.

The Regional Board concurs with the comments provided by OEHHA dated December 16, 2013 and the Expert Panel dated December 18, 2013. The RAP should address the comments by the Expert Panel that are not already addressed in this letter.

In addition, Shell is directed to concurrently submit with the RAP (1) the final HHRA Report and (2) draft environmental documents consistent with the California Environmental Quality Act (CEQA) analyzing the potential environmental impacts associated with remediation alternatives considered in the RAP.

The RAP shall address any areas that the HHRA Report identifies that will not meet the remedial action objectives (RAOs) of a cancer risk of 1×10^{-6} and non-cancer risk of 1. The RAP shall ensure that these areas shall be remediated to meet the RAOs.

In summary, the RAP, HHRA Report, and environmental documents are due to the Regional Board by 5:00 pm on March 10, 2014.

Following receipt of the required documents, the Regional Board will provide an opportunity for Expert Panel, OEHHA, other agencies, and public review and comment. Following its review of the documents and comments, the Regional Board will consider certification of the environmental documents and approval of RAP.

The due date for the above required documents constitutes an amendment to the requirements of Cleanup and Abatement Order No. R4-2011-0046 originally dated March 11, 2011. All other aspects of Order No. R4-2011-0046 originally dated March 11, 2011 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 the due date for the RAP, HHRA Report and CEQA documents set forth in this letter, may result in civil liability administratively imposed by the Regional Board in an amount up to five thousand dollars ($5000) for each day of failure to comply.

The State Water Board adopted regulations requiring the electronic submittals of information over the Internet using the State Water Board GeoTracker database. You are required not only to submit hard copy reports required in this Order but also to comply by uploading all reports and correspondence prepared to date and additional required data formats to the GeoTracker system. Information about GeoTracker submittals, including links to text of the governing regulations, can be found on the Internet at the following link:

http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal

Please note that, the Regional Board requires you to include a perjury statement in all reports submitted under the CAO. The perjury statement shall be signed by a senior authorized Shell 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 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] 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:
Table 1: Site Specific Cleanup Goals, Soil (revised Table 9-2)
Table 2: Site Specific Cleanup Goals, Soil Vapor (revised Table 9-3)
Table 3: Site Specific Cleanup Goals, Groundwater (revised Table 9-4)
SSCGs Development Support Documents References
Comments from the Expert Panel dated January 14, 2014
Regional Board Staff Internal Memorandum 1 dated December 10, 2013
Comments from the Expert Panel dated December 18, 2013
Regional Board Staff Internal Memorandum 2 dated December 23, 2013
OEHHA Memorandum dated November 21, 2013

cc: List

<u>List</u>

Janice Hahn, Honorable Congresswoman, US House of Representatives,
California's 44th District
Isadore Hall, III, Assembly member, 64th Assembly District
Mark Ridley-Thomas, Supervisor, Second District County of Los Angeles
Jim Dear, Mayor of Carson
Michael Lauffer, Office of Chief Counsel, State Water Resources Control Board
Frances McChesney, Office of Chief Counsel, State Water Resources Control Board
James Carlisle, Office of Environmental Health Hazard Assessment
Robert Romero, Department of Toxic Substances Control
Alfonso Medina, Los Angeles County Department of Health
Angelo Bellomo, Los Angeles County Department of Health
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
Jackie Acosta, Carson Acting City Manager
Sheri Repp-Loadsman, City of Carson
Ky Truong, City of Carson
Karen A. Lyons, Shell Oil Products US
Alison Abbott Chassin, 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 Resource Management, LLC
Deanne L. Miller, Morgan, Lewis & Bockius LLP
Patrick Dennis, Gibson Dunn

Table 1: Site Specific Cleanup Goals, Soil (revised Table 9-2)

Constituents of Concern	Soil Cleanup Goals (mg/kg)	
Inorganics	**0-5 feet**	**5-10 feet**
Antimony	0.272	0.272
Arsenic	12	12
Cadmium	70	6,100
Chromium VI	1.2	110
Cobalt	23	2,100
Coopper	3,100	270,000
Lead	80	800
Thallium	0.143	0.143
Vanadium	390	34,000
Zinc	23,000	2,100,000
PAHs		
Benz[a]anthracene	1.6	140
Benzo[a]pyrene	0.9	14
Benzo[b]fluoranthene	1.6	140
Benzo[k]fluoranthene	1.6	140
Chrysene	16	1,400
Dibenz[a,h]anthracene	0.11	9.7
Indeno[1,2,3-cd]pyrene	1.6	140
Methylnaphthalene, 1-	16	1,400
Methylnaphthalene, 2-	230	20,000
Naphthalene	4	14.1
Pyrene	1,700	150,000
TPH		
TPH-Gasoline	117	117
TPH-Diesel	625	625
TPH-Motor oil	3,300	8500
SVOCs		
2,4-Dinitrotoluene	1.6	140
Bis(2-Ethylhexyl) Phthalate	35	3,000
VOCs		
1,1,2,2-Tetrachloroethane	0.47	41
Cis-1,2-Dichloroethene	0.00385	0.00385
1,2-Dichloroethane	0.000321	0.000321
1,2,3-Trichloropropane	0.00000417	0.00000417
1,2,4-Trimethylbenzene	83	7,200
1,2-Dichloropropane	0.83	72
1,3,5-Trimethylbenzene	85	7400
1,4-Dichlorobenzene	0.0123	0.0123
Benzene	0.0208	0.208
Bromodichloromethane	0.49	42
Bromomethane	8.8	770
Ethylbenzene	4.8	420
Methylene chloride	5.3	470
tert-Butyl Alcohol	0.00785	0.00785
Tetrachloroethene	0.00577	0.00577
Trichloroethene	0.00321	0.00321
Vinyl Chloride	0.000321	0.000321
Toluene	To be provided by Shell	To be provided by Shell
Xylenes	To be provided by Shell	To be provided by Shell

Table 2: Site-Specific Cleanup Goals, Soil Vapor (revised Table 9-3)

Constituents of Concern	Soil Vapor Cleanup Goals (µg/m³)
VOCs	
1,1,1-Trichloroethane	2.60E+06
1,1,2,2-Tetrachloroethane	2.10E+01
1,1,2-Trichloroethane	7.50E+01
1,1-Dichloroethane	7.50E+02
1,2,4-Trichlorobenzene	1.05E+03
1,2,4-Trimethylbenzene	3.65E+03
1,2-Dichloroethane	6.00E+01
1,2-Dichloropropane	1.20E+02
1,3,5-Trimethylbenzene	3.65E+03
1,3-Butadiene	7.00E+00
1,4-Dichlorobenzene	1.10E+02
1,4-Dioxane	1.60E+02
2,2,4-Trimethylpentane	5.00E+05
2-Hexanone	1.55E+04
4-Ethyltoluene	5.00E+04
Benzene	4.20E+01
Bromodichloromethane	3.30E+01
Bromomethane	2.60E+03
Carbon disulfide	3.65E+05
Carbon tetrachloride	2.90E+01
Chloroform	2.30E+02
Chloromethane	4.70E+04
Cyclohexane	3.15E+06
Dibromochloromethane	4.50E+01
Dichloroethene, cis-1,2-	3.65E+03
Dichloroethene, trans-1,2-	3.15E+04
Dichloropropene, trans-1,3-	7.50E+01

Constituents of Concern	Soil Vapor Cleanup Goals (µg/m³)
VOCs	
Ethanol	2.10E+06
Ethylbenzene	4.85E+02
Heptane	3.65E+05
Hexachloro-1,3-butadiene	5.50E+01
Hexane	3.65E+05
Isopropanol	3.65E+06
Isopropylbenzene (cumene)	2.10E+05
Methyl ethyl ketone (2-butanone)	2.60E+06
Methylene chloride	1.20E+03
Methyl-tert-butyl-ether	4.70E+04
Naphthalene	3.60E+01
Propylbenzene	5.00E+05
tert-Butyl Alcohol (TBA)	5.50E+05
Tetrachloroethene	2.05E+02
Tetrahydrofuran	1.05E+06
Toluene	2.60E+06
Trichloroethene	2.95E+02
Vinyl chloride	1.55E+01
Xylene, m-	5.00E+04
Xylene, o-	5.00E+04
Xylene, p-	5.00E+04
TPH	
Aliphatic: C5-C8	3.65E+05
Aliphatic: C9-C18	1.55E+05
Aromatic: C9-C16	2.60E+04
TPH (Nuisance)	5.00E+01

Table 3: Site Specific Cleanup Goals, Groundwater (revised Table 9-4)

Constituents of Concern	Groundwater Cleanup Goals (µg/L)
Benzene	1
Naphthalene	17
tert-Butyl Alcohol (TBA)	12
TPH-Gasoline	100
TPH-Diesel	100
TPH-Motor Oil	100
1,1-Dichloroethane	5
1,1-Dichloroethene	6
1,2,3-Trichloropropane	0.005
1,2-Dichloroethane	0.5
cis-1,2-Dichloroethene	6
Tetrachloroethene	5
trans-1,2-Dichloroethene	10
Trichloroethene	5
Vinyl Chloride	0.5
1,4-Dichlorobenzene	5
Antimony	background
Thallium	background
Arsenic	background

SSCGs Development Support Documents References

1) Plume Delineation Report, Former Kast Property, Carson, California. (URS, September 25, 2010).
2) Human Health Screening Evaluation Work Plan, Former Kast Property, Carson, California. (Geosyntec, October 30, 2009).
3) Soil Vapor Extraction Pilot Test Report. Former Kast Property, Carson, California. (URS, September 30, 2010).
4) Soil Background Evaluation Report. Former Kast Property, Carson, California. (URS, September 14, 2010).
5) Community Outdoor Air Sampling and Analysis Report, Former Kast Property, Carson, California. (Geosyntec, November 5, 2010).
6) Pilot Test Work Plan for Remedial Excavation and In-situ Treatment Pilot Testing, Former Kast Property, Carson, California. (URS & Geosyntec, May 10, 2011).
7) Gage Aquifer Investigation, Former Kast Property, Carson, California. (URS, October 10, 2011).
8) Bioventing Pilot Test Summary Report. Former Kast Property, Carson, California. (Geosyntec, December 6, 2012).
9) Excavation Pilot Test, 24612 Neptune Avenue, Former Kast Property, Carson, California. (URS, January 4, 2013).
10) Phase II ISCO Bench-Scale Test Report. Former Kast Property, Carson, California. (Geosyntec, August 30, 2013).
11) A Human Health Screening Risk Evaluation (HHSRE) was conducted to evaluate the analytical results of the indoor air, soil, and sub-slab soil vapor samples collected at 268 total homes to date and over 600 Residential Sampling Reports prepared (2009 to present).

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TO: Los Angeles Regional Water Quality Control Board

FROM: UCLA Expert Panel, Gary Krieger

PROJECT: Former Kast Property in Carson, California

SUBJECT: Soil depth intervals used to calculate the Site Specific Cleanup Goals

DATE: January 14, 2014

The Revised Site Specific Cleanup Goals Report (Revised Report) submitted by Shell to the Regional Board on Oct. 21, 2013 divides the upper 10-foot soil horizon into two intervals: 0-2 feet, and 2-10 feet. Shell used different exposure frequency to constituents of concern in the soil intervals based on the rationale that residents have more frequent exposures to shallower soils (0-2 feet) than to deeper soils (2-10 feet). On January 14, 2014, the Regional Board requested the UCLA Expert Panel comment on the appropriateness of this rationale of using different exposure frequencies for different soil depths within a 10-foot soil horizon.

The UCLA Expert Panel agrees that this methodology is appropriate to assess human health exposure. The USEPA (1993) has defined that the top 2 centimeters of soil is where direct contact for the residential receptor predominantly occurs. In the guidance for soil screening the USEPA states "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, page 12). In their supplemental guidance, the USEPA 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 subsurface soil via direct contact pathways such as ingestion and dermal absorption" (USEPA 2002, page 2-8). In USEPA's (2003) *Superfund Lead-Contaminated Residential Site Handbook*, the agency states that sampling "does not need to exceed 24 inches to define the vertical extent of contamination for clean-up purposes" as the remediation is being conducted to eliminate the potential for direct exposure in the residential setting. The Handbook (USEPA 2003) goes on to recommend for remediation that "Based on Agency experience, 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." and "Twenty-four (24) inches of clean soil cover is generally considered to be adequate for gardening areas ..."

We 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. It is our opinion that only if soil concentrations exist below 2 feet that may pose a unacceptable exposure to vapor intrusion should residential exposure be the driver for Site Specific Cleanup Goals for subsurface soil (2 to 10 feet) rather than the utility worker. This opinion is consistent with the Revised Site Specific Cleanup Goals Report submitted by Shell.

References Cited

USEPA 1993, *The Urban Soil Lead Abatement Demonstration Project.* Vol I: Integrated Report Review Draft. National Center for Environmental Publications and Information. EPA 600/AP93001/A. NTIS PB93-222-651. as cited in USEPA 1996.

USEPA 1996, *Soil Screening Guidance: User's Guide*, Second Edition, Office of Solid Waste and Emergency Response, Washington DC Publication 9355.4-23, July 1996.

USEPA 2002, *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.* Office of Solid Waste and Emergency Response, Washington DC OSWER 9355.4-24, December 2002.

USEPA 2003, *Superfund Lead-Contaminated Residential Sites Handbook.* Office of Emergency and Remedial Response, Washington DC OSWER 9285.7-50, August 2003.

CALIFORNIA
Water Boards

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GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

TO: Samuel Unger, P.E., Executive Officer
California Regional Water Quality Control Board – Los Angeles Region

FROM: Yue Rong, Ph.D., YR
Section Chief, Underground Storage Tank Section
Weixing Tong, Ph.D., PG, CHG WXT
Unit Chief, Underground Storage Tank, Los Angeles Coastal Unit

DATE: December 10, 2013

SUBJECT: COMMENTS ON PROJECT PROPOSAL

We went through the attachment documents presented to us (Revised Site-Specific Cleanup Goal Report, by Geosyntec, dated October 21, 2013, APPENDIX A), particularly to review the calculations for benzene and TPH for groundwater protection (not including vapor intrusion or risk assessment part). The following are our comments as we discussed in the meeting.

1. Soil screening levels calculated in the document did not contain all components in our 1996 Guidebook method, which contains a modification factor due to soil type (a different coefficient for gravel, sand, silt, and clay, respectively). This modification factor was not used in the calculation.

2. In page A-28, it states that the Attenuation Factor method in 1996 Guidebook Step 3 is not conducted in order to "avoid double-counting" the soil type. We disagree with the approach to skip Step 3. The 1st Step using soil type parameter is to calculate VOC partitioning based on soil physical material and contaminant chemical properties. Steps 2 and 3 are to obtain "safety factors" for the attenuation factor, but are not used to count for VOC partitioning. Step 3 is a factor based on leachability. Therefore, Step 1 and Step 3 are different in nature.

3. Based on the 1996 Guidebook method referenced above, the soil cleanup level should be calculated for benzene as follows:

$C_{(cleanup)} = MCL \times AF(\mathrm{T}) / \rho b = (1 \mu g/L \times 33/10) / 1.54\ kg/L = 2.1\ \mu g/kg$

(Please compare with results in page A-31)

4. In page A-31, the report used a dilution factor (DAF=6.24) in the calculation for soil cleanup goals. Note that the same DAF has been used for all other VOCs in table A-17. In Appendix A (Section 5.3.3), it used the Soil Attenuation Model (SAM) to quantify the dilution of dissolved constituents of concern (COCs) when soil leachate mixes with lateral groundwater flow. This method assumes when leachate vertically migrates to the water-bearing unit through infiltration, a contaminant will be diluted by the lateral groundwater flow in the mixing zone. We believe that the use of SAM is

not appropriate in this case because the groundwater underneath the subject site has been impacted by the various COCs (i.e., TPHg, benzene, etc.) and groundwater contamination plumes with concentrations above their respective MCLs or NLs already exist. Any contaminants brought into the water-bearing unit through infiltration will be considered as an addition to the existing plume. Furthermore, the proposed dilution concept is against the State Anti-degradation Policy. The discharge compliance point should be at the groundwater table where the infiltrated water enters the water-bearing unit.

5. Not clear how the TPH cleanup goal is calculated in terms of groundwater protection. TPH cleanup levels calculated in the report seem all based on human health risk factors. If we use Table 4-1 in the 1996 Guidebook, the cleanup levels should be: TPH(gasoline range C4-C12) = 500 mg/Kg, TPH(diesel range C13-C22) = 1000 mg/Kg, and TPH(motor oil range C23-C32) = 10000 mg/kg, respectively. By contrast, Table A-17 presented in the report proposed soil cleanup goals for TPH as gasoline of 730 mg/Kg, TPH as diesel of 3900 mg/Kg, and TPH as motor oil of 50000 mg/Kg.

6 Use of the Attenuation Factor method specified in our 1996 Guidebook can also be considered for determining the TPH cleanup levels. In that case, individual compounds representing each carbon range should be used for calculation. For example, hexane, naphthalene, trimethylbenzene, etc.

7. Specific comments on the document and Appendix A:
   a) Need to number all equations in the report for reference.
   b) The bottom two equations in page A-31 are incorrect. The DAF equation should use 11.3m as input instead of 21.4m, and *C(cleanup)* equation should have result in unit of *μg/kg*, not mg/kg.
   c) Vertical dispersivity αv value seems too high. Need justifications for choosing this value (although it did not really impact the result in this case).

Comments from the Expert Panel on the Revised Site-Specific Cleanup Goal Report

Submitted: December 18, 2013

A. Introduction

As requested by the Los Angeles Regional Water Quality Control Board (Regional Board), the Expert Panel has reviewed the Revised Site-specific Cleanup Goal Report (Revised SSCG Report) prepared for the former Kast Property in Carson, California by Geosyntec Consultants for Shell Oil Products US. This builds upon the Panel's review of the previously submitted Site-specific Cleanup Goal Report (SSCG Report), and precedes the release of the Remedial Action Plan.

The Panel's overall charge is to provide its recommendations for the Regional Board to consider in determining whether cleanup goals and remedial actions proposed by the responsible parties named in the Cleanup Order are consistent with applicable legal authorities.

In general, Geosyntec did not make many changes to the overall approach taken in the Revised SSGC Report compared to the original SSCG Report. Text and figures were added to help explain reasoning and inconsistencies while improving transparency. Yet we have concerns with the following issues.

B. Concerns and Recommendations

1. Cumulative risk and/or hazard taken into account in the SSCG calculations
2. Finalizing the COC list
3. Attenuation factor for sub-slab vapor concentrations
4. Chlorinated volatile organic compounds (CVOCs) potentially from onsite sources
5. Remediation options
6. Interpretation of State Board Resolution No. 92-49

B.1. Cumulative risk and/or hazards taken into account in the SSCG calculations

One of the Expert Panel's most significant concerns, still not addressed in the Revised SSCG Report, is with the calculation of the SSCGs. Each COC has a calculated SSCG that is based on a cancer risk of one in a million (10^{-6}) or a hazard index of 1. "The final SSCG values were not adjusted by number of chemicals included in the SSCG derivation process therefore there is no impact on the value calculated." (Response to Expert-3 comment regarding the number of COCs selected) We advise the Regional Board to explicitly task Geosyntec to clearly demonstrate how cumulative risk is assessed and calculated for all of the chemicals of concern (COCs).

In response to OEHHA commenting, "The implication of cumulative risks and/or hazards that exceed target levels needs to be considered." Geosyntec replied, "Agreed. This is consistent with the approach described in the SSCG report." (Response to OEHHA-32) However, the Panel still does not see how this is consistent with the approach. In general, Geosyntec states,

> *"... we believe dividing the SSCGs by the number of COCs to calculate a lower value to address cumulative risk issues is overly conservative and assumes that the chemicals are equally distributed. For most sites there are a subset of chemicals that contribute the majority to risk and hazard. Rather than assume a certain distribution of risk and hazard among chemicals ahead of time, the site data will be evaluated in the HHRA to identify the final COCs. In addition as presented in the RAOs section, the forthcoming HHRA [Human Health Risk Assessment] will address cumulative risk."* (Responses [whole or in part] to Expert-4, Expert-5, RWQCB-15 and Expert-8)

This comment pushes things to the forthcoming full Human Health Risk Assessment (HHRA), which the Panel believes should logically have been done already. As stated in our Interim Report on the SSCG Report, "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."

The only step where we see cumulative risk assessed is in the selection of the COCs where the risk-based screening level (RBSL) has been divided by 10. Geosyntec's primary argument for not taking cumulative risk into account in the SSCG report appears to be two-fold: 1) chemicals are not necessarily equally distributed and 2) the upcoming HHRA will do it.

> *"When the forthcoming HHRA is conducted cumulative risks and hazards will be calculated and corrective actions will be based on the SSCGs presented in this report and the cumulative HHRA results." (Response to Expert-3)*

While not discussed explicitly, we have to wonder if the way this will be conducted is similar to the HHSRE where the risk index is calculated using the SSCGs rather than the RBSLs and that a risk index greater than 1 would require remedial action rather than an exceedance of SSCG ("bright line" method). That is how the following text could be interpreted.

> *"The chemical-specific SSCGs will be used in the HHRA along with the exposure point concentration for each property and depth interval being evaluated to estimate chemical-specific risks and noncancer hazards. ... Cumulative estimates of cancer risk and noncancer hazard will be calculated by summing the chemical-specific estimates presented in the HHRA."* (Pages 44-45 of the SSCG Report)

If SSCGs will be used to calculate a "risk index" that will trigger action rather than using the SSCGs as "bright line" remediation cleanup values for determining whether an action is required, then our concern with cumulative risk/hazard has probably been addressed, and we can see how the Site's RAOs for soil[1], in particular, can be met/addressed. However, if the SSCGs are actually used as "bright line" cleanup concentrations, we are concerned that once the board approves of this report, there is no modification possible. Geosyntec uses the "they have approved it so it is good" argument several times in their comment responses. Therefore, the Board should be very clear about how these SSCGs are going to be used for making decisions in the RAP.

We would advise the Water Board to clearly and explicitly hold Geosyntec to a work plan that explicitly addresses the key issues and lays out methodology; otherwise this will recycle. And again, we are concerned with how key decisions are continuously pushed forward onto the HHRA, when it is unclear that Geosyntec will perform the calculations in a total manner that is reflected in the cleanup that the Water Board will find acceptable.

B.2. Finalizing the COC list

Geosyntec indicates that the SSGCs are final, but they describe the COC list as preliminary. The Panel agrees with the OEHHA and recommends that the COC list should be presented as the final list; otherwise it will be difficult to argue that the SSCG list is final.

While we did previously point out that HERO HHRA Note 4 (Expert-15 comment) is inconsistent with the COC approach in the SSGC report, we will agree with Geosyntec that "[T]he screening approach used in the SSCG report to select COCs is considered appropriate for this site ..." (Response to Expert-15). However Geosyntec appears to indicate that this COC list is not considered "final" by stating, "The Revised SSCG Report presents the **preliminary** [emphasis added] list of COCs for evaluation in the RAP. The forthcoming HHRA will provide the **final** [emphasis added] analysis following the approached presented in Appendix A" (Response to OEHHA-23). It is unclear why then the COC list is preliminary if it follows the same approach. However, note the COC selection process is in the SSCG report and only summarized in Appendix A. Appendix A states, "Tables 4.5 and 4.6 of the main report present the COCs that have been identified for each media to be carried forward into the RAP" (page A-2).

We recommend that the COC list should be presented as the final list.

B.3. Attenuation factor for sub-slab vapor concentrations

The Revised SSCG Report proposes an attenuation factor (AF) of 0.001 when sub-slab vapor concentrations are greater than 100 ug/m^3 (a high concentration for this site). However, this AF is very low. We recommend using a home-specific attenuation factor rather than a generic AF, to ensure that each individual home is protected.

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[1] "The RAOs for soil are to prevent human exposures to concentrations of COCs in soil such that total (i.e., cumulative) lifetime incremental carcinogenic risks are within the NCP risk range of 1×10^{-6} to 1×10^{-4} and noncancer hazard indices are less than 1 or concentrations are below background, whichever is higher." (page 39)

In the analysis presented by Geosyntec (Appendix B), the argument is made that a generic attenuation factor of 0.01 for consideration the pathway from sub-slab to indoor air is in fact conservative. While this may be valid for a large number of the homes, Figures B-10 and B-11 suggest that this is NOT the case for a number of individual homes, when paired data for specific compounds is evaluated. The empirical data does not support using a "generic" attenuation factor for determining the risk, which is consistent with the notion that conditions may be different in each home, and that for a given home owner it is important to reduce her/his individual risk, not the generic risk. In fact, Figure B-10 suggests that the number of cases where the empirical attenuation factor is > 0.01 is large, although mostly at low sub-slab concentrations. Nevertheless, there are a significant number of cases where the empirical attenuation factor is > 0.01 and sub-slab concentrations are > 100 ug/m3.

The recommendation is to not use a generic attenuation factor, but rather a home-specific attenuation factor, to ensure that each individual home is protected.

In addition, it would have been useful for Geosyntec to have provided the spatial distribution of the CVOCs in the sub-slab vapor as it would have likely followed the CVOC groundwater distribution and not the CVOC soil distribution, providing more evidence of a trespassing CVOC plume. This would provide a link between the risk assessment and subsurface evaluation.

B.4. Chlorinated volatile organic compounds potentially from onsite sources

Geosyntec provided in Appendix E the distribution maps of PCE and TCE in both shallow soil and in groundwater. These maps make the best case for the conclusion that the CVOCs in both shallow soil and groundwater are from neighboring source, but the evidence could be presented more clearly and transparently. The "evidence" of "[T]he lack of detections of PCE and TCE in Site soils between 10 feet below ground surface and groundwater (>400 samples)" [Response to comment RSQCB-2] does not "rule out" that CVOCs in shallow soil are sourced from the Site rather only rules out that the Site probably did not source the groundwater plume under the site. We advise the Regional Board to focus attention on this area.

B.5. Remediation options

We recommend not eliminating remediation options at this point in the analysis. Section 9 of the Revised SSCG includes a preliminary evaluation of remedial alternatives, also called a Screening Feasibility Study, and then based on this preliminary evaluation excludes certain technologies and remedial alternatives while prioritizing only certain remaining ones for further evaluation. Geosyntec envisions that later a "detailed evaluation of the recommended remedial alternative will be conducted and presented in the forthcoming Remedial Action Plan." The Expert Panel is concerned that it may be premature to eliminate many remediation technologies and alternatives now and thus exclude these options from further evaluation in the forthcoming RAP.

For instance, Geosyntec indicates that bioventing "would not be technologically and economically feasible to implement and is therefore eliminated from consideration for inclusion in remedial alternatives". This is based on the presumption that "based on the average rate of biodegradation (of petroleum hydrocarbons), the systems would have to be in place for several decades," as well as the significant number (15 to 20) of extraction points that would have to be installed on each property.

While the pilot scale studies did reflect low biodegradation rates, this technology should be kept in consideration, since it may be a cost-effective approach for significantly reducing the risk in those areas where there are elevated concentrations of hydrocarbons within the first 5-20 feet below ground surface. Naturally, the recommended approach would be to first apply soil vapor extraction (which will be considered further in the next phase) to remove the more volatile compounds. But as pointed out by Geosyntec, diesel components and other heavy hydrocarbons will not be removed significantly by soil vapor extraction. The bioventing pilot test results indicated that relatively low flow rates were necessary to deliver sufficient oxygen to the subsurface to meet the bioventing oxygen demand. Geosyntec calculated that "the 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." Thus, for some locations it may be possible to remove a significant mass in a few years. The extraction wells used for soil vapor extraction (SVE) could be used for subsequent bioventing as needed. Key is to determine the conditions that result in the higher biodegradation rate at the site.

Although this technology will not be applicable for all hot spots, it seems premature to dismiss it, without a real economic feasibility analysis. It will certainly be technologically feasible if done correctly, as was done in some of the pilot scale studies. Bioventing would be additive to Alternative 7, and would be considered on a hot spot by hot spot basis. The marginal costs are small (given that SVE would be used first), and there could be considerable savings over the project life, as well as faster risk reduction, if a significant mass of hydrocarbons is removed.

B.6. Interpretation of Resolution No. 92-49

Geosyntec proposes a narrow interpretation of State Water Board Resolution No. 92-49. The Revised SSCG asserts that Resolution No. 92-49 applies only to groundwater quality and excludes soil and soil vapor. We are concerned that the Board's approval of the Revised SSCG would be taken as approval of this narrow interpretation of Resolution in a way that would affect actions for relevant non-water media. We recommend that the Board clarify their scope of authority and respond to the assertion that:

> *Waste in non-water media (such as soil) should be addressed through remediation to promote the attainment of background water quality (not, for example, background levels in soil) or the best water quality that is reasonable feasible given the considerations listed." (Revised SSCG Report, page 78)*

C. Relatively Minor, Miscellaneous Comments Relevant to Application of the Technical Review Principles

- The table of Potentially Complete Exposure Pathways in the report and in Appendix A does not match (e.g., Indoor Air is missing from the version in Appendix A, as well as just matching modifiers). This has to do basically with consistency.
- Table A-3a, second half appears to be missing naphthalene (the volatile PAH).
- Table A-3b appears to be missing $VF_{soil\text{-}OA}$ values for some of the selected COPCs in soil.
- Concentration units should be included on the on the soil figures in Appendix E.
- The use of light pink/pink to represent the >25th to 50th percentile in the indoor vapor figures is unfortunate as it tends to "blend" with the purple used to represent the >90th Percentile and thus upon first glance this reviewer had the "pink houses" with much higher indoor air concentrations than the legend indicates. This reviewer would recommend using a gradual color scheme so colors intensify to the higher concentrations or go from the cool colors to the warm (blue, green, yellow, orange, red). We make this recommendation in the belief that at some point these figures will be presented in a public forum and we have found that the use of this color scheme strategy allows the reader/viewer to make first glance conclusions that match the map interpretation.

CALIFORNIA
Water Boards

Los Angeles Regional Water Quality Control Board

TO: Samuel Unger, Executive Officer
California Regional Water Quality Control Board, Los Angeles Region

FROM: Cris Morris CRM
Water Resource Control Engineer
Site Cleanup Program, Unit III

DATE: December 23, 2013

SUBJECT: COMMENTS ON REVISED SITE-SPECIFIC CLEANUP GOAL REPORT

To address the comments in the Soil/Water/Air Protection Enterprise (SWAPE) letter dated November 27, 2013 pertaining to the KAST Screening Feasibility Study in the Revised Site-Specific Cleanup Goal Report (Report), it is necessary to identify the proper approach to a feasibility study of this complexity. If we use the Superfund Remedial Investigation/ Feasibility Study (RI/FS) process as a guideline, the development and screening of alternatives includes:

1. Develop remedial action objectives (RAOs), specifying the contaminants and media of interest, exposure pathways, and preliminary remediation goals.
2. Develop general response actions for each medium of interest (containment, treatment, excavation, pumping etc.) that may be taken either individually, or in combination, to satisfy the RAOs.
3. Identify volumes or areas of media to which general response actions might be applied.
4. Identify and screen the technologies applicable to each response action to eliminate those that cannot be implemented technically at the site. Further define each response action.
5. Identify and evaluate technology process options to select a representative process for each technology type.
6. Assemble the selected representative technologies into alternatives representing a range of treatment and containment options as appropriate.
7. The alternatives are evaluated with respect to effectiveness, implementability and cost. Only the most promising alternatives are included in the detailed alternative analysis.

The abbreviated versions of the RAOs presented in the Report for the Former Kast Property are

- Prevent human exposures to constituents of concern (COC) concentrations in soil, soil vapor, and indoor air such that the cumulative lifetime incremental carcinogenic risks is within $1x10^{-6}$ and 10^{-4} and the noncancer hazard index is less than 1 or concentrations are below background, whichever is higher. The receptors are onsite residents, and construction and utility maintenance workers. The point of departure for onsite residents is $1x10^{-6}$.

- Prevent fire/explosion risk in indoor air and enclosed spaces and eliminate methane in the subsurface to the extent technologically and economically feasible.
- 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.
- Reduce COCs in groundwater to the extent technologically and economically feasible to achieve the water quality objectives in the Basin Plan.

Rather than utilizing the formalized alternative screening process developed for Superfund RI/FS, this document just identifies technologies that fit into two categories. The categories and the technologies are:

- Interrupt the Human Health Exposure Pathway
    - Sub-slab vapor mitigation
    - Capping portions of the site
    - Institutional Controls
- Remove COC Mass and Interrupt the Human Health Exposure Pathway
    - Excavation
    - Soil vapor extraction
    - Bioventing
    - In-situ chemical oxidation
    - LNAPL/source removal
    - Other removal or remediation of groundwater
    - Monitored natural attenuation

To effectively manage the determination of Site Specific Cleanup Goals (SSCGs), the Report classifies the exposure medium by splitting the soil into a shallow surface soil and a shallow subsurface soil. The justification for this step is that the human exposure frequency varies between the surface soil (0 to 2 feet deep) and the subsurface soil (2 to 10 feet deep) (Refer to Appendix A). By imposing the assumption that the subsurface soil is encountered only infrequently and that any excavated subsurface soil is not distributed onto the surface, a Soil Management Plan and a deed restriction are required for each property. As a result, there are no alternatives without the imposition of Institutional Controls. In addition, the assumption is also made that the Soil Management Plan would be utilized to limit the risk of the construction /worker so there are no technologies necessary to protect the construction worker except for the Institutional Controls

Using the technically feasible technologies, seven alternatives, with some sub-alternatives, were prepared and presented. (Only Alternatives 1 through 6 focus on the soil medium). For an initial screening in a Superfund RI/FS, these alternatives would have only been evaluated with respect to effectiveness, implementability and cost and the cost estimate range would have been +100 / -50 %. The evaluation criteria included in the Report include: Cleanup Goal Achieved; Implementability; Environmental Considerations; Reduction of Toxicity, Mobility and Volume; Social Considerations, Other Issues and Cost. The cost estimate range presented in the Report is +50 / -30 %.

The alternatives for the soil medium included in the analysis and the ones that are not retained for the next phase are indicated below:

1) Removal of all site features and excavation of impacted soil.

   Not retained: not technologically and economically feasible and very high social, environmental and economic costs.

2) Removal of all site features and excavation down to 10 feet.

   Not retained: not technologically and economically feasible and very high social, environmental and economic costs.

3) Excavation to 2 feet bgs in open areas and beneath residential hardscape as required by SSCG.

   Retained

   3A) Excavation to 5 feet bgs in open areas and beneath residential hardscape as required by SSCG.

   Retained

   3B) Excavation to 10 feet bgs in open areas and beneath residential hardscape as required by SSCG.

   Not retained: not technologically and economically feasible and very high social, environmental and economic costs.

4) Excavation to2 feet bgs in open and landscaped areas as required by SSCG.

   Retained

   4A) Excavation to 5 feet bgs in open and landscaped areas as required by SSCG.

   Retained

   4B) Excavation to 10 feet bgs in open and landscaped areas as required by SSCG.

   Not retained: not technologically and economically feasible and very high social, environmental and economic costs.

5) Removal of all site features and cap site.

   Not retained: not technologically and economically feasible and very high social, environmental and economic costs.

6) Capping of exposed soils and landscaped areas.

   Retained

At the conclusion of this screening step, the retained alternatives include

- Alternative3: Excavation to 2 or 5 feet bgs in open areas and beneath residential hardscape
- Alternative 4: Excavation to 2 or 5 feet bgs in open and landscaped areas
- Alternative 6: Capping of exposed soils and landscaped areas

Although this screening included more criteria than the three criteria used for a RI/FS preliminary screening of alternatives (effectiveness, implementability and cost), the issues are whether alternatives have not been retained which should have been and whether valid justification is provided. The evaluation of whether or not each alternative meets the RAOs is the critical issue. If the RAOs are satisfied for each alternative and the screening process retains a representative alternative from each response action, then the screening process is valid. Since the decision making process focuses around the soil medium, the discussion below only addresses the soil.

The premise that a Soil Management Plan (and thus a deed restriction) is required for each residence to disrupt the pathway from the subsurface soil to human receptors is not a valid assumption and has invalidated the RAO review process. Once this restriction is removed, the alternatives need to be reevaluated with respect to whether they satisfy the RAOs. The response actions that need to be addressed by a retained alternative are:

- No Action,
- Institutional Controls (including the Soil Management Plan and deed restriction)
- Collection/Discharge (excavation and disposal)
- Containment (cap)

Once the alternative screening process has been repeated with retained alternatives representing each of the response actions listed above, the alternatives are further developed and the nine National Contingency Plan (NCP) criteria are evaluated. These criteria include: overall protection of human health and the environment, compliance with Applicable or Relevant and Appropriate Requirements (ARARs), long term effectiveness and permanence, reductions in toxicity, mobility and volume through treatment, short term effectiveness, implementability, cost, state acceptance and community acceptance.

The SWAPE comment letter dated November 27, 2013 raised a number of issues including the validity of the screening analysis and the lack of retaining alternatives that relocated the residents and redeveloped the site for non-residential options. The most notable comments are listed below:

1. Pg 1 Alternatives are rejected without any detailed explanation
2. Pg 1-2 Request "to conduct a detailed evaluation of remedial alternatives and present those evaluations in a 'proper' Feasibility Study"
3. Pg 2 Expectation that all feasible alternatives are evaluated in a manner that is "transparent, subject to public participation and that conforms with standard practices and policies"
4. Pg 2 Does not include any alternatives with the relocation of residents and redeveloping the site for non-residential options.
5. Pg 3 Detailed FS required before a proposed RAP can be prepared
6. Pg 3 Understated economic and social impact to residents
7. Pg 5 Difficulties associated with some alternatives are overstated

Depending upon the outcome of the RAO analysis after the Soil Management Plan/deed restriction constraint is removed, the option of relocating and redeveloping the site would need to be reevaluated. However, as long as the RAO can be satisfied with another alternative within a response action that is easier to implement and less expensive, then not retaining that option is valid.

The SWAPE expectation that the screening process and the detailed evaluation of alternatives be transparent is a valid concern but the comments presented in the text and Table 9-5 appear to provide the necessary information to screen the alternatives. This step only requires the evaluation of effectiveness, implementability and cost. During the detailed analysis of alternatives phase, however, the community acceptance criteria will need to be addressed for each alternative individually and in comparison to the others. This analysis will be limited to only the alternatives that are retained from the screening step and will probably not include the option of redeveloping the site. The preparation and review process of the detailed analysis needs to be made prior to the Remedial Action Plan, but can be combined into one document.

In summary, the SSCG report needs to be revised to limit the Soil Management Plan/deed restriction requirement to the Institutional Controls alternative. Once the alternatives are reevaluated with respect to the RAOs and the SSCG report has been resubmitted for review, the detailed analysis of the alternatives should be submitted with the individual and comparative evaluation of each of the retained alternatives to the 9 NCP criteria. If this process is completed per the RI/FS guidance, then the comments presented by the SWAPE letter should be addressed.

Office of Environmental Health Hazard Assessment

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Matthew Rodriquez
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Edmund G. Brown Jr.
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MEMORANDUM

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

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

DATE: November 21, 2013

SUBJECT: REVISED SITE-SPECIFIC CLEANUP GOAL REPORT, FORMER KAST PROPERTY, CARSON, CALIFORNIA
SWRCB#R4-09-17 OEHHA #880212-01

Document reviewed

- Revised Site-Specific Cleanup Goal Report, Former Kast Property, Carson, California, dated October 21, 2010 by Geosyntec Consultants, Inc.

Scope of review

- OEHHA's review is limited to risk assessment issues and does not include evaluation of explosion hazards or leaching/groundwater protection.

Response to previous comments

- OEHHA's April 23, 2013 comments on the first draft SSCG report are summarized below followed by OEHHA's evaluation of Shell's responses to these comments:
  1. Please consider whether major renovation projects such as pool installation or underground utility work are possible and whether residents could be exposed to deeper soils redistributed to the surface during and after such renovation.
     a. SHELL RESPONSE: subsurface soils (e.g. >2-10 feet bgs) are considered for infrequent contact; the likelihood of a resident contacting soils at deeper depths is extremely low given the developed nature of the Site and typical residential activities where exposure to soil could occur (e.g., recreational activities, lawn care, landscaping). In addition, it is unlikely that soils from a deeper excavation (such as during a major renovation or utility repair work) would be placed at the surface due to the lack of area to place excavated soils. It is assumed for the infrequent contact scenario that institutional controls (e.g., a notification trigger added to the existing excavation permitting process, a soil management plan) to prevent redistribution of deep soils at the surface would be required.

OEHHA's RESPONSE: Typically, residential exposure scenarios include soil down to 10 feet depth in the standard exposure scenario (i.e. 350 days per year). The rationale is that soils at this depth may be excavated and re-distributed to the surface. Shell's response calls for institutional controls that would prevent this re-distribution and presumably achieve the low exposure goals. The appropriateness of institutional controls is a risk management decision.

2. A Table showing final SSCGs and whether each is health-based or background-based would be very helpful.
   a. OEHHA's RESPONSE: Shell's Table 9-2 complies with this request (although it is unclear why "C" or "NC" were not included in the "Basis" column).
3. OEHHA questions the appropriateness of comparing background-based SSCGs to the 95 percent upper confidence limit (UCL_{95}) for each property.
   a. Shell's RESPONSE: For chemicals that are present at concentrations above the BTV, a one-sample proportion test will be used to compare the Site data with the BTVs.
   b. OEHHA's RESPONSE: Shell's methodology is adequate.
4. In order to fully evaluate background arsenic and PAHs, reviewers need to see site-wide arsenic & PAH data.
   a. OEHHA's RESPONSE: Sell indicates that hese data will be supplied as part of the HHRA.
5. Please consider evaluating the outdoor vapor inhalation pathway for residents or explain the exclusion of this pathway.
   a. OEHHA's RESPONSE: Appendix D includes the statement "soil vapor to outdoor air screening levels were developed for the soil vapor to outdoor air pathway for residential exposures. However, this does not seem to be the case. The soil to outdoor air pathway was evaluated for residential exposures and the community air study and the outdoor air monitoring address outdoor air.
6. 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.
   a. OEHHA's RESPONSE: This approach (described on page 44-45) was included in the original SSCG report.

SSCGs

- OEHHA was able to verify selected soil and soil vapor SSCGs by using the SSCG as the exposure concentration in a forward calculation.
- The assumed exposure of 4 days per year for soils from 2 to 10 feet bgs has been commented on previously. This assumption results in very high SSCGs for some contaminants in soils from 2 to 10 feet bgs.

Regression analysis of indoor VOCs and their possible sources

- The use of detection limits as the explanatory variables for 1,2-DCA, benzene, carbon tetrachloride, ethylbenzene, m,p-xylene, and o-xylene may distort the relationship making it more difficult to discern any actual relationship (Table B-14 and Attachment A). Using benzene as an example:
  - In Figure 2 the indoor benzene concentrations corresponding to the non-detects in the sub-slab vary over about 3 orders of magnitude. Since there is no corresponding measured variation in sub-slab benzene it is difficult to tell how much of this variation in indoor benzene could be explained by variation in sub-slab benzene.
  - If sub-slab benzene is contributing to indoor benzene, one would expect the 13 or so data-points where benzene was detected in sub-slab vapors to have indoor values that are higher than those associated with non-detects. No such a difference is apparent in the graphic.
  - Unfortunately, there is no separate analysis of the 13 data points.
- The graphics in Attachment B clearly show that as apparent attenuation factor (AAF) values decline, the correlation between IA-OA and sub-slab VOCs increases.
- The table on page B-18 shows values for the correlation coefficient, usually designated as r. The graphs in Attachment B show similar values for r^2. Please clarify whether these are r or r^2 values. (Presumably these are r values since r^2 [in most cases] cannot have a negative value.) Also, the graphic depicts, a negative r with positive beta, which seems unusual at best.
- Plots of AAF versus sub-slab VOCs (Figures B-10 & B-11) are more instructive in this regard. For chlorinated compounds, the AAF appears to flatten out at around 0.001. For petroleum compounds, the AAF also appears to flatten out at around 0.001, but the trend is less clear. For non-chlorinated solvents, the AAF does not appear to have reached a point of flattening out.
  - The trend-line in B-11 is not labeled and it is unclear what it represents.

Community air

- Section 7.1 states that "all statistical tests (ANOVA, t-test, and Mann-Whitney) show that air concentrations within the Site boundary are not significantly different from concentrations from areas to the east (generally downwind) and west (generally upwind) of the Site." While not disputing the veracity of that statement, OEHHA cautions that failure to reject the null hypothesis does not mean that the alternative hypothesis is proven, i.e. that the VOC concentrations in the different air masses are the same.

- However, alternative methods of data analysis, e.g. binomial distribution, as noted in our August 19, 2013 memorandum, raise the possibility that there are small increases in VOCs other than naphthalene that are below the detection thresholds of the statistical tests employed in the study report.
- OEHHA concurs with the conclusion that VOCs in the outdoor air at the Carousel Tract are within the reported range of VOCs in regional outdoor air, with the possible exception of naphthalene.

Editorial comments

- The factors labeled ECSS-SV-IA and ECSV-OA Section 5.1 of Appendix A would seem to be attenuation factors based on their units, but they are labeled as exposure concentrations.
- The last paragraph on ES-6 seems misplaced.
- The word "receptor" is not only unnecessary jargon but also, offensive to any resident of Carousel Tract who happens to read this document. In most, if not all, cases, "residential receptor" can be replaced with "resident" without loss of meaning.
- Appendix A section 3.1.2.2 presents equations for soil vapor to outdoor air then goes on to show how soil vapor concentrations are estimated from soil concentrations, which begs the question: "If soil vapor concentrations are estimated, why not use standard soil to outdoor air equations?" Based on a recent conference call, it is OEHHS's understanding that the more direct calculation will be used depending on the medium being analyzed.
- In some cases "VF" (meaning "volatilization factor") represents the ratio of VOC concentrations in outdoor air to soil vapor. This is dilution, not volatilization.
- Appendix A section 3.1.2.2, $VF_{soil\text{-}OA}$ is identified as the ratio of the outdoor air exposure point concentration ($EPC_{soil\text{-}OA}$) to the soil exposure point concentration (EPC_{soil}) in the text, but in the following equation, it is the inverse.
- Also in Table A-2 Soil vapor-to-outdoor air volatilization factor $VF_{SV\text{-}OA}$ (µg/m^3 per µg/m^3) is identified as the ratio of chemical concentration in outdoor air (µg/m^3) to chemical concentration in soil vapor (µg/m^3). In Table A-3b, the units for $VF_{SV\text{-}OA}$ are given as "µg/m^3 per µg/m^3" without specifying what media are represented by these units, but it is clear from the spreadsheets that $VF_{SV\text{-}OA}$ must be the ratio of chemical concentration in soil vapor to that in outdoor air.
- Similarly, in Table A-6 $EC_{SV\text{-}OA}$ (the exposure concentration for outdoor inhalation of chemicals from soil vapor is given as mg/m^3 per mg/m^3, and $VF_{SV\text{-}OA}$ (the volatilization factor is given as µg/m^3 per µg/m^3. One might think these are the same. But they are apparently inverted. Because the media represented by these units are not specified this inversion is not obvious.
- In Table A-3a (first 3 lines) "-"indicates division, contrary to common usage.

- In Table A-5, $EC_{SS\text{-}SV\text{-}IA}$ is defined as an exposure concentration. But the units are mg/m^3 per mg/kg. This is not a concentration, but a ratio, specifically the inverse of the VF, adjusted for exposure parameters.
- In Table A-7, $EC_{inh,soil}$ is defined as an exposure concentration. But the units are mg/m^3 per mg/ m^3. Clearly it is not a concentration; since the units in the equation cancel out, it must be some kind of a ratio. I might guess that it was intended to have an attenuation factor on the right side of the equation, in which case $EC_{inh,soil}$ could be an attenuation factor, adjusted for exposure parameters.
- The concerns reflected in the above comments refer to communication issues only. Since OEHHA was supplied with spreadsheets, we were able to verify the actual calculations. Not all readers will have that ability.

Conclusions and next steps

- OEHHA has verified the residential and occupational SSCGs for soil and soil vapor, but questions the exposure assumptions for soils from 2 to 10 feet bgs.
- The graphics in Attachment B and Tables B-10 and B-11, support an upper bound on alpha around 0.001. However, please identify the trend-line in B-11 and explain the correlation coefficients in Appendix B, as noted above.
- A univariate regression of sub-slab versus indoor minus outdoor benzene using only detected benzene data would help to dispel controversy concerning this relationship.
- Notwithstanding the conclusion that VOCs in the outdoor air at the Carousel Tract are generally within the reported range of VOCs in regional outdoor air, OEHHA considers the equivalence of upwind, on-site, and downwind VOC concentrations to be an open question.
- Please consider the editorial comments.

Peer reviewed by

H.H.

Hristo Hristov, MD, PhD