REMEDIAL DESIGN AND IMPLEMENTATION PLAN

FORMER KAST PROPERTY
CARSON, CALIFORNIA

Prepared for

Shell Oil Products US
20945 S. Wilmington Avenue
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October 15, 2015

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REMEDIAL DESIGN AND IMPLEMENTATION PLAN

FORMER KAST PROPERTY
CARSON, CALIFORNIA
Site Cleanup No. 1230
Site ID 2040330
Cleanup and Abatement Order No. R4-2011-0046

This Remedial Design and Implementation Plan (RDIP) for the former Kast Property was prepared by AECOM and Geosyntec Consultants, Inc. (Geosyntec) on behalf of Equilon Enterprises LLC, doing business as Shell Oil Products US (Shell or SOPUS) for Shell Oil Company. AECOM prepared the majority of this document with support and assistance from American Integrated Services, Inc. (AIS), the remediation contractor selected to perform the work. Geosyntec prepared the sections of the RDIP pertaining to sub-slab depressurization and groundwater, and provided support on the soil vapor extraction (SVE)/bioventing design. This RDIP is being submitted in response to Cleanup and Abatement Order No. R4-2011-0046 issued by the California Regional Water Quality Control Board, Los Angeles Region (RWQCB or Regional Board) on March 11, 2011, as amended July 10, 2015.

The scope of services performed in preparation of this RDIP may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the information contained herein is at the sole risk of said user. No express or implied representation or warranty is included or intended in this RDIP except that the work was performed within the limits prescribed by the client with the customary thoroughness and competence of professionals working in the same area or on similar projects. This report was prepared under the technical direction of the undersigned.

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CERTIFICATION
REMEDIAL DESIGN AND IMPLEMENTATION PLAN

FORMER KAST PROPERTY
CARSON, CALIFORNIA

I am the Senior Principle Program Manager for Equilon Enterprises LLC, doing business as Shell Oil Products US, for this project. I am informed and believe that the matters stated in the this Remedial Design and Implementation Plan for the former Kast Property, Carson, California are true, and on that ground I declare, under penalty of perjury in accordance with Water Code section 13267, that the statements contained therein are true and correct.

Douglas Weimer
Sr. Principle Program Manager
Shell Oil Products US
October 15, 2015

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LIST OF ACRONYMS AND ABBREVIATIONS

1H:1V	one horizontal to one vertical
3-D	three-dimensional
AASHTO	American Association of State Highway and Transportation Officials
AIS	American Integrated Services, Inc.
ASTM	ASTM International
bgs	below ground surface
BHC	Barclay Hollander Corporation
BMPs	best management practices
CalEPA	California Environmental Protection Agency
Cal/OSHA	State of California Department of Industrial Relations, Division of Occupational Safety and Health
Cal-Water	California Water Service Company
CAO	Cleanup and Abatement Order
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Level
CLSM	controlled low-strength material
cm	centimeters
CMU	concrete masonry unit
COCs	constituents of concern
CPT	cone penetrometer test
CWC	California Water Code
CWS	California Water Service Company
cy	cubic yard
dBA	decibel
DBS	Department of Building and Safety
DO	dissolved oxygen
Dole	Dole Food Company, Inc.
DOT	U.S. Department of Transportation
DPW	Department of Public Works
DTSC	Department of Toxic Substances Control
EIR	Environmental Impact Report
ERP	Emergency Response Plan
ESLs	Environmental Screening Levels
FID	flame ionization detector
FM	Factory Mutual
FORCO	Fletcher Oil and Refining Company
FS	Feasibility Study
ft	foot or feet
Gas Company	Southern California Gas Company
Geosyntec	Geosyntec Consultants, Inc.
GMED	Geotechnical Materials Engineering Division
HHRA	Human Health Risk Assessment
HI	hazard Index
hp	horsepower
HQ	hazard quotient
HSC	Health and Safety Code

HSP	Health and Safety Plan
HVAC	heating ventilation and air conditioning
in-Hg	inches of mercury
in-WC	inches of water column
IRAP	Interim Remedial Action Plan
ISCO	in-situ chemical oxidation
ITRC	Interstate Technology & Regulatory Council
JSAs	Job Safety Analyses
L	liter
LA	Los Angeles
LACDPW	Los Angeles County Department of Public Works
Landtec	Landtec GEM 2000
Langan	Langan Engineering & Environmental Services, Inc.
lb	pound
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
m	meter
MAROS	Monitoring and Remediation Optimization System
MCC	Motor Control Center
MCLs	Maximum Contaminant Levels
MCP	Motor Control Center
met station	meteorological station
mg/kg	milligrams per kilogram
MMRP	Mitigation Monitoring and Reporting Program
MMs	Mitigation Measures
MNA	monitored natural attenuation
mph	miles per hour
MTA	Los Angeles County Metropolitan Transportation Authority
NAD83	North American Datum of 1983
NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum of 1988, 2005 Adjustment
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NELAP	National Environmental Laboratory Accreditation Program
NEMA	National Electrical Manufacturers Association
NLs	Notification Levels
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
OEHHA	CalEPA Office of Environmental Health Hazard Assessment
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PAHs	polycyclic aromatic hydrocarbons
PCE	tetrachloroethene
PDFs	Project Design Features
PID	photoionization detector
PLC	programmable logic controller
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
PPE	personal protection equipment

ppm	parts per million
ppmv	parts per million by volume
PSI	pounds per square inch
PSRP	Property-Specific Remediation Plan
PTC	Permit to Construct
PTO	Permit to Operate
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RACRs	Remedial Action Completion Reports
RAP	Remedial Action Plan
RAOs	Remedial Action Objectives
RCP	reinforced concrete pipe
RCRA	Resource Conservation and Recovery Act
RDIP	Remedial Design and Implementation Plan
REAP	Rain Event Action Plan
Regional Board	Los Angeles Regional Water Quality Control Board
ROST	rapid optical screening tool
ROVI	radius of vacuum influence
RSLs	USEPA Region 9 Regional Screening Levels
RWQCB	Los Angeles Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
scfm	standard cubic feet per minute
sf	square feet
SFRWQCB	San Francisco Regional Water Quality Control Board
SIM	selected ion monitoring
Site	Former Kast Property, Carson, California
SMARTS	Storm Water Multiple Application and Report Tracking System
SOPs	Standard Operating Procedures
SOPUS	Shell Oil Products US
SPLP	Synthetic Precipitation Leaching Procedure
SPT	standard penetration test
SSCGs	site-specific cleanup goals
SSD	sub-slab depressurization
STC	Sound Transmission Class
SVE	soil vapor extraction
SVOCs	semi-volatile organic compounds
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TBA	tert-butyl alcohol
TCE	trichloroethene
TEFC	totally enclosed fan-cooled
TGNMOC	total gaseous non-methane organic compounds
THAs	task-specific hazard analyses
THMs	trihalomethanes
Tn	LNAPL transmissivity
TPH	total petroleum hydrocarbons
TPHd	total petroleum hydrocarbons as diesel

TPHg	total petroleum hydrocarbons as gasoline
TPHmo	total petroleum hydrocarbons as motor oil
UEL	upper explosive limit
UL	Underwriters Laboratories
URS	URS Corporation
USA	Underground Service Alert
USCS	Unified Soil Classification System
USEPA or EPA	U.S. Environmental Protection Agency
UVOST	ultraviolet optical screening tool
VEW	vapor extraction well
VFD	variable frequency drive
VOCs	volatile organic compounds
WRD	Water Replenishment District of Southern California
WSPA	Western States Petroleum Association
WWECP	Wet Weather Erosion Control Plan
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
%	percent
% v/v	percent by volume

EXECUTIVE SUMMARY

AECOM and Geosyntec Consultants, Inc. (Geosyntec) prepared this Remedial Design and Implementation Plan (RDIP) on behalf of Equilon Enterprises LLC, doing business as Shell Oil Products US (SOPUS or Shell) for Shell Oil Company, to describe the technical approach and plan for implementing the Revised Remedial Action Plan (RAP) for the former Kast Property (Site), which is now the Carousel housing tract in Carson, California.

The Revised RAP summarized the nature and extent of impacts to soil, soil vapor, and groundwater associated with Shell's former oil storage activities prior to subsequent redevelopment of the Site into a single-family housing tract by a developer, the remedial alternative evaluation process that was described in the companion Feasibility Study (FS), potential human health effects from exposure to chemicals present at the Site that were evaluated in a Human Health Risk Assessment (HHRA), and identified and described recommended full-scale remedial actions for impacted shallow soil and soil vapor and groundwater at the Site as the Los Angeles Regional Water Quality Control Board (RWQCB or Regional Board) directed in Cleanup and Abatement Order (CAO) R4-2011-0046.

On July 10, 2015, the Regional Board certified the Final Environmental Impact Report (EIR) for implementation of the RAP and adopted a Statement of Overriding Considerations and Mitigation Monitoring and Reporting Program (MMRP). Along with certification of the Final EIR, the Regional Board approved the Revised RAP dated June 30, 2014, as modified by the Addendum to Revised RAP dated October 15, 2014, and issued Amended CAO R4-2011-0046 to Shell and Barclay Hollander Corporation (BHC), a wholly-owned subsidiary of Dole Food Company, Inc. Amended CAO R4-2011-0046 directed Shell and BHC to implement Alternative 4D as described in the Revised Feasibility Study (FS) dated June 30, 2014 and Revised RAP, consistent with the Final Certified EIR. The Time Schedule for Implementation of the RAP in the amended CAO directed Shell and BHC to submit a Site-wide RDIP by October 15, 2015 as the first step in implementing the RAP. This RDIP is being submitted in response to that directive.

The Site has been impacted with petroleum hydrocarbons associated with crude oil storage during the period prior to residential redevelopment. Total petroleum hydrocarbon (TPH) impacts occur in shallow and deep soils together with volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs). VOCs, including benzene, and methane resulting from degradation of petroleum hydrocarbons, are present in soil vapor; dissolved-phase VOC and TPH impacts are present in groundwater, and light non-aqueous phase liquid (LNAPL) consisting of crude oil is locally present in the groundwater underlying a portion of the Site. In addition to hydrocarbon-related impacts, the Site is also locally impacted by chlorinated solvents, such as tetrachloroethene (PCE) and trichloroethene (TCE), and from a class of chlorinated compounds associated with potable water treatment referred to as trihalomethanes (THMs). Because THMs are related to residential water use, they are not considered constituents of concern (COCs) at the Site.

Some of these compounds, referred to as COCs, are present at concentrations that may pose an incremental cancer risk or human health hazard greater than the *de minimis* risk level of one in a million or hazard index (HI) greater than 1. Although it does not present a human health risk based on exposure, methane can potentially pose a combustion hazard where present in an enclosed space

when at a concentration between 5 and 15 percent (%) in air and there is a source of ignition. In addition, concentrations for some COCs exceed criteria for the potential leaching to groundwater pathway.

A set of final recommended site-specific cleanup goals (SSCGs) was developed for the Site. SSCGs were developed for COCs in soil, soil vapor, and groundwater and were provided in the Revised RAP.

Remedial Action Objectives (RAOs) were developed for soil, soil vapor, and groundwater. These RAOs include:

- Prevent human exposures to concentrations of COCs in soil, soil vapor, and indoor air such that total (i.e., cumulative) lifetime incremental cancer risks are within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) risk range of one in one million to one hundred in one million (1×10^{-6} to 1×10^{-4}) and noncancer HIs are less than 1 or concentrations are below background, whichever is higher. Potentially exposed humans include onsite residents and construction and utility maintenance workers. For onsite residents, the lower end of the NCP risk range (i.e., 1×10^{-6}) and a noncancer HI less than 1 are used.
- 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 water quality objectives in the Basin Plan and to protect the designated beneficial uses, including municipal supply.

A further consideration is to maintain residential land use of the Site and avoid displacing residents from their homes or physically dividing the established Carousel community.

The Revised RAP summarized the remedial alternative evaluation process and identified and described recommended full-scale remedial actions to achieve RAOs for impacted shallow soil and other media at the Site in accordance with requirements of the CAO and directives from the Regional Board.

The Site-wide RDIP provides a detailed plan for implementing the scope of remedial actions described in the approved RAP to address impacts to soil, soil vapor, and groundwater at the Site. The primary components of the remedial actions include:

- Excavation of shallow soils from both landscaped and hardscaped areas of residential yards at identified residential properties. Excavation will be conducted to a depth of 5 feet below ground surface (bgs) throughout the accessible areas of front and back yards at approximately 208 properties identified based on Site characterization data and findings of the HHRA, subject to setbacks to protect structures and sensitive utilities. The excavation will also remove residual concrete slabs, to the extent practicable, if encountered within the depth excavated.

- Excavation of deeper soils between 5 and approximately 10 feet bgs at approximately 85 properties where significant hydrocarbon mass can be reduced based on the distribution and concentration of hydrocarbons detected. This targeted deeper excavation will be conducted only where a 5-foot excavation is already scheduled, where equipment access is feasible and excavation can be achieved safely, subject to allowable setbacks from structures and sensitive utilities.
- Following excavation, a combination of soil vapor extraction (SVE) and bioventing will be used to address residual petroleum hydrocarbons and VOCs in soils below the depth of excavation and in areas not excavated. Soil vapor, including methane, will be addressed by active extraction using SVE and subsequent treatment by promoting degradation of residual hydrocarbon concentrations via bioventing. SVE wells will be installed in City streets and on approximately 224 residential properties, as appropriate.
- Sub-slab depressurization (SSD) systems will be installed at 29 properties. In addition, while the data do not indicate that vapor intrusion is an issue at any of the residences, Shell is prepared to offer installation of SSD systems to any of the homeowners in the Carousel neighborhood that request one to alleviate concerns about potential impacts to their indoor air from the Site.
- LNAPL will continue to be recovered where it has accumulated in monitoring wells MW-3 and MW-12, and will be recovered in additional wells if it accumulates at a measurable thickness to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result.
- COCs in groundwater will be reduced to the extent technologically and economically feasible via source reduction and monitored natural attenuation (MNA).

The RDIP includes discussion of specific tasks necessary to implement the RAP. It also includes detailed design drawings and specifications for the SVE/bioventing and SSD systems. The Site cleanup work will be implemented by a team of Shell contractors. The work will be done by contractors licensed in their area of specialty who will be working under the technical direction of licensed engineers and geologists. The work also will be done under applicable permits issued by state and local agencies and governments.

This RDIP also provides an overview of the Property-Specific Remediation Plans (PSRPs), which will be prepared for each property where remedial work will occur. PSRPs will contain detailed plans for remedial activities on a property-by-property basis, including site restoration. Property owners will be consulted regarding scheduling and logistics, particularly regarding site restoration, including any necessary removal and replacement of hardscape and landscaping features.

The work will be conducted on groups of properties referred to as clusters. Within each cluster of up to 10 properties work that will occur sequentially includes excavation and backfill, installation of SVE/bioventing wells and piping, installation of sub-slab depressurization systems, as required or requested, and site restoration.

Residents will be relocated for a period of 8 to 10 weeks while work occurs at their property and possibly when work occurs at other nearby properties. There will be personnel, equipment, and trucks in the neighborhood that will temporarily affect traffic, parking, and circulation. All reasonable steps will be taken to reduce noise levels, but some noises, like back up alarms, are

necessary for worker safety. There also may be odors associated with excavated soil, and all appropriate steps will be taken to control odors.

The RDIP includes detailed technical discussions of the following:

- Specific elements of the remedial design;
- Site-wide and property-specific surveying to support remedial design;
- Conceptual excavation design, planned excavation equipment and methodologies, and soil handling methods, waste handling, transportation, and treatment/recycling/disposal of wastes;
- Required supporting plans for implementing the work, including:
    - Health and Safety Plan
    - Site-specific Rule 1166 Soil Mitigation Plan
    - Stormwater Pollution Prevention Plan (SWPPP) and Rain Event Action Plan (REAP) which satisfies the requirement for the Wet Weather Erosion Control Plan (WWECP)
    - Emergency Response Plan
    - Construction Traffic Management and Haul Route Plans
    - Post-Excavation Documentary Sampling and Post-Construction Long-Term Sampling and Monitoring Plan
    - SVE System Operations and Maintenance (O&M) Plan, and
    - Surface Containment and Soil Management Plan;
- Resident relocation during implementation;
- Notifications;
- Site preparation and utility clearance/avoidance;
- Monitoring activities and mitigation measures for vapor, odor, and fugitive dust and reporting required under the MMRP;
- Noise mitigation measures that will be implemented, including results of unmitigated and mitigated noise modeling conducted by a noise consultant for the selected contractor who will perform the work;
- Identification of suitable backfill criteria and planned source of backfill materials;
- Hardscape and landscape restoration, including consideration of recent State and local restrictions on water use and landscaping;
- Engineering design of selected Site-wide remedial action components, such as SVE/bioventing and SSD systems;
- Ongoing monitoring activities for soil vapor, sub-slab soil vapor, and groundwater;
- Details regarding selected locations for baseline and periodic sampling of soil and soil vapor to assess the effectiveness of the SVE/bioventing system on reducing concentrations of COCs;
- Project phasing and the overall sequencing of the work and estimated schedule to complete implementation of the RAP; and

- Identification of potential major scheduling problems or delays that may impact the overall schedule.

The RDIP also addresses identified permitting requirements and regulatory compliance activities, including Grading Permits, SWPPP best management practices (BMPs), dust control, South Coast Air Quality Management District (SCAQMD) Rule 1166 Mitigation Plan monitoring requirements for excavation, SCAQMD Permit to Construct/Operate for SVE/bioventing operation, SCAQMD permits for asbestos removal to install the sub-slab mitigation systems, as well as building, plumbing, and electrical permits that may be necessary.

Following excavation and installation of the SVE/bioventing and SSD systems, operations, monitoring and maintenance activities will continue for active systems at the Site. Groundwater monitoring and LNAPL removal will continue, and periodic monitoring of soil, soil vapor probes, and sub-slab soil vapor probes will be conducted.

A tentative project schedule for RAP implementation has been developed and is discussed in Section 15 of this RDIP. The construction phase of Site remediation, including installation of the SVE/bioventing system is expected to take approximately 5 years. Following the active construction phase, operations and maintenance of the SVE/bioventing system will occur for approximately 30 to 40 years.

1.0 INTRODUCTION

1.1 BACKGROUND AND REGULATORY DIRECTIVES

AECOM and Geosyntec Consultants, Inc. (Geosyntec) prepared this Remedial Design and Implementation Plan (RDIP) on behalf of Equilon Enterprises LLC, doing business as Shell Oil Products US (SOPUS or Shell) for Shell Oil Company, to describe the technical approach and plan for implementing the Revised Remedial Action Plan (RAP) for the former Kast Property (Site), which is now the Carousel housing tract in Carson, California. On July 10, 2015, the California Regional Water Quality Control Board (RWQCB or Regional Board) certified the Final Environmental Impact Report (EIR) for Implementation of the RAP and adopted a Statement of Overriding Considerations and Mitigation Monitoring and Reporting Program (MMRP). Along with certification of the Final EIR, the Regional Board approved the Revised RAP dated June 30, 2014, as modified by the Addendum to Revised RAP dated October 15, 2014, and issued Amended Cleanup and Abatement Order (CAO) R4-2011-0046 to Shell and Barclay Hollander Corporation (BHC), a wholly-owned subsidiary of Dole Food Company Inc. The Amended CAO directed Shell and BHC to implement the Revised RAP, as modified by the Addendum, consistent with the Final Certified EIR and to implement the Project Design Features (PDFs) and Mitigation Measures (MMs) and comply with the MMRP set forth in the Amended CAO. The RDIP identifies these PDFs and MMs and specifies how they will be addressed. Appendix O provides a cross reference table that summarizes the PDFs and MMs and where they are addressed in the document. The Time Schedule for Implementation of the RAP directed Shell and BHC to submit a Site-wide Remedial Design and Implementation Plan by October 15, 2015 as the first step in implementing the RAP. This RDIP is being submitted in response to that directive.

1.2 SITE-WIDE RDIP OBJECTIVES

The objective of the Site-wide RDIP is to provide a detailed plan for implementing the scope of remedial actions described in the approved RAP. It also includes detailed design drawings and specifications for the soil vapor extraction (SVE)/bioventing system and sub-slab depressurization (SSD) systems. The RDIP provides discussion of specific tasks necessary to implement the RAP, including:

- Specific elements of the remedial design;
- Site-wide and property-specific surveying to support remedial design;
- Conceptual excavation design, planned excavation equipment and methodologies, and soil handling methods, waste handling, transportation, and treatment/recycling/disposal of wastes;
- Required supporting plans for implementing the work, including:
    - Health and Safety Plan
    - Site-specific Rule 1166 Soil Mitigation Plan
    - Stormwater Pollution Prevention Plan (SWPPP) and Rain Event Action Plan (REAP), which satisfies the requirement for the Wet Weather Erosion Control Plan (WWECP)
    - Emergency Response Plan

  - Construction Traffic Management and Haul Route Plans
  - Post-Excavation Documentary Sampling Plan
  - Post-Construction Long-Term Sampling and Monitoring Plan, and
  - Surface Containment and Soil Management Plan;
- Resident relocation during implementation;
- Notifications;
- Site preparation and utility clearance/avoidance;
- Monitoring activities and mitigation measures for vapor, odor, and fugitive dust and reporting required under the MMRP;
- Noise mitigation measures that will be implemented, including results of unmitigated and mitigated noise modeling conducted by a noise consultant for the selected contractor who will perform the work;
- Identification of suitable backfill criteria and planned source of backfill materials;
- Hardscape and landscape restoration, including consideration of recent State and local restrictions on water use and landscaping;
- Engineering design of selected Site-wide remedial action components, such as SVE/bioventing and SSD systems and monitoring/operations and maintenance plans;
- Ongoing monitoring activities for soil vapor, sub-slab soil vapor and groundwater;
- Details regarding selected locations for baseline and periodic sampling of soil and soil vapor to assess the effectiveness of the SVE/bioventing system on reducing concentrations of constituents of concern (COCs);
- Project phasing and the overall sequencing of the work and estimated schedule to complete implementation of the RAP; and
- Identification of potential major scheduling problems or delays that may impact the overall schedule.

A further objective of this RDIP is to summarize PDFs and MMs included in the certified Final EIR and describe how those PDFs and MMs will be incorporated and addressed when implementing the RAP.

The RDIP also addresses identified permitting requirements and regulatory compliance activities, including Grading Permits, SWPPP best management practices (BMPs), dust control, South Coast Air Quality Management District (SCAQMD) Rule 1166 Mitigation Plan monitoring requirements for excavation, SCAQMD Permit to Construct/Operate for SVE/bioventing operation, SCAQMD permits for asbestos removal to install the SSD systems, as well as building, plumbing, and electrical permits that may be necessary.

Following implementation of the remedy, operations, monitoring, and maintenance activities will continue at the Site. This will include operations, monitoring, and maintenance of active systems, as well as continued groundwater monitoring and light non-aqueous phase liquid (LNAPL) removal, and periodic monitoring of soil, soil vapor probes, and sub-slab soil vapor probes.

1.3 REPORT ORGANIZATION

Following this brief Introduction, the RDIP contains the following sections and contents:

- **Section 2** provides a description of the Site and relevant background information.
- **Section 3** discusses Remedial Action Objectives (RAOs) and site-specific cleanup goals (SSCGs).
- **Section 4** provides a summary of the RWQCB-approved remedial actions.
- **Section 5** describes the project organization, roles and responsibilities.
- **Section 6** briefly summarizes supporting plans and documentation that are included as appendices to the RDIP.
- **Section 7** addresses permitting requirements.
- **Section 8** addresses Site preparation, work phasing and logistical considerations, the Property-Specific Remediation Plans (PSRP) process, safety exclusion zones, and security considerations.
- **Section 9** addresses general excavation design, including all aspects of excavation, backfill and restoration.
- **Section 10** provides the SVE/bioventing system design.
- **Section 11** provides sub-slab depressurization system design.
- **Section 12** addresses the landscape restoration program.
- **Section 13** describes LNAPL recovery activities.
- **Section 14** addresses groundwater monitoring.
- **Section 15** addresses reporting.
- **Section 16** provides a project schedule for RAP implementation.
- **Section 17** provides a list of references cited.

2.0 SITE DESCRIPTION AND BACKGROUND INFORMATION

2.1 SITE DESCRIPTION AND LOCATION

The Kast Property is a former petroleum storage facility that was operated by a Shell Oil Company predecessor from the mid-1920s to the mid-1960s. The property was sold to real estate developers who redeveloped it into the Carousel community residential housing tract in the late 1960s and early 1970s. Today the Site consists of approximately 44 acres occupied by 285 single- and two-story single-family residential properties and City streets collectively referred to as the Carousel Tract. The Site is located in the City of Carson (City) in the area inclusive of Marbella Avenue on the west, Panama Avenue on the east, E. 244th Street on the north, and E. 249th Street on the south (Figure 2-1). The Site is bordered by the Los Angeles County Metropolitan Transportation Authority (MTA) railroad tracks to the north (formerly owned by the BNSF Railway Company), Lomita Boulevard to the south, residential properties of the Monterey Pines Community and industrial property of the former Turco Products Facility to the west, and residential properties to the east (Figure 2-2).

2.2 SITE HISTORY

The Site was undeveloped until 1923 when Shell Company of California purchased the 44-acre property from Mary Kast and constructed three oil storage reservoirs. Two of the reservoirs (the central and southern Reservoirs No. 5 and 6) had capacities of 750,000 barrels each, and the third reservoir (northern Reservoir No. 7) had a capacity of 2 million barrels. The reservoirs were partially in-ground and partially aboveground with earthen berms constructed using soils excavated from the belowground portions of the reservoirs. The reservoirs had wire-mesh reinforced concrete-lined floors and side walls, and were covered with wood frame roofs supported by wooden posts on concrete pedestals (URS, 2010a). The outer berms were 15 to 20 feet above surrounding grade, and the outer walls of the berms are believed to have been covered with asphalt. The oil storage reservoirs were primarily used to store crude oil; however, historical records indicate that bunker oil or heavier intermediate refinery streams may also have been stored in the reservoirs at one time. There is no indication that the reservoirs were used to store any other chemicals or compounds (SOPUS, 2010).

Site use remained as an active oil storage facility until the 1950s, when the Site was kept on a standby reserve basis. In October 1965, Shell Oil Company entered into a Purchase Option Agreement to sell the Site, with the oil storage reservoirs intact, to Richard Barclay or his nominee. Richard Barclay was a principal in Barclay Hollander Curci, later renamed Barclay Hollander Corporation (BHC), and Lomita Development Company (Lomita Development). Lomita Development was subsequently merged into BHC. BHC is now a wholly-owned subsidiary of Dole Food Company, Inc. (Dole).

In December 1965, Richard Barclay designated Lomita Development as his nominee for purchase of the Site. The property was evaluated for BHC and Lomita Development by Pacific Soils Engineering, a BHC-owned company, which performed soil borings and developed engineering studies and grading plans for the Site. In 1966, BHC and its contractors conducted these studies,

removed the remaining residual oil and water from the reservoirs, demolished the reservoirs and graded the Site. Lomita Development's request to rezone the Site from industrial to residential was approved by Los Angeles County in October 1966, and in the same month, title was transferred to Lomita Development under the Purchase Option Agreement. Construction of homes began in 1967 and was apparently completed by the early 1970s. The Site has remained residential since that time.

The Site came under the attention of the Regional Board in 2008 when environmental investigations for the neighboring former Turco Products Facility, located directly west of the Site, discovered contamination by petroleum hydrocarbons at sample locations within the Carousel Tract. The Department of Toxic Substances Control (DTSC) communicated these findings to the Regional Board in March 2008, and in April 2008 the Regional Board sent an inquiry to Shell regarding the status of any environmental investigations at the Site. This inquiry was followed by the Regional Board's California Water Code (CWC) Section 13267 Order to Conduct an Environmental Investigation at the former Kast Property issued to Shell on May 8, 2008. Shell has conducted a series of investigations, pilot studies, and other environmental evaluations of the Site in response to that Order and subsequent 13267 Orders issued on October 1, 2008 and November 18, 2009, Section 13304 Order dated October 15, 2009, and CAO R4-2011-0046 dated March 11, 2011, as amended on July 10, 2015. These investigations culminated with the Revised Human Health Risk Assessment (Revised HHRA; Geosyntec, 2014a), Revised Feasibility Study (Revised FS; Geosyntec, 2014b), and Revised Remedial Action Plan (Revised RAP; URS and Geosyntec, 2014).

2.3 SUMMARY OF PREVIOUS INVESTIGATIONS AND FINDINGS

2.3.1 Site Characterization Investigations

Extensive multimedia investigations have been conducted at the Site from 2008 to present. Investigations at the Site included:

- Assessment in public rights-of-way, the adjacent railroad right-of-way, and other non-residential areas consisting of:
    - Shallow and deep soil sampling
    - Shallow and deep soil vapor sampling
    - Advancing cone penetrometer test/rapid optical screening tool (CPT/ROST) and CPT/ultraviolet optical screening tool (UVOST) soundings for LNAPL assessment
    - Groundwater monitoring well installation and sampling and LNAPL removal
    - Background outdoor air sampling, and
    - Background soil sampling;
- Assessment at individual residential properties consisting of:
    - Methane screening
    - Sub-slab soil vapor probe installation and sampling
    - Shallow soil sampling, and
    - Indoor and outdoor air sampling;
- Assessment of environmental impact and feasibility of removal of residual concrete reservoir slabs; and

- Pilot testing to evaluate different potential remedies for Site impacts.

As described below, the Site has been impacted with petroleum hydrocarbons associated with crude oil storage during the period prior to residential redevelopment. The distribution of hydrocarbons was significantly affected by reservoir demolition and Site grading activities to prepare the Site for residential construction.

Crude oil is a complex mixture of various petroleum hydrocarbon compounds. Sampling completed during Site characterization confirms that there were petroleum releases at the Site. Total petroleum hydrocarbon (TPH) impacts, reported in general hydrocarbon chain ranges corresponding to gasoline (TPHg), diesel (TPHd), and motor oil (TPHmo), occur in shallow and deep soils at the Site together with volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs). VOCs, including benzene, and methane resulting from degradation of petroleum hydrocarbons, are present in soil vapor (also referred to as soil gas). Dissolved-phase VOC and TPH impacts quantified as TPHg, TPHd, and TPHmo-range hydrocarbons are present in groundwater, and LNAPL consisting of crude oil is locally present in groundwater underlying a portion of the Site. In addition to hydrocarbon-related impacts, the Site is locally impacted by chlorinated solvents, specifically tetrachloroethene (PCE) and trichloroethene (TCE), and from a class of chlorinated compounds associated with treatment of potable water supplied to the community referred to as trihalomethanes (THMs). Although the chlorinated solvents TCE and PCE are found sporadically around the Site in shallow soils, their presence in groundwater appears to be related to offsite sources. THMs are commonly found in drinking water that has been treated with chlorine or chloramines and form when chlorine reacts with organic matter in the water. THMs have all been detected in Site soils, soil vapor, and groundwater.

Petroleum hydrocarbons in the subsurface have fermented to produce methane in subsurface soils at depth; however, methane is generally not present in the shallow subsurface and has not been detected in residences or enclosed areas of the Site at levels that pose a hazard. Repeated sampling events of soil vapor probes in the streets have shown that where methane may be detected at concentrations of 40 percent (%) or more at 5 feet below ground surface (bgs), methane is not detected or is present at trace concentrations in adjacent soil vapor probes at 1 or 1.5 feet bgs. These data indicate that methane is being aerobically degraded in shallow soils where it encounters oxygen diffusing downward from the atmosphere into the soil column. Methane is expected to be present in soil pore spaces within the depth of planned excavations and will be monitored during excavation work. Although exposure to methane does not, by itself, pose a risk to human health, if methane accumulates in an enclosed space at a concentration between approximately 5% or 50,000 parts per million by volume (ppmv, termed the lower explosive limit, LEL) and 15% or 150,000 ppmv (termed the upper explosive limit, UEL) in the presence of sufficient oxygen and a source of ignition is present, methane may pose a combustion or explosion hazard.

2.3.1.1 Impacts in Soil

Elevated TPH and other VOCs and SVOCs related to petroleum releases were found in Site soils beneath the footprint of the former reservoirs, within the fill material above the base level of the former reservoirs, and in areas outside the footprints of the former reservoirs. The specific analytes TPHg, TPHd, TPHmo, benzene, naphthalene, and other PAHs, are representative of Site COCs with elevated concentrations in soil. The overall distribution of these analytes at 2, 5 and 10 feet bgs is

shown on Figures 2-3 through 2-8. As can be seen on these figures, detections at 2 feet are much less frequent and lower in concentration than detections at 5 and 10 feet bgs.

Higher concentrations of petroleum hydrocarbons tend to be located inside and closer to the edges of the former reservoir footprints. The distribution of TPHd at 2 feet bgs correlates with the reservoir footprints but TPHd is also detected outside the reservoir footprints, particularly in the southern and eastern portion of the Site. At 5 and 10 feet bgs, TPHd detections are more common with higher concentrations inside the footprints of the former reservoirs. There are also detections outside the reservoir boundaries, including the area where the former sump was located in the eastern part of the Site.

Concrete reservoir bases were encountered in some of the borings at depths ranging from approximately 8 to 10 feet bgs. Soil just above the concrete was generally moist to wet but there was no evidence of significant ponding on top of the slabs. Where cored for deeper borings, the concrete was in good condition with staining on the top and, on some cores, bottom surfaces. The interpreted distribution of residual concrete reservoir slabs based on historical information and data collected during Site investigations is shown on Figure 2-9.

2.3.1.2 Impacts in Soil Vapor

A number of constituents have been detected in soil vapor at the Site. Methane, benzene, and naphthalene are representative of Site-related COCs detected in soil vapor. PCE, TCE, and THMs have also been detected locally in soil vapor.

Methane has been detected in subsurface soil vapor samples, particularly deeper soil vapor samples, collected at the Site. Methane screening conducted in indoor structures at the Site and utility vaults, storm drains, and sewer manholes at and surrounding the Site has not identified methane concentrations in enclosed spaces that indicate a potential safety risk. During the Phase I Investigation in 2009, methane was detected in soil vapor probes installed in City streets at 5 feet bgs at concentrations from 0.838 percent by volume (% v/v) to 59.7% v/v. Methane was detected at 33 of 73 locations (45%) sampled for the Phase I Investigation, and methane concentrations exceeded 5% at 22 of 73 sample locations. Methane and VOCs have been monitored in 10 5-foot soil vapor probes in the City streets quarterly since 2012 (semi-annually in 2013). Maximum methane concentrations over this period in nine of these 10 probes have ranged from 31 to 78%. During the geotechnical drilling program conducted in 2015 to support the RDIP and excavation design at individual properties, methane was encountered at greater than the LEL of 5% at depths below the former reservoir slabs in 11 of 73 geotechnical boring locations. These data confirm that methane is present in subsurface soils that will be encountered during drilling and soil excavation.

Other VOCs, including benzene and other aromatic compounds associated with petroleum hydrocarbons, are present in sub-slab soil vapor and in soil vapor sampled at depths of 5, 15, and 20 feet bgs. In addition, chlorinated compounds including PCE and TCE are present locally in sub-slab and deeper soil vapor. Benzene detections in sub-slab soil vapor are scattered and generally much lower than soil vapor detections at 5 feet bgs and deeper. Elevated benzene concentrations at 5 and 15 feet bgs are present inside and outside the footprint of the former reservoirs.

Naphthalene is also present in sub-slab soil vapor and in soil vapor at depths of 5, 15 and 20 feet bgs. Elevated naphthalene concentrations in sub-slab soil vapor samples are few and scattered. Elevated

naphthalene concentrations at 5 feet bgs appear to be concentrated along E. 244th Street and scattered along Marbella Avenue. Naphthalene was not detected in soil vapor samples from 15 or 20 feet bgs.

2.3.1.3 Impacts in Groundwater

Groundwater monitoring wells have been sampled quarterly since installation. Most of the groundwater monitoring wells are screened in the water table aquifer, the top of which ranges from approximately 51 to 65 feet bgs onsite. The remaining wells are screened in the Upper and Lower Gage aquifer onsite. The Gage aquifer extends from approximately 90 to 170 feet bgs beneath the Site. Groundwater is impacted with Site-related COCs associated with crude oil constituents, as well as with those attributed to upgradient sources, including chlorinated compounds and tert-butyl alcohol (TBA). Based on the presence of fuel oxygenates, some of the benzene detected in groundwater is also likely due to upgradient sources.

Site-related COCs in groundwater exceeding California drinking water standards (Maximum Contaminant Levels [MCLs] or Department of Public Health Notification Levels [NLs]) are benzene, naphthalene, and arsenic. TPH also exceeds the Regional Water Quality Control Board, San Francisco Region (SFRWQCB) December 2013 Environmental Screening Levels (ESLs). As discussed in the Revised SSCG Report (Geosyntec, 2013), Geosyntec used public domain Monitoring and Remediation Optimization System (MAROS) software to model and evaluate the stability of the benzene groundwater plume at the Site. The MAROS analysis indicated it is likely that the benzene in Site groundwater is being attenuated through natural biodegradation processes and is a stable or decreasing plume.

As noted in previous reports, drinking water is supplied to the Carousel community by the water provider from aquifers deeper than the impacted groundwater at the Site. The drinking water is tested according to state standards, and is safe to drink (California Water Service Company, 2013). No current or future use of the shallow zone and Gage aquifer at or near the Site is anticipated because: (1) high total dissolved solids and other water quality issues unrelated to Site conditions, (2) it is present in a low yield, thin aquifer, (3) there are restrictions on groundwater pumping in the basin due to the adjudication of the groundwater resource; and, (4) the overlying land use is completely residential without the needed open space for water production infrastructure.

2.3.1.4 LNAPL

If petroleum hydrocarbons from crude oil are present at sufficiently high concentration they may occur as a non-aqueous phase liquid (NAPL), which typically has lower density than water and is often referred to as “light NAPL” or LNAPL. LNAPL has been detected at a measurable thickness in groundwater at the Site in two wells, MW-3 and MW-12, located approximately 43 feet from each other in Marbella Avenue. Additionally, LNAPL historically has been reported in Turco monitoring well MW-16 by consultants working on the former Turco Products Facility. Shell took possession of this well on October 21, 2014 and renamed the well MW-18. Since that time, MW-18 has been gauged monthly for presence of LNAPL. Although a sheen has been observed, a measurable thickness of LNAPL has not been detected in MW-18.

An LNAPL sample collected from Site monitoring well MW-3 and analyzed was characterized as a relatively unweathered crude oil. AECOM currently removes LNAPL from these wells monthly using dedicated pumps installed in the wells. To date, approximately 166 gallons of LNAPL have

been recovered from MW-3 and MW-12. LNAPL has not been detected in any of the other groundwater monitoring wells at the Site.

2.3.2 Human Health Risk Assessment (HHRA)

2.3.2.1 HHRA Overview

Geosyntec conducted a Revised HHRA (Geosyntec, 2014a) to estimate potential human health risks associated with COCs detected in soil, sub-slab soil vapor, and soil vapor at the Site that was submitted in conjunction with the Revised FS and Revised RAP on June 30, 2014. The objective of the Revised HHRA was to evaluate potential human health impacts to onsite residents and onsite construction and utility maintenance workers prior to any remediation efforts at the Site (baseline condition). In addition, an evaluation of potential COC leaching from soil to groundwater was conducted using the SSCGs for soil for the leaching to groundwater pathway as provided by the Regional Board (RWQCB, 2014a, b).

The methodology used in the Revised HHRA was consistent with current U.S. Environmental Protection Agency (USEPA or EPA), RWQCB, and DTSC guidance and incorporated the SSCGs presented in the Revised SSCG Report (Geosyntec, 2013). The Revised HHRA used the SSCGs with the Site concentration data to develop a cumulative risk characterization for the Site addressing both potential human health risks and potential leaching to groundwater concerns. The Revised HHRA is a predictive tool and is used in the remedial decision-making process to establish if further action is warranted for areas of the Site. Properties that did not meet the project RAOs were identified for further evaluation in the Revised FS and Revised RAP.

2.3.2.2 Potential Residential Exposures

For shallow surface soils (≤5 feet bgs), 172 properties were identified as having an exceedance of the lower bound of the risk range of one excess cancer risk in one million (1×10^{-6}) or a hazard index (HI) of 1 for a frequent exposure scenario. The primary COCs that contributed to the cancer risk estimates were benzene, carcinogenic PAHs, ethylbenzene, 1-methylnaphthalene, naphthalene, and PCE (one property). The primary COCs that contributed to the HI estimates were TPHd and TPHmo, with TPHd being the primary COC for 55 properties.

For subsurface soils (>5 to ≤10 feet bgs), no properties were identified as having an exceedance of the lower bound of the risk range of 1×10^{-6} or an HI of 1 for the infrequent contact residential exposure scenario.

In addition to the evaluation of incremental cancer risk and noncancer hazard, a property-specific background analysis was conducted for the Site COCs to determine if metals or carcinogenic PAHs (cPAHs) were present in soils above background levels. Metals and cPAHs considered above background were included in the estimates of risk and hazard summarized above with the exception of arsenic. For an additional five properties, arsenic was the only COC identified due to being above background, and one additional property was added based on Regional Board comments received following submittal of the Revised RAP and Addendum. These properties were considered further during remedial planning.

Based upon the multiple lines of evidence evaluations, Geosyntec and URS concluded that constituents detected in indoor air are reflective of background sources. The RWQCB and California

Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) generally agreed with this conclusion. Notwithstanding the absence of evidence of vapor intrusion at the Site, and out of an abundance of caution, the RWQCB directed Shell to evaluate theoretical exposures due to the vapor intrusion pathway using the detected concentrations of COCs in sub-slab soil vapor. The Revised HHRA includes this vapor intrusion evaluation and theoretical exposures were calculated using conservative assumptions (e.g., sub-slab soil vapor to indoor air attenuation factor of 0.002).

The Revised HHRA identified 27 properties as having an exceedance of the lower bound of the risk range of 1×10^{-6} or a HI of 1 for sub-slab soil vapor, not including the background risks associated with THMs. THMs were not considered in the final risk characterization for soil vapor due to their presence as a result of municipal water use at the Site. The primary COCs that contributed to the incremental lifetime cancer risk estimates were benzene, carbon tetrachloride, ethylbenzene, naphthalene, and PCE. There was a 28th property identified for sub-slab depressurization based on occurrence of methane at concentrations slightly above its action level of 0.5%, and the Regional Board added a 29th property in its RAP approval letter and the amended CAO dated July 10, 2015.

2.3.2.3 Potential Construction and Utility Maintenance Worker Exposures

Construction and utility maintenance worker exposures were evaluated for both soil and soil vapor in two areas within the Kast Site: (1) within the individual property boundaries, and (2) within the streets.

For soil, nine residential properties were identified as having an exceedance of the target risk of 1×10^{-5} when the data were analyzed using the construction and utility worker exposure scenario. The primary COC that contributed to the incremental lifetime cancer risk estimates was benzene. One hundred and thirty-eight (138) properties were identified as having an exceedance of an HI of 1, ranging from 2 to 10. The primary COCs that contributed to the HI estimates were TPHd and TPHg, with TPHd the primary contributor at 116 properties.

For soil data collected in the streets, the incremental lifetime cancer risk was 2×10^{-5} with no individual COC having a risk greater than 1×10^{-5}. The noncancer HI estimate was 6 with TPHd as the primary contributor to the HI estimate. The lead hazard quotient was less than 1.

For soil vapor, no property had an incremental lifetime cancer risk greater than 1×10^{-5} or a noncancer HI greater than 1. For data collected in the streets, the cumulative incremental lifetime cancer risk was 2×10^{-5} and the noncancer HI estimate was 0.04.

2.3.2.4 Potential Soil Leaching to Groundwater

An evaluation was conducted for the potential for COCs to migrate from the soil to underlying groundwater at the Site. For soil ≤5 feet bgs within the properties, 202 properties exceed the soil-leaching-to-groundwater SSCGs. TPHd, TPHg, TPHmo, benzene, and naphthalene are the compounds with the most frequent exceedances in this depth interval. For soil >5 to ≤10 feet bgs, 174 properties exceed the soil-leaching-to-groundwater SSCGs. TPHd, TPHg, TPHmo, benzene, and naphthalene are the chemicals with the most frequent exceedances in this depth interval.

For soil data collected in the streets from ≤10 feet bgs, concentrations were compared to the soil-leaching-to-groundwater SSCGs. Using the maximum concentrations, 11 COC concentrations

exceeded their respective soil leaching to groundwater SSCGs (1,2,3-trichloropropane, antimony, arsenic, benzene, cis-1,2-dichloroethene, naphthalene, PCE, thallium, TPHg, TPHd, and TPHmo).

2.3.2.5 HHRA Summary and Properties Proposed for Remediation

The results of the HHRA are presented graphically on Figures 2-10, 2-11 and 2-12. Tables 2-1 and 2-2 present the property addresses that exceeded the lower bound of the risk management range for lifetime incremental cancer risk and a noncancer HI of 1 for soil and sub-slab soil vapor, respectively. In addition, soil leaching to groundwater and metals present above background were considered. For sub-slab soil vapor, concentrations of methane were also considered. These properties along with impacts in the streets are identified as not meeting the RAOs established for the Site and were considered further in the RAP. In addition, in response to RWQCB comments, soils between 5 and 10 feet bgs were included for consideration in the Revised FS Report and Revised RAP for targeted excavation as shown on Figure 4-2.

2.3.3 Feasibility Study

Geosyntec prepared a Revised FS (Geosyntec, 2014b) to evaluate remedial technologies and alternatives for impacted Site media leading to recommendation of a set of remedial actions presented in the Revised RAP (URS and Geosyntec, 2014). The Revised FS Report included identification and screening of a range of technologies, each of which can address a specific Site cleanup issue. Screening of technologies was followed by identification, screening and detailed evaluation of a range of remedial alternatives for the Site.

Remedial alternatives retained and evaluated include:

- Alternative 1 – No Action.
- Alternative 4 – Excavation of Site soils from both landscaped areas and beneath residential hardscape; existing institutional controls; SVE/bioventing; sub-slab depressurization; removal of LNAPL; and groundwater monitored natural attenuation (MNA) and potentially supplemental active remediation. Four separate excavation alternatives in this category were evaluated in the FS Report:
    - Alternative 4B – Excavation to 3 feet bgs
    - Alternative 4C – Excavation to 5 feet bgs
    - Alternative 4D – Excavation to 5 feet bgs with Targeted Deeper Excavation to 10 feet bgs, and
    - Alternative 4E – Excavation to 10 feet bgs.
- Alternative 5 – Excavation of Site soils from landscaped areas only; existing institutional controls; SVE/bioventing; sub-slab depressurization; removal of LNAPL; and groundwater MNA and potentially supplemental remediation. Four separate excavation alternatives in this category were evaluated:
    - Alternative 5B – Excavation to 3 feet bgs
    - Alternative 5C – Excavation to 5 feet bgs
    - Alternative 5D – Excavation to 5 fee bgs with Targeted Deeper Excavation to 10 feet bgs, and
    - Alternative 5E – Excavation to 10 feet bgs.

- Alternative 7 – Capping the landscaped areas of the Site; existing institutional controls; SVE/bioventing; sub-slab depressurization; removal of LNAPL; and groundwater MNA and potentially supplemental remediation.

These alternatives were evaluated against a set of criteria that included:

- Overall protection of human health and the environment;
- Compliance with applicable or relevant and appropriate requirements (ARARs);
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, and volume through treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- State acceptance;
- Consistency with State Water Resources Control Board Resolution 92-49;
- Social considerations; and
- Sustainability.

In accordance with the RWQCB letter of January 23, 2014, the Revised FS Report addressed provisions of State Water Resources Control Board (SWRCB) Resolution 92-49 with respect to technical and economic feasibility. Technological feasibility is determined by assessing available technologies which have shown to be effective under similar hydrogeologic conditions in reducing the concentration of the COCs. Economic feasibility is an objective balancing of the incremental benefit of attaining further reductions in the concentrations of COCs as compared with the incremental cost of achieving those reductions.

The remedial alternative that was recommended in the Revised FS for further development in the Revised RAP was Alternative 4D – Excavation of Site soils to 5 feet bgs from both landscaped areas and areas beneath residential hardscape; targeted deeper excavation to 10 feet bgs for hydrocarbon mass removal; existing institutional controls; SVE/bioventing; sub-slab depressurization; removal of LNAPL; groundwater MNA and potentially supplemental remediation; and long-term monitoring.

2.3.4 Revised Remedial Action Plan

The Revised RAP was prepared to address the Regional Board's directives in its April 30, 2014 letter commenting on the March 10, 2014 RAP. The Revised RAP summarized the remedial alternative evaluation process and identified and described recommended full-scale remedial actions for impacted shallow soil and other media at the Site in accordance with requirements of the CAO and directives in the Regional Board's January 23 and April 30, 2014 letters. The Revised RAP and the recommended remedy comply with applicable provisions of the California Health and Safety Code (HSC), CWC, and SWRCB Resolution 92-49.

A set of final recommended SSCGs was developed in the Revised HHRA and are described in Section 3.2 below. SSCGs were developed for COCs in soil, soil vapor, and groundwater and are provided in Tables 5-1, 5-2, and 5-3 of the Revised RAP.

The Revised FS identified and screened a range of remedial technologies potentially applicable to Site cleanup. Remediation technologies were screened and then assembled into remedial alternatives that were subjected to initial screening and detailed evaluation for cleanup of the Site. Detailed evaluation conducted for the Revised FS included evaluation of costs associated with each of the alternatives considered and incremental costs vs. benefits of different alternatives in accordance with SWRCB Resolution 92-49. Estimates of mass proposed to be left in place and the basis for estimating the time and cost to reduce the concentrations of constituents of concern is detailed in the Revised FS and formed a part of the basis for selecting the recommended Alternative 4D. The detailed evaluation of alternatives, along with the April 30, 2014 comments and consideration of State Acceptance, led to selection of the following recommended alternative and multi-media remedial action approach[1]:

- Excavation of shallow soils to a depth of 5 feet bgs from both landscaped and hardscaped areas of residential yards at 208 impacted residential properties where RAOs are not met under existing conditions.
- Targeted excavation of deeper soils between 5 and approximately 10 feet bgs at 85 residential properties where TPH concentrations exceed 10 times SSCGs or the residual NAPL soil concentration and significant hydrocarbon mass can be reduced based on the distribution and concentration of hydrocarbons detected.
- SVE and bioventing to address residual petroleum hydrocarbons and VOCs in soils below the depth of excavation and areas not excavated. Soil vapor, including methane, will be addressed by active extraction using SVE and subsequent treatment by promoting degradation of residual hydrocarbon concentrations via bioventing where RAOs are not met following shallow soil excavation. SVE wells will be installed in City streets and on approximately 224 residential properties, as appropriate.
- Bioventing will be conducted via cyclical operation of SVE wells to increase oxygen levels in subsurface soils and promote microbial activity and degradation of longer-chain petroleum hydrocarbons.
- Sub-slab depressurization will be implemented at 29 properties where RAOs are not met and vapor intrusion risk is greater than 1×10^{-6} calculated using an attenuation factor of 0.002 or methane concentrations in sub-slab soil vapor exceed the upper RAO for methane of 0.5%. In addition, while the data do not indicate that vapor intrusion is an issue at any of the residences, Shell is prepared to offer installation of a SSD system to any of the homeowners in the Carousel neighborhood who request one to alleviate concerns about potential impacts to their indoor air from the Site.

[1] The numbers of types of remedial actions discussed here also includes information from the Addendum to the Revised RAP and as directed by the Amended CAO.

- LNAPL will be recovered where it has accumulated in monitoring wells MW-3 and MW-12 and in additional wells if it accumulates at a measurable thickness to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result.
- COCs in groundwater will be reduced to the extent technologically and economically feasible via source reduction and MNA. MNA could be paired with contingency groundwater remediation by oxidant injection in areas where Site-related COCs exceed 100x MCL if, after a 5-year review following start of SVE/bioventing operations, the groundwater plume is not stable or decreasing. In addition, upgradient sources would need to be addressed by the overseeing agencies.
- The recommended remedy includes a comprehensive long-term monitoring plan that will include monitoring of:
    - Sub-slab soil vapor probes at properties scheduled for remedial excavation until the SVE/bioventing system becomes operational and periodically thereafter, as requested or allowed by the homeowner;
    - Select soil vapor probe locations in City streets as feasible until the SVE/bioventing system becomes operational;
    - Utility boxes and other Site features previously monitored until the SVE/bioventing system becomes operational or as otherwise approved by the Regional Board; and
    - SVE/bioventing system operations and maintenance (O&M) and system effectiveness sampling including soil and soil vapor probes in the streets.

3.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

3.1 REMEDIAL ACTION OBJECTIVES

Medium-specific (i.e., soil, soil vapor, and groundwater) RAOs were developed for the Site. These RAOs include:

- Prevent human exposures to concentrations of COCs in soil, soil vapor, and indoor air such that total (i.e., cumulative) lifetime incremental cancer risks are within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) risk range of one in one million to one hundred in one million (1×10^{-6} to 1×10^{-4}) and noncancer HIs 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 onsite residents, the lower end of the NCP risk range (i.e., 1×10^{-6}) and a noncancer HI less than 1 are used.
- 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, water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply.

A further consideration is to maintain residential land use of the Site and avoid displacing residents from their homes or physically dividing the established Carousel community.

3.2 SITE-SPECIFIC CLEANUP GOALS

Medium-specific SSCGs for soil, soil vapor, and groundwater have been designed to achieve these RAOs. The SSCGs were developed using the guidance documents and agency policies identified by the Regional Board in the CAO, as well as other applicable resources. The RWQCB directed Shell to use the RWQCB-revised SSCGs in preparing the Revised RAP, Revised FS, and Revised HHRA (RWQCB, 2014d) and provided corrections for the SSCGs for TPHmo and benzene in subsequent correspondence (RWQCB, 2014e). The RWQCB-approved and directed SSCGs for each medium are summarized below.

3.2.1 Soil

SSCGs for soil were calculated considering human health exposure pathways (i.e., risk-based SSCGs), and the potential for leaching to groundwater. Risk-based SSCGs for residential land use are based on: (1) frequent exposure assumptions (350 days per year) for shallow soil (e.g., from 0 to 5 feet bgs), and (2) infrequent exposure assumptions (4 days per year) for soils at depths of 5 to 10 feet bgs that residents are unlikely to contact more than a few times per year. Risk-based SSCGs for

the construction and utility maintenance workers were developed assuming exposures can occur to soil at depths from 0 to 10 feet bgs.

- The soil SSCGs for residential exposures are chemical-specific numerical values for COCs assuming a target incremental cancer risk of 1×10^{-6} and a hazard quotient of 1. These numerical SSCGs were calculated for both frequent and infrequent exposure assumptions.
- The soil SSCGs for construction and utility maintenance worker exposures are chemical-specific numerical values for COCs assuming a target incremental cancer risk of 1×10^{-5} and a hazard quotient of 1.
- The soil SSCGs for the leaching to groundwater pathway are based on protection of groundwater as provided by the Regional Board (RWQCB, 2014a, b). Soil SSCGs for the leaching to groundwater pathway are chemical-specific numerical values for COCs directed by the Regional Board in their January 23, 2014 letter, as revised in the May 29, 2014 letter.

SSCGs for soil are listed in Table 3-1.

3.2.2 SSCGs for Sub-Slab and Soil Vapor

As directed by the RWQCB:

- Soil vapor and sub-slab soil vapor SSCGs for the residential exposures were calculated using a vapor intrusion attenuation factor of 0.002.
- Odor-based screening levels were developed based on screening levels for soil vapor published in the SFRWQCB ESL documentation (SFRWQCB, 2013). Based on comparison of risk based SSCGs and odor based screening levels, corrective action planning to address risk-based SSCGs will also address odor concerns.
- The SSCGs for construction and utility maintenance worker exposures are chemical-specific numerical values for COCs assuming a target incremental cancer risk of 1×10^{-5} and a hazard quotient of 1.
- THMs are not considered with respect to soil vapor exposures because they are components of drinking water and are not Site-related COCs.

SSCGs for sub-slab and soil vapor are presented in Table 3-2.

3.2.3 Site-Specific Action Levels for Methane

The SSCGs for methane are provided below. These SSCGs are consistent with CalEPA DTSC guidance for addressing methane detected at school sites (DTSC, 2005).

Methane Level	Response
>10% LEL (> 5,000 ppmv or 0.5%) Soil vapor pressure > 13.9 in H_2O	Evaluate engineering controls
> 2% - 10% LEL (> 1,000 - 5,000 ppmv or 0.1 - 0.5%) Soil vapor pressure > 2.8 in H_2O	Perform follow-up sampling and evaluate engineering controls

3.2.4 SSCGs for Groundwater

The following are SSCGs for groundwater at the Site:

- Remove or treat LNAPL to the extent technologically and economically feasible, and where a significant reduction in risk to groundwater will result; and
- Reduce concentrations of COCs in groundwater to the extent technologically and economically feasible to achieve, at a minimum, the water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply.

The groundwater SSCGs are presented in Table 3-3.

4.0 SUMMARY OF SELECTED REMEDIAL ALTERNATIVE

Amended CAO R4-2011-0046 approved the Revised RAP dated June 30, 2014, as amended by the Addendum to the Revised RAP dated October 15, 2014, and directed Shell to implement Alternative 4D as described in the Revised FS and Revised RAP. The approved remedial alternative includes a number of multi-media remedial actions to address impacts to soil, soil vapor, and groundwater at the Site. These remedial actions are summarized in the following sections.

There are three properties that have had soil sampling conducted since completion of the Revised HHRA. Geosyntec will conduct an HHRA for these three properties before remediation activities commence in the area of the tract in which they are located, and they will be added to the list of properties for remediation if appropriate. There are also nine properties that have not been investigated as of October 15, 2015. Whether excavation or other remedial action is needed at the three properties recently sampled or the nine remaining unsampled properties will be established based on analysis of sampling data obtained and HHRAs for these properties when access is obtained.

4.1 SOIL EXCAVATION

4.1.1 Shallow Soil Excavation from 0 to 5 Feet bgs

Shallow soils will be excavated to a depth of 5 feet bgs from both landscaped and hardscaped areas of yards at impacted residential properties where RAOs are not met under existing conditions. Excavation will be conducted to a depth of 5 feet bgs throughout the accessible areas of front, back, and side yards at approximately 208 properties identified based on Site characterization data, results of the HHRA, and where groundwater protection SSCGs are exceeded, subject to setbacks and sloping requirements to protect structures and sensitive utilities.

The 208 properties include those identified in the Revised RAP, additional properties identified in the Addendum to the Revised HHRA (Geosyntec, 2014d), one property where all testing has been completed except soil sampling due to hardscape cover and utility conflicts that was added based on information from surrounding properties, and an additional property added due to the presence of arsenic at 5 feet bgs at concentrations just above the regional background arsenic concentration. The excavation will also remove residual concrete reservoir slabs, to the extent practicable, if encountered within the depth excavated. The 208 properties identified for excavation to 5 feet bgs are shown on Figure 4-1. The estimated soil volume to be excavated from 0 to 5 feet bgs from these 208 properties is approximately 127,100 cubic yards, or approximately 217,000 tons based on a soil density of 1.7 tons/cubic yard.

Soils will be excavated from both landscaped areas and areas currently covered by hardscape, including walkways, driveways, patio areas, and hardscape associated with landscaping. Property-specific features may limit excavations at some properties. Most fences and block walls between yards and ornamental or partitioning walls on individual properties will be removed, as the depth of excavation will exceed fencepost and footing depths. Removal of fences and block walls between properties will facilitate excavation of side yards at many residences, as the distance between

adjacent houses is approximately 7 to 10 feet, and there is insufficient room for excavation equipment access for excavation with fences and walls in place. As with other hardscape, fences and walls will be restored following completion of excavation prior to restoration of landscaping.

Excavation areas at individual properties will be dependent on setback or excavation sloping requirements established by the Geotechnical Engineer (summarized in Section 9.1) and approved by the Los Angeles County Department of Public Works (LACDPW) and City of Carson. Consistent with PDF GEO-1, a geotechnical investigation has been conducted (Section 9.1) to evaluate soil strength and stability conditions and will form the basis for establishing setback and/or sloping requirements. A geotechnical report presenting findings and recommendations of this investigation will be submitted to the LACDPW Department of Building and Safety (DBS) and Geotechnical Materials Engineering Division (GMED) for review and approval before PSRPs are submitted. Per requirements of California Water Service Company (Cal-Water), the local water purveyor, setbacks will also be required from transite pipe water mains that are located at a depth of approximately 3 to 4 feet in front yards of the west side of north-south trending streets and the south side of east-west trending streets. Setbacks and/or sloping of excavations will also be required from power poles located along rear property lines and will be established in consultation with Southern California Edison (SCE) and described in individual PSRPs.

Exceptions to excavation beneath hardscape include patios covered by structures and roofs, and swimming pools and pool decking surrounding swimming pools. These hardscape areas will not be excavated to avoid structural demolition and potential damage to homes, swimming pools and appurtenant equipment. Appropriate setback requirements to protect these features were also established by the Geotechnical Engineer and will be approved by the LACDPW and City of Carson. In addition, property-specific features may limit excavation in some localized areas and this will be considered when the PSRPs are developed. No excavation will occur beneath City streets and sidewalks or beneath houses. In addition to treatment by the SVE/bioventing system discussed below and in Section 10, remaining soils in these non-excavated areas are addressed in the Surface Containment and Soil Management Plan (Appendix A) and by existing institutional controls that require a Grading Permit be obtained from the City of Carson for excavations deeper than 3 feet.

4.1.2 Targeted Deep Excavation from 5 to 10 Feet bgs

Targeted excavation of deeper soils between 5 and approximately 10 feet bgs will also be conducted at approximately 85 properties where significant hydrocarbon mass can be reduced based on the distribution and concentration of hydrocarbons detected. Targeted deep excavations were included in the Revised RAP at the Regional Board's direction to reduce hydrocarbon concentrations for the potential leaching to groundwater pathway, and not because of human health risk considerations. Some properties were identified for excavation of both front and back yards, while others were identified for excavation of only the front or back yard based on statistical analysis of the petroleum hydrocarbon concentration data.

Targeted deeper excavation will only be conducted where the soil from 0 to 5 feet bgs is slated for excavation, equipment access is feasible, and deeper excavation can be achieved safely, subject to allowable setbacks from structures and sensitive utilities. The 85 properties identified for targeted excavation from 5 to 10 feet bgs are shown on Figure 4-2. The estimated soil volume from targeted excavation from 5 to 10 feet bgs is 20,500 cubic yards, or approximately 34,900 tons.

The possibility of exposure to soils remaining below 5 feet bgs and impacted soils beneath City streets and sidewalks is addressed through existing institutional controls that require a Grading Permit be obtained from the City of Carson for excavations deeper than 3 feet and an updated Surface Containment and Soil Management Plan to address notifications, management, and handling of residual soils that are impacted by COCs at concentrations greater than risk-based levels. This plan is included as Appendix A.

4.1.3 Potential Additional Lateral or Vertical Excavation

The RWQCB directed Shell to consider an additional 10% of excavated soil volume as a contingency. Potential additional lateral or vertical excavation based on findings from excavations to 5 feet bgs or from 5 to 10 feet bgs was addressed in the Addendum to the Revised RAP. As discussed in the Addendum, additional excavation would apply where evidence of mobile hydrocarbons is observed during excavation. The primary purpose of the additional excavation would be to remove hydrocarbon mass.

Once an excavation has reached the planned lateral or vertical limits, the decision to conduct additional excavation at a particular property or properties will be based on field observations and subsequent field testing. The observations that may be considered to determine the need for additional excavation include: 1) obvious mobile NAPL; 2) hydrocarbons seeping or oozing from excavation walls; and 3) wet crude oil-like residue on gloves when soils are handled. If mobile NAPL appears to be present in the soils, the soils/liquids will be collected directly from the excavation or from the bucket of the excavator and tested for the presence of liquids using the paint filter test (EPA Method 9095B). Any liquids passing the paint filter will then be placed in a graduated cylinder and allowed a 5-minute time period to assess whether mobile NAPL is present. The presence of mobile NAPL will be assessed by visual inspection of the liquids in the glassware. Procedures for conducting the paint filter tests are provided in Appendix P.

Additional excavation will be conducted if the presence of mobile NAPL is confirmed using field observations/testing as discussed below:

- If, during a 5-foot excavation, the presence of mobile NAPL is confirmed:
    - At the base of the 5-foot excavation, the excavation will locally proceed deeper to remove soils containing mobile NAPL, to the extent it can be done safely and without damaging property. The total depth of such additional vertical excavation will not exceed 10 feet bgs.
    - Along an excavation sidewall that adjoins a property that is already planned for 5-foot excavation, the excavation will occur at that adjacent property in accordance with the PSRP and Grading Permit for that property.
    - Along an excavation sidewall that adjoins a property that was not identified for excavation to 5 feet, a PSRP would need to be prepared and a Grading Permit would need to be obtained before soils beneath the adjacent property are excavated to remove impacted soils. Localized lateral excavation onto the adjoining property would be performed, to the extent it can be done safely and practicably, to remove the NAPL-impacted material only after a Grading Permit is obtained, or a waiver is granted by the City, for the additional excavation work. This may delay restoration of both properties until the Grading Permit can be obtained creating an inconvenience

to the residents. If this case happens outside of a current cluster, open excavations will be backfilled and restored and further excavation required will be conducted at a later date.

- If, during a 10-foot targeted excavation for mass removal (i.e., during excavation from 5 to 10 feet bgs) the presence of mobile NAPL is confirmed:
    - At the base of the 10-foot excavation, the vertical extent of excavation will not be extended deeper than 10 feet bgs.
    - Along the excavation sidewall for a partial yard excavation, lateral excavation will continue to the extent it can be done safely and without damaging property until the mobile NAPL has been removed or the property line or other boundary has been reached.
    - Along an excavation sidewall that adjoins a property that was not identified for excavation, soils beneath the adjacent property would not be excavated to remove impacted soils below 5 feet.
    - Along an excavation sidewall that adjoins a property that was identified for excavation to 5 feet, but not identified for excavation to 10 feet:
        - If that adjacent property has not yet been excavated, the PSRP and Grading Permit would be amended, or a waiver of need for amendment granted by the City, to allow limited deeper excavation to remove targeted mass, and localized lateral excavation would be performed, to the extent it can be done safely and practicably, to remove the NAPL-impacted material.
        - If the adjacent property has been excavated but not yet backfilled, the PSRP and Grading Permit would be amended, or a waiver of need for amendment granted by the City, to allow limited deeper excavation to remove targeted mass, and localized lateral excavation would be performed, to the extent it can be done safely and practicably, to remove the NAPL-impacted material.
        - If the adjacent property has been excavated and backfilled, localized limited lateral excavation would be performed, as can be done safely and practicably, to remove the targeted material, and documentation would be amended as applicable.
    - If the mobile NAPL encountered is due to smear on top of the residual concrete base, no additional lateral excavation will be performed.

Mobile NAPL will not be removed from an excavation sidewall if that sidewall adjoins a building foundation, city sidewalk/street, or utility line, or would intrude upon required geotechnical setbacks.

4.1.4 Estimated Soil Volume/Mass for Disposal/Recycling

The total estimated soil volume for disposal or recycling is approximately:

- 127,100 cubic yards (216,100 tons) from excavations from 0 to 5 feet bgs;
- 20,500 cubic yards (34,900 tons) for targeted deeper excavation from 5 to 10 feet bgs;
- 8,100 cubic yards (13,800 tons) from SVE piping trenching (Section 10.3); and
- Potentially an additional 14,760 cubic yards (25,100 tons) of soil from step-out excavations stipulated by the Regional Board.

For planning purposes, the total volume of soil to be excavated is 155,700 cubic yards (264,700 tons), excluding step-out excavation volume.

4.1.5 General Excavation Approach

Excavation will be accomplished using a variety of methods, including rubber-track-mounted excavators, backhoes, skid steers, and front-end loaders. Specific equipment anticipated to be used is identified in Section 9.6 below. American Integrated Services, Inc. (AIS), the selected remediation contractor, will utilize the smallest, quietest equipment capable of effectively and safely completing planned excavation tasks. Although the Revised RAP included using a limited access bucket auger rig to excavate vertical columns and then backfill those columns with controlled low-strength material (CLSM), upon further discussions with AIS, slot trenching can be conducted more efficiently in areas where auger excavation might be applied, and therefore excavation will not be conducted using augers.

Excavation will be conducted using conventional rubber track-mounted excavators or rubber-tired backhoes. Approximately 10,000 pound and 18,000 pound mini-excavators equipped with rubber tracks will be used for work in front yards and back yards where sufficient access is available. Side yard access will be significantly improved by removing fences between the side and back yards allowing larger equipment access to back yards. Excavation and soil management will also be conducted using a front-end loader and/or Bobcat skid-steer mini-loader to move soil from back yards to front yards and *vice versa* to bring in clean fill soil. An electrically-powered conveyor system may also be used to move soils from back to front yards and to move fill soils from front to back yards. As work progresses, additional equipment may be used to improve efficiency.

Conventional excavation using slot-trenching as necessary to protect structures or other features and open bulk excavation with appropriate sloping, setbacks, and/or shoring will be used where possible as the preferred excavation method.

In areas where access to equipment is severely limited, excavation will be accomplished using a mini-excavator, and where necessary hand tools and wheelbarrows will be used to conduct excavations. Hand excavation may be required on side yards where there is insufficient room for equipment to operate. Depth of excavation using these methods is restricted to a maximum of 5 feet bgs, and may be further restricted on a case-by-case basis to protect worker safety.

Excavations will be made with setbacks from structures and/or side slopes at the horizontal to vertical ratio recommended by the Geotechnical Engineer and approved by the LACDPW and City of Carson in the Grading Permit for the particular property being excavated. The basic excavation protocols will be altered as needed as excavations are conducted and to address any previously unknown utilities, concrete debris or foundations unearthed. We anticipate that excavation sidewalls will be sloped below foundation footings of structures. However, it is possible that the LACDPW and City will require setbacks from structures in accordance with appropriate elements of Sections J101, J104, J106, and J108 of the County Grading Code as amended by the City of Carson.

If remnants of the former reservoir concrete sidewalls and bases are encountered in remedial excavations, the concrete will be removed where encountered in the upper 5 feet of the excavations. At locations where targeted deeper excavations extend from 5 to 10 feet bgs, the concrete reservoir slabs will be removed where encountered, to the extent practicable and where it can be done safely.

If encountered concrete extends laterally beneath a structure or beneath the sidewalk, it will be broken at the edge of the structure or inner edge of the sidewalk using a hydraulic breaker and the remaining concrete will be left in place. Personnel will not enter into excavations to cut the residual slab using concrete saws.

Excavation will proceed in phases, with each phase of work including excavating a cluster of up to 10 properties, assuming access can be obtained. There will be an average of 7.5 properties excavated in each cluster, with the number of properties excavated ranging from 4 to 10. This average number of properties to be excavated in each cluster is consistent with the eight-property clusters described in the RWQCB-approved Revised RAP. Each cluster will include homes on both sides of a city block (e.g., the east side of Marbella and west side of Neptune Avenues or the east side of Ravenna and west side of Panama Avenues). This approach will be used so that back-of-lot fences or block walls can be removed one time and excavation conducted in both yards before the fences are restored. Removal of the side and back fences/walls will also facilitate equipment access and ability to conduct bulk excavations rather than more time consuming slot trenching.

Further details regarding excavation design and implementation are provided in Section 9 of this RDIP.

4.2 SVE/BIOVENTING

SVE and bioventing are the approved remedial technologies to address petroleum hydrocarbons, VOCs, and methane in soil vapor and to promote degradation of residual hydrocarbon concentrations in soil that do not meet RAOs, or are not removed by excavation. Consistent with PDF AQ-4, SVE/bioventing will be used to address impacted areas beneath existing paved areas, City sidewalks, and concrete foundations of the homes, in addition to addressing reduction of COC concentrations in unexcavated areas and areas not targeted for deeper excavation for mass removal with the goal of achieving SSCGs over time.

SVE is recognized as an effective technology for removal and treatment of VOCs from impacted soils. The process involves inducing airflow in the subsurface with an applied vacuum, enhancing in-situ volatilization of VOCs, and effecting movement of the VOCs to vapor extraction wells for removal from the subsurface. SVE is also effective at removing methane from deeper subsurface soils and has been used for this application at other hydrocarbon-impacted sites and at landfills. SVE would effectively remediate the lighter volatile-range petroleum hydrocarbons, VOCs, and methane.

Bioventing is an in-situ technology generally applicable to the remediation of petroleum hydrocarbons in shallow soils. In this process, air is introduced into the subsurface to provide oxygen to enhance biodegradation of petroleum compounds. Based on findings from pilot testing at the Site, bioventing was found to be effective at reducing hydrocarbon concentrations in Site soils over time. SVE working in concert with bioventing will promote microbial degradation of longer-chain petroleum hydrocarbons and, over the long term, reduce concentrations of these less-volatile compounds in the subsurface.

The SVE system will be operated in a cyclical manner, with active extraction in different portions of the Site at different times. The SVE/bioventing system will be operated cyclically (pulsed) to extract impacted soil vapor and introduce oxygen to the subsurface to stimulate degradation of the heavier

fraction of diesel-range hydrocarbons and motor oil-range hydrocarbons in a bioventing operational mode. During periods of active vapor extraction from a sub-set of wells ("on" cycle), the SVE system will not only remove hydrocarbon vapors, but will also draw oxygen into the subsurface to enhance the biodegradation of residual petroleum hydrocarbons in soil. During periods when vapor extraction is not occurring for the set of wells ("off" cycle), remediation will be achieved through biodegradation alone (i.e., bioventing). The system will use the same infrastructure (i.e., extraction wells) for both SVE and bioventing, and the cyclic operating conditions will be used to implement both remedial actions. The SVE/bioventing system will be operated in manner to achieve the soil oxygen demand estimated from the bioventing pilot tests.

The SVE/bioventing infrastructure will consist of a system of extraction wells, belowground conveyance piping, aboveground manifold and treatment compound(s), vapor treatment system(s), and various system controls and instrumentation. SVE will be applied in the shallow zone from approximately 5 to 10 feet bgs, intermediate zone from approximately 15 to 25 feet bgs, and deep zone from approximately 30 to 40 feet bgs. Nested shallow, intermediate, and deep zone wells will be installed in the streets of the Site, which provide ready access for installation. Shallow zone wells will also be installed within the front and back yards of residences to achieve SVE/bioventing coverage beneath houses based on locations where RAOs are not met in the 0 to 10 foot bgs depth interval. Well and piping components for SVE/bioventing wells installed on residential properties will be entirely below grade. These shallow wells will be screened from 5 to 10 feet bgs and will be connected to the SVE system via conveyance piping, which will be installed in the streets.

Based on the SVE pilot test radius of vacuum influence (ROVI) results for the intermediate zone, a total of 63 nested well clusters (shallow, intermediate, and deep zone) will be installed in the streets with an average spacing of approximately 125 feet (Figure 10-2). Based on the estimated ROVI of 50 feet for the shallow zone from the SVE pilot test, an additional 65 shallow zone wells will be installed between the nested wells in the streets of the Site to provide increased vapor extraction coverage within the shallow zone (Figure 10-1). Additionally, shallow zone wells will be installed in the front and back yards of residences requiring remediation of the shallow zone soil by SVE/bioventing. Due to potential short-circuiting from surface landscaping, the shallow zone ROVI for the residential wells is estimated to be 25 feet.

A total of 224 residences are proposed for SVE/bioventing remediation. The SVE/bioventing well field layout, well design and installation, piping system design and installation, manifold and SVE treatment system design are discussed in Section 10 of this RDIP.

4.3 SUB-SLAB DEPRESSURIZATION

Sub-slab depressurization will be implemented at 29 properties where calculated vapor intrusion risk is greater than one-in-a-million (1×10^{-6}) based on a directed attenuation factor of 0.002 or methane concentrations in sub-slab soil vapor exceed the upper RAO for methane of 0.5%, and as required by the Regional Board. In addition, while the data do not indicate that vapor intrusion is an issue at any of the residences, Shell is prepared to offer installation of a SSD system to any of the homeowners in the Carousel neighborhood who request one to alleviate concerns about potential impacts to their indoor air from the Site. This remedial action addresses the requirements of PDF AQ-5.

SSD systems will be used to mitigate the potential vapor intrusion pathway at the Site. The SSD system creates a negative pressure below the slab of the residence using a fan to remove air from below the slab and exhausting it above the building. The resulting downward flow of air reduces soil vapor concentrations and keeps soil vapors from entering the building.

SSD design, installation, and operation will be in general accordance with the DTSC Vapor Intrusion Mitigation Advisory (DTSC, 2011). The system consists of creating holes in building footing below the floor slab, removing small quantities of soil from beneath the slab to create suction pits, and placing suction pipes into the holes. The suction pipes are directed to a vent located above the roofline and connected to a fan to create a sub-slab vacuum.

Geosyntec conducted a SSD pilot test at the property located at 24628 Marbella Avenue to assess the general air permeability of subsurface materials and to collect data necessary for SSD system design for the building (e.g., spacing/number of suction points and fan size required). Additionally, data will be collected during diagnostic testing at each property where a SSD system will be installed and used to facilitate planning and mitigation system design for the homes receiving SSD systems as part of remedial actions planned for the Site.

Based on findings from the SSD diagnostic pilot test, a minimum of two suction points likely will be installed (on opposite sides of the house) on the main portion of the houses. Prior to completing the SSD design, a diagnostic test will be conducted at properties that will have SSD systems installed. The test will be conducted by installing two suction points beneath the floor slab of the home, applying a vacuum to the suction points, and monitoring the vacuum response in sub-slab probes installed beneath the floor of the home. The SSD design will be based on SSD diagnostic test conditions that result in a vacuum greater than 0.004 inches of water column (in-WC; New Jersey Department of Environmental Protection [NJDEP], 2013). If a vacuum of 0.004 in-WC beneath the slab cannot be achieved, then additional suction points will be installed or greater static vacuum applied to meet the target sub-slab vacuum response. The SSD diagnostic pilot test previously conducted also concluded that a separate suction point will likely be needed for garages and additions. SSD system design is discussed in detail in Section 11 of this RDIP.

4.4 LNAPL RECOVERY

As part of the RAP implementation, Shell will continue periodic LNAPL recovery where LNAPL has accumulated in monitoring wells MW-3 and MW-12 to the extent technologically and economically feasible, and where a significant reduction in risk to groundwater will result. If LNAPL accumulates in the future in other wells to a measurable thickness, LNAPL recovery will commence from those wells, and if LNAPL accumulates at a thickness of greater than 0.5 foot in other wells, LNAPL will also be periodically recovered from those wells using a dedicated pump. The goal for LNAPL recovery will be an end point of no measurable LNAPL accumulation in monitoring wells at the Site.

Monitoring of LNAPL and water levels, and LNAPL recovery volume monitoring will continue during LNAPL recovery events. When LNAPL recovery shows a declining trend in wells in which LNAPL occurs, recovery trends will be evaluated, a recommendation may be made to the RWQCB to reduce the frequency of LNAPL recovery, as appropriate.

The planned LNAPL recovery program is discussed in detail in Section 13 of this RDIP.

4.5 GROUNDWATER

Site-related impacts to groundwater will be addressed by MNA combined with source reduction through excavation, SVE/bioventing in the vadose zone, and LNAPL removal. 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.

Semi-annual monitoring will be conducted for a 5-year period coincident with Site-wide implementation of SVE/bioventing. In accordance with the Regional Board's letter dated March 23, 2011 regarding groundwater monitoring synchronization with monitoring at other nearby sites with impacted groundwater, semi-annual monitoring will be conducted during the third week in April (second quarter) and third week in October (fourth quarter) of each year. Monitoring of both shallow zone and Gage wells will be conducted. Groundwater samples will be analyzed for the following COCs and select MNA parameters: VOCs, TPHg, TPHd, TPHmo and metals, and the MNA parameters oxidation-reduction potential (ORP), dissolved oxygen (DO), pH, nitrate, iron, sulfate, and methane.

The MNA groundwater monitoring program will commence with startup of the SVE/bioventing system. If after 5 years of semi-annual MNA monitoring following completion of the excavation and the startup phase of the SVE system the concentrations of Site-related COCs do not continue to remain stable or decreasing based on statistical analysis, contingency in-situ groundwater remediation through oxidant injection will be considered at localized areas (i.e., where Site-related COCs exceed 100 times the MCLs). However, if the concentrations of Site-related COCs are stable or decreasing, the MNA program will continue and will be re-assessed after 5 additional years of annual groundwater monitoring.

5.0 PROJECT ORGANIZATION ROLES AND RESPONSIBILITIES

A RAP Implementation Team Organization chart is provided on Figure 5-1, and AIS' project organization chart is provided on Figure 5-2. Note that Figures 5-1 and 5-2 identify individual persons assigned in various roles for RAP implementation. Over the course of the project, it is anticipated that some of the persons assigned to these roles may change due to the duration of the project and other factors. The subsections below describe roles and responsibilities of the different organizations that will implement the RAP and this RDIP.

5.1 SHELL OIL PRODUCTS US

As Responsible Parties named in the CAO directing cleanup of the Former Kast Property, Shell Oil Company and BHC are ultimately responsible for cleanup and abatement of COCs discharged at the Site. The roles and responsibilities discussed in the following sections refer solely to the responsibilities within and among Shell Oil Company, SOPUS and SOPUS's contractors and consultants, and nothing presented here or elsewhere in the RDIP is intended to minimize BHC's responsibility for cleanup and abatement of COCs at the Site under the CAO.

Equilon Enterprises LLC doing business as Shell Oil Products US (SOPUS or Shell) is responsible for Shell Oil Company's response to the CAO. Shell's Senior Principle Program Manager has authority to make commitments to the RWQCB on Shell's behalf.

Shell's External Relations Advisor for Southern California has responsibility for public outreach and community interaction.

5.2 AECOM – OVERALL PROGRAM MANAGEMENT AND REPORTING

AECOM has overall responsibility for designing planned remedial actions and managing their implementation under the direction of the AECOM Project Manager who has overall contractual responsibility to SOPUS for contractual and financial aspects of implementation of the RWQCB-approved Revised RAP. The AECOM Technical Lead has overall technical responsibility for investigation and remediation, directing staff implementing the RAP, reporting, and for regulatory interface.

The Engineer-in-Charge and Resident Engineer for RAP implementation is responsible for excavation design and preparation of grading plans to be included in PSRPs, for directing staff in design of the SVE/bioventing system, piping systems, the SVE treatment system and associated infrastructure. The Resident Engineer will spend the majority of his time at the AECOM construction trailer at the laydown yard located less than ½ mile from the Site and will be available on short notice to address any issues that arise in the field during RAP implementation. He will be assisted by a lead design manager for civil design work, a field manager for RAP implementation, and a landscape architect responsible for designing Site restoration and landscape options.

Construction management services will be provided by AECOM's Program/Construction Management staff based in our Los Angeles office. These efforts will be led by a full-time

Construction Manager, who will be onsite full-time during implementation. Together with the Resident Engineer, the Construction Manager will have primary interface with AIS, the remediation contractor performing the remediation work. The Construction Manager will be assisted by a document controls specialist and by a Project Controls Manager in the areas of cost and schedule management, planning, scheduling, and management systems.

5.3 GEOSYNTEC CONSULTANTS – SUB-SLAB DEPRESSURIZATION AND GROUNDWATER

Geosyntec Consultants, an AECOM subcontractor, will lead design services and direct installation of SSD systems. Geosyntec will also be responsible for diagnostic testing of SSD systems as part of SSD system design for individual properties. Geosyntec also is the Technical Lead for groundwater MNA and will be responsible for evaluation of groundwater treatment technologies if required.

5.4 AIS – CONTRACTOR PERFORMING RAP IMPLEMENTATION

AIS has been selected as the remediation contractor that will implement the remedial actions described in the Revised RAP. AIS has a Class A (Haz) contractor's license and will be responsible for all aspects of RAP implementation, including excavation, loading, transportation, trenching, well and piping installation, and Site management. AIS' services will be provided under the overall supervision of the Project Director. AIS' Project Manager and will be responsible for AIS' day-to-day activities and will be supported by several key members of the AIS team, including a Task Manager for preconstruction activities, including permitting. The AIS Site Superintendent will direct AIS field teams in implementing the remedial work. The AIS corporate Health and Safety Officer is responsible for their overall health and safety program and for employee training, and the Site Health and Safety Officer and has day-to-day responsibility for implementing AIS' health and safety program.

Gregg Drilling and Testing, an AIS subcontractor, will provide drilling and SVE well installation services for shallow and multi-level SVE wells installed in City streets.

5.5 LANGAN AND CARTUS – RESIDENT RELOCATION PROGRAM

Langan Engineering & Environmental Services, Inc. (Langan) will have primary responsibility for temporary relocation of residents during remedial action implementation at their property. Langan is the overall relocation coordinator and will be the direct interface with the residents. Cartus is the Temporary Relocation Program Administrator (Program Administrator). Langan will work closely with Cartus, an established relocation company, to identify suitable locations for relocation of residents and will provide the primary interface with residents for temporary relocation.

Langan's responsibilities include meeting with a representative of the household to review the relocation packages and discuss any questions or concerns. Langan will then coordinate with the Program Administrator to determine which of the available locations would be suitable for the household. Langan, with assistance from Cartus, will prepare an information package for the household that will include details such as date of required relocation, location information, and per diem reimbursement details. As Program Administrator, Cartus is responsible for contracts and

logistics coordination with the residents needing to be relocated and coordinating the reimbursement for the individual households.

6.0 SUPPORTING PLANS AND DOCUMENTATION

6.1 HEALTH AND SAFETY PLAN

A site-specific Health and Safety Plan (HSP) has been developed for this RAP implementation program. The HSP for this project is intended to provide guidance and direction to AECOM employees allowing for a safe and compliant work site. The HSP is a living document that will be updated periodically through the life of this project. It is written in compliance with the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120(b) through (h); it also reflects AECOMs internal Standard Operating Procedures (SOPs) and Shell's 12 Life Saving Rules. As an attachment to the HSP, task-specific hazard analyses (THAs) have been written for each task to be conducted during RAP implementation. THAs will serve as a qualitative task-based risk assessment and analysis of the hazards posed by each task, and will include both hazards as well as mitigation measures to be taken to ensure a safe working environment as well as maintain a Goal Zero Standard. These THAs are intended to be evergreen documents, updated as needed to address hazards and subsequent mitigations as they arise. The HSP and each THA are developed by project staff that possess specific knowledge and experience in the task to be performed, and these documents are then reviewed and approved by Certified Safety Professionals. The HSP is included in Appendix B.

6.2 STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND RAIN EVENT ACTION PLAN (REAP)

In accordance with PDF H/WQ-1, the SWPPP addresses control of pollutants and their sources associated with remedial construction activities (e.g., excavation of hardscape and landscape areas) to reduce the potential for sediments within discharge of runoff into the storm drain system during grading and other activities associated with the remedy implementation for the Site. It identifies and provides methodologies to eliminate, control, or treat all non-stormwater discharges from the Site, and to prevent or control erosion during Site activities.

BMPs are included to reduce or eliminate pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity, and to prevent eroded materials from being transported from the Site via sheetflow, swales, area drains, natural drainage courses, or wind. A Rain Event Action Plan (REAP), designed to protect all exposed portions of the Site within 48 hours prior to any likely precipitation event, was also developed as part of the SWPPP.

Because the project will disturb over 1 acre of soil, it requires coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (NPDES No. CAS000002 and SWRCB No. 2009-0009-DWQ, as amended). A SWPPP has been prepared for the project and is included in Appendix C.

Additionally, Shell has enrolled in the Storm Water Multiple Application and Report Tracking System (SMARTS) program as the responsible entity for compliance and reporting. The SWPPP has been uploaded to the State's SMARTS website and approved by Doug Weimer as the designated Shell responsible person.

6.3 RELOCATION PLAN AND OPTIONAL REAL ESTATE PROGRAM

The Temporary Relocation Program is being implemented by Shell, Langan, and Cartus. As part of implementation of the Revised RAP, Shell is offering a Temporary Relocation Program to residents of properties while remedial excavations are performed in the yards of their residences. During the remedial excavation, backfill, and hardscape restoration work, residents of the properties where excavation is conducted will be temporarily relocated as described herein. Residents will move back into their homes following removal of a noise barrier that will surround their properties during the remedial activities.

Residents of properties adjacent to locations where excavations are occurring will be offered alternative accommodations if necessary based on the nature of the excavation work, the potential for interruptions of access to the property, or potential disruptions in utility service to the property.

Langan will be coordinating the Temporary Relocation Program. Cartus, a nationwide real estate services company, will administer the Temporary Relocation Program.

In addition to the Temporary Relocation Program, Carousel homeowners are also being offered an Optional Real Estate Program. The Optional Real Estate Program is a voluntary program that ensures that participating homeowners who elect to sell their house to independent third party buyers after placing their home on the market will receive fair market value as determined through the appraisal process described in the Program Brochure.

A detailed description of the Relocation Plan and Optional Real Estate Program is included in Appendix D.

6.4 CONSTRUCTION TRAFFIC MANAGEMENT PLAN AND HAUL ROUTE PLAN

The Construction Traffic Management Plan and Haul Route Plan is included in Appendix E.

AIS will provide traffic control measures as set forth in the Encroachment Permits and the associated Traffic Control Plans. Traffic control will be performed during excavation at residential properties, installation of SSD systems at residential properties, installation of SVE/bioventing wells and associated laterals and piping in both yards and streets, and installation of soil borings and multi-level soil vapor probes in City streets.

Prior to leaving the Site, each haul truck, and other remediation project-related delivery trucks that come in contact with Site waste, will be inspected and put through procedures, such as brushing, to remove loose debris from tire wells and on the truck exterior. Haul truck operators (drivers) will be required to have the proper training and registration by the State as applicable to the material they will be hauling. As described in Section 7.11, a street sweeper will be staged at the laydown yard and will be deployed as needed to clean any construction-related soil from the City streets.

Non-hazardous soil and sub-surface concrete will be transported to Soil Safe in Adelanto, California, a Shell-approved disposal facility for thermal treatment or to Chiquita Canyon Landfill in Castaic, California. Resource Conservation and Recovery Act (RCRA)-hazardous and non-RCRA California hazardous soil will be profiled and transported for disposal at Clean Harbors, Buttonwillow,

California for direct landfill disposal in appropriately certified cells. Route maps for these facilities are provided in Appendix E.

6.5 EMERGENCY RESPONSE PLAN

The Emergency Response Plan (ERP) previously prepared to support pilot testing has been revised and updated to address RAP implementation. The ERP provides specific information on potential hazards that may arise during implementation of the Revised RAP that may potentially affect the Carousel Tract community and describes the risk mitigation and emergency response procedures that will be instituted during RAP implementation. The ERP outlines roles, responsibilities, and authorities of the various entities implementing the RAP as well as public agencies who are or may be involved in emergency preparedness, mitigation, and response activities to address potential hazards associated with soil remediation activities at the Carousel Tract. The ERP outlines existing and potential hazards associated with soil, soil vapors, and remedial activities that will be conducted, and also describes procedures, communications, and coordination processes for initiating emergency response to safeguard the community in the event of an emergency. The ERP also provides information on emergency notification services, based on existing public resources. Finally, the ERP provides a list of important public agency contacts and emergency preparedness resources. This plan is included in Appendix F.

6.6 POST-EXCAVATION DOCUMENTARY SAMPLING PLAN

Post-excavation documentary soil samples will be collected to document concentrations of certain COCs remaining on properties following excavation and prior to start of SVE/bioventing operations. This sampling will supplement the more than 10,000 soil samples that have previously been collected from residential properties.

Post-excavation documentary soil samples will be collected only as can be performed safely and efficiently due to physical constraints based on the types and locations of excavation being performed. Post-excavation soil samples will be collected from the sidewalls of excavations adjacent to excavated residential structures. Samples will be collected from two depths at two sidewall locations along each side of residences where yards are excavated to a depth of 5 feet (up to 8 locations, 16 samples total) and from two locations at the bottom of each excavation in the back and front yards (4 samples). Where properties are excavated to 10 feet bgs, up to four additional samples will be collected will be collected at depth. Additionally, samples will be collected from excavation sidewalls adjacent to the City sidewalks, subject to operational and safety constraints, including protection of utilities. Thus, up to 28 post-excavation documentary samples may be collected per property where the adjacent property is also excavated to similar depths.

Samples also will be collected from two locations at two or three depths along property lines in the front and back yards of properties where the adjacent property will not be excavated or where the adjoining yard will be/has been excavated to a shallower depth.

These samples will be analyzed for COCs with the potential to partition to soil vapor and/or migrate to groundwater, including TPHg, TPHd, TPHmo, and VOCs. Because of their very low solubility and migration potential, post-excavation samples will generally not be analyzed for SVOCs, PAHs,

or metals. For the properties where excavation is proposed due to antimony, arsenic, or thallium concentrations exceeding background, the post-excavation samples collected from depths of 0.5, 2 and 5 feet bgs will be analyzed for these metals only.

A detailed plan discussing the post-excavation documentary sampling procedures is included in Appendix G.

6.7 SURFACE CONTAINMENT AND SOIL MANAGEMENT PLAN

The possibility of exposure to soils remaining below 5 feet bgs, soils in non-excavated areas, and impacted soils beneath City streets and sidewalks is addressed through existing institutional controls that require a Grading Permit be obtained from the City of Carson for excavations deeper than 3 feet and a Surface Containment and Soil Management Plan to address notifications, management, and handling of residual soils that are impacted by COCs at concentrations greater than risk-based levels, per the requirements of PDF H/WQ-1. The Surface Containment and Soil Management Plan that was included in the approved RAP has been updated and is included in Appendix A. Aspects of PDF H/WQ-1 related to the General Construction NPDES Permit, SWPPP, WWECP, and BMPs are addressed in the SWPPP and will be included as notes on the grading plans.

Shell will implement a community outreach program to inform and educate residents in the community of residual impacted soils and of the notification procedures for management of these materials via the Surface Containment and Soil Management Plan.

6.8 POST-CONSTRUCTION LONG-TERM SAMPLING AND MONITORING PLAN

The details of the Post-Construction Long-Term Sampling and Monitoring Plan are discussed in Appendix G. An overview of Shell's recommended long-term monitoring and sampling plan for the Site is provided below:

- Sampling of Existing Soil Vapor Probes in Streets and Utility Vaults:
    - Quarterly monitoring of existing soil vapor probes at 1, 1.5, and 5 feet bgs at nine onsite probe locations and one offsite location in the streets will continue until the probes are decommissioned during trenching in the street for SVE conveyance pipe installation or until Site conditions demonstrate it is no longer necessary, but no later than the time the SVE/bioventing system becomes operational.
    - Quarterly monitoring of 69 onsite and offsite utility vaults will continue until Site conditions demonstrate it is no longer necessary via four consecutive quarters with methane detected at no greater than 0.1%, or at the latest when the SVE/bioventing system becomes operational.
- Monitoring of SVE/Bioventing System Effectiveness:
    - SVE/bioventing system O&M procedures including soil vapor sampling to monitor system effectiveness are discussed in Section 10.6 and in the O&M Plan for the SVE system in Appendix M.
    - Multi-level soil vapor probes will be installed at 16 representative locations throughout the Carousel Tract and monitored periodically to evaluate system effectiveness. These soil vapor probes will be sampled prior to start of

SVE/bioventing system operation to establish baseline conditions. Details of these monitoring activities are provided in Appendix M.

- As an additional measure to monitor SVE/bioventing effectiveness, soil samples will be collected using a Geoprobe rig at 16 representative locations collocated with the multi-level soil vapor probe locations prior to start of SVE/bioventing system operation to establish baseline conditions. Details of the Geoprobe soil sampling program are included in Appendix G.
- Soil samples will be collected from the same 16 soil boring locations after 5 years of SVE/bioventing system operation and at 5-year intervals thereafter for comparative analysis with prior samples from the same locations. Geoprobe borings will be advanced and sampled at the same depths at locations adjacent to the previous borings and samples will be collected and analyzed. The Geoprobe soil sampling at individual probe locations will be terminated if all soil SSCGs (Table 3-1) are achieved or if Site conditions demonstrate it is no longer necessary.
- Along with soil vapor data from the SVE system O&M, results of the baseline and periodic sampling will be used to evaluate overall system effectiveness as well as optimize system operation and will be reported in an initial 5-year review report and subsequent reports submitted on a 5-year basis.

- Residential Sampling:
  - Except for those identified for excavation due solely to antimony, arsenic, or thallium at the properties identified for soil excavation from 0 to 5 feet bgs, existing sub-slab soil vapor probes will be monitored and sampled every other year for VOCs and fixed gases until remedial excavation is completed and a SSD system is installed or the SVE/bioventing system becomes operational for the property.
  - For the same properties where a SSD system is not installed, after the SVE/bioventing system is fully operational, sub-slab soil vapor probes will be monitored and sampled every 5 years until property conditions demonstrate it is no longer necessary. Sampling of sub-slab soil vapor probes will be terminated at a given property if COC concentrations detected are below soil vapor SSCGs (Table 3-2) for two consecutive sampling events.
  - Methane screening will be conducted inside the homes using hand-held instruments at the time of the sub-slab soil vapor probe sampling to check for potential presence of methane.
  - Because outside sub-slab soil vapor probes in front and back yards will be removed along with residential hardscape, replacement probes will be installed in the garage (if one does not exist) so that two probes can be sampled per property. Sampling of sub-slab soil vapor probes will be terminated at a given property if COC concentrations detected are below soil vapor SSCGs (Table 3-2) for two consecutive sampling events.
- Sub-Slab Depressurization (SSD) Systems:
  - The SSD monitoring program will consist of sub-slab soil vapor probe sampling at the properties where SSD systems are installed as follows:
    - One sampling event per year for years 1 through 5 following system installation;
    - One sampling event every other year for years 5 through 15; and

        - One sampling event every f years for years 15 through 30, or until property conditions demonstrate it is no longer necessary.
    - Annual inspections will be done to verify that the SSD systems are operating as designed and vacuum and flow rate of the SSD fan will be monitored.
- Groundwater Sampling
    - Semi-annual groundwater sampling will commence in the Fourth Quarter 2015 in accordance with the RWQCB-approved Revised RAP. The semi-annual MNA evaluation program will commence once the SVE system is fully operational throughout the community.

7.0 PERMITTING REQUIREMENTS

7.1 GRADING PERMITS

Consistent with PDF GEO-1, prior to issuance of Grading Permits by the City of Carson, a final geotechnical report and a remedial excavation grading plan with final design recommendations applicable to each excavated area will be prepared by a California-registered Geotechnical Engineer and Civil Engineer, respectively, and submitted to the LACDPW and City of Carson for review and approval. The remedial excavation grading plans will be based on the geotechnical investigation completed as part of preparation of the RDIP (See Section 9.1 and Appendix K). The grading plans will include details on the demolition of hard and soft scape features, removal of existing utilities in conflict with the planned remedial excavations, remedial excavation plan and sections, backfill and final grading, replacement of utilities, drainage improvements, flatwork paving, and fencing details. The geotechnical report will describe the characteristics of underlying natural or fill soils, including expansive soils, potential differential settlement and varying soils strength and requirements for the placement of backfill. The geotechnical report will contain recommendations for any needed cut slopes or compaction of fill materials. The remedial excavation grading plans will detail the excavation and backfill design details based on the findings and recommendations of the geotechnical report. Grading plans will be prepared for each cluster of properties that will be excavated at the same time and included in a single submittal for City of Carson and LACDPW review.

Once the final geotechnical report and individual cluster grading plans have been approved, AIS will obtain a Grading Permit for each property from the City. The City will review and assign a master reference number for tracking of the individual grading permits assigned to each cluster. During project execution, inspections will be coordinated with the City, as required. At completion of the work, AECOM and AIS will provide closeout documentation and obtain permit closure(s) from the City. Permit closure will require submittal of the final compaction report including but not limited to, compaction testing by the Geotechnical Engineer. The City will typically provide final closure of a Grading Permit approximately 2 to 3 weeks after submittal.

If shoring permits are required per the PSRPs or geotechnical report, the plans and engineering reports to support the shoring installation will be included in the remedial excavation grading plan and submitted to the City for approval.

7.2 SCAQMD PERMIT TO CONSTRUCT/OPERATE FOR SVE/BIOVENTING SYSTEM

In June 2015, an application was submitted to the SCAQMD for a permit for the SVE and oxidizer treatment systems. It is anticipated that the Permit to Construct (PTC) will be finalized and issued in late 2015. The PTC will allow for well and piping installation and system construction to begin and will include system operating conditions and monitoring requirements. Upon completion of system installation, the PTC will be processed into a Permit to Operate (PTO) that will contain conditions required for system operation, monitoring, and maintenance.

7.3 EXCAVATION AND ENCROACHMENT PERMITS

Partial closure of the street and sidewalk surrounding each cluster of homes will be required in order to conduct the work. To comply with noise restrictions in accordance with requirements imposed in the Final EIR in PDF NOISE-5 and MM NOISE-1, AIS plans to erect sound attenuation panels surrounding each cluster of properties that will be excavated at a time. The sound panels will be mounted on K-rails and will extend into City streets to near the centerline. Loading of trucks will occur within this enclosed area. The K-rails and sound panels will remain in the City streets for the duration of work at each cluster of properties. "No Parking" signs will be posted on the opposite side of the street from the sound panels so that controlled two lanes of traffic can be maintained at all times. Street trenching for installation of the SVE/bioventing piping, installation of the SVE/bioventing wells in the streets, backfill and asphalt paving of piping trenches, installation of SVE/bioventing wells on properties, and other work associated with the remedial excavation and Site restoration will be conducted within the noise attenuation barriers where possible. This is intended to mitigate potential noise impacts in accordance with PDF NOISE-5 and MM NOISE-1.

For each cluster of properties, AIS will prepare required traffic control plans and submit the plans to the City of Carson Public Works Department for approval and obtain an encroachment/excavation permit prior to conducting work in the city right-of-way.

At the conclusion of all street work or major portions of street work to install SVE system piping and wells AIS will obtain an additional encroachment permit for performing asphalt resurfacing of the city streets. This work will be done when the excavation work is completed at all properties.

AIS will coordinate required inspections, and upon completion of the work, provide closeout documentation and obtain permit closure from the City.

7.4 PLUMBING AND ELECTRICAL PERMITS FOR RESTORATION

AIS will obtain appropriate utility permits for each property from the City and will coordinate required inspections during project execution. At completion of the work, AIS will provide closeout documentation and obtain permit closure(s) from the City. City utility permits that may be required include:

- Plumbing Permits for removal, capping and reinstallation of sewer lines from houses to the back of sidewalk;
- Plumbing Permits for removal, capping and reinstallation of water lines from houses to water meters, requiring pressure testing and possibly disinfection;
- Electrical Permits for sub-slab depressurization system installation and for electrically-powered landscaping features (e.g., fountains, hard-wired lighting, etc.) or other select electrical devices removed during excavation activities; and
- Electrical Permits for installation of temporary power poles with sub-panel power boxes, if necessary.

7.5 LANDSCAPING PERMIT

Based on discussions with the City of Carson Planning Department and LACDPW representatives on March 16, 2015, landscaping permits will not be required for this work. The City Planning Department, however, does want to review conceptual landscaping and irrigation plans for Site restoration.

7.6 MASONRY PERMITS FOR BLOCK WALL RECONSTRUCTION

Masonry block screen and retaining walls to be reconstructed will be depicted on the grading plans and submitted to the city for approval. Per the Los Angeles County Department of Building and Safety, building permits generally are not required for screen walls less than 6 feet high and retaining walls less than 4 feet high. If building permits are required it will be determined during the grading plan check process and the Building Permit will be issued at the time the Grading Permit is issued.

7.7 SCAQMD PERMITS FOR ASBESTOS NOTIFICATION/ABATEMENT

SCAQMD requires a 10-day notification by a State-licensed contractor prior to any lead or asbestos-containing material removal, which may be applicable during SSD system installation. AIS is a California-licensed asbestos contractor. AIS will complete the required SCAQMD form and will include all required information for the scope of the abatement, as required for the work being conducted.

It is anticipated that one or two houses will be purchased and demolished for construction of the SVE manifold structure. The process for house demolition will require the same notifications; however, a comprehensive demolition-level asbestos survey and lead-based paint survey will need to be conducted to properly plan the demolition. An AECOM Certified Asbestos Consultant and Certified Lead Inspector will conduct the demolition-level surveys. Additionally, monitoring will be conducted by a Certified Asbestos Consultant, as required by SCAQMD, during demolition activities that have the potential to release asbestos to the atmosphere.

7.8 SUB-SLAB DEPRESSURIZATION SYSTEM PERMITS

Based upon information obtained from SCAQMD personnel during a meeting on February 13, 2015, AECOM understands that permits are not required for active SSD systems installed at single-family residential properties. Therefore, SSD Permits will not be required from SCAQMD for the project.

According to the City of Carson Building Official, a Building Permit will not be required for installation of the SSD system. An Electrical Permit will be obtained from the City for modification to the electrical panel and for electrical connections to SSD system fans.

7.9 SCAQMD SITE-SPECIFIC RULE 1166 COMPLIANCE PLAN

SCAQMD Rule 1166, Volatile Organic Compound Emissions from Decontamination of Soil, sets forth the requirements to control the emission of VOCs generated from the excavation and handling of VOC-contaminated soil. VOC-contaminated soil is defined by the SCAQMD as soil having VOC

concentrations of 50 ppmv or greater as measured not more than 3 inches from the soil surface using an organic vapor analyzer (OVA) calibrated with hexane.

In compliance with PDF AQ-6, AIS has obtained a Site Specific Rule 1166 Compliance Plan (1166 Permit) from the SCAQMD and will maintain the permit for the duration of project activities involving soil excavation. The 1166 Permit (Plan #577559) was approved on September 1, 2015 and a copy is provided in Appendix H. The Rule 1166 Permit will be available at the excavation sites at all times. AIS will pay bi-annual and notification fees and obtain an updated Rule 1166 Permit on a bi-annual basis.

AIS will be responsible for notifying SCAQMD of pending excavation activities at least 24 hours before work commences at each cluster. Experience obtained during the Pilot Test project excavations provided insight that excavations below 5 feet bgs may require additional notifications. These additional notifications will be required when soil vapors are at or exceed 50 ppmv, as measured by a hexane-calibrated photoionization detector (PID). AIS will submit written/faxed notifications to SCAQMD to obtain a reference number for each occurrence of soils with total VOCs exceeding 50 ppmv. AIS's Project Coordinator will track Rule 1166 Permit notifications, reference numbers and annual permit renewal dates for continuous permit maintenance and compliance.

A written report indicating the facility selected to treat the VOC contaminated soil, quantity of soil removed from the site, status of the excavation, and any VOC contaminated soil remaining onsite will be submitted to SCAQMD within 40 days of the initial detection of VOC contamination. A brief summary indicating additional cleanup efforts (if any) to be conducted, the additional quantity of VOC contaminated soils to be excavated and the projected schedule of excavation will also be included.

All required documentation will be maintained, including:

- Written records of OVA monitoring and calibrations in a format approved by the SCAQMD;
- Certification on all records signed and dated on the day the measurements are observed;
- Daily inspections conducted and recorded of all covered VOC contaminated stockpiles to ensure the integrity of the plastic cover; and
- Records of treatment/disposal maintained for all VOC contaminated soil removed from Site.

Records clearly labeled "SCAQMD RULE 1166-VOC CONTAMINATED SOIL" that include the identification and the location of: 1) the generator, 2) transporter, and 3) receiving facility will be submitted to SCAQMD within 30 days after the excavation is completed for each cluster. Records will be signed and dated by each of the above parties indicating receipt or relinquishment of the VOC contaminated soil at the time custody is transferred. Additionally, records of disposal of VOC contaminated soil will be maintained at the laydown yard construction trailer during the excavation and later maintained for a period of two years at AIS' office after the completion of the excavation project. The records will be made available to SCAQMD personnel upon request.

7.10 CAL/OSHA TRENCHING PERMIT

AIS will maintain a State of California Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA) T1-Annual Trench/Excavation Permit per California Code of

Regulations (CCR) Title 8 Section 341 for the duration of remedial excavation and SVE/bioventing trenching work. A copy of AIS' Trenching Permit for 2015 is included as Appendix I.

7.11 LAYDOWN YARD

In order to conduct the work efficiently a nearby laydown yard (approximately 2 acres in size) will be used to stage equipment, store materials, for field offices, and provide parking for staff. The laydown yard is planned to be located on a portion of the former Fletcher Oil Refinery at the northwest corner of the intersection of Lomita Boulevard and S. Main Street. AECOM has prepared and submitted a planning approval permit application package to the City of Carson for the laydown yard. Once approved, and following execution of a lease between SOPUS and Los Angeles County Sanitation Districts, current owner of the property, AIS will equip and maintain the laydown yard in accordance with City-approved Plans.

The laydown yard will have three portable construction trailers for use by Shell, AECOM, and AIS. The trailers will include offices, electricity, high speed internet, telephone, heating/air conditioning, water, restrooms, and trash service.

The laydown yard will be used for daily safety and other project meetings, to provide a staff break area, and for parking by AECOM and AIS employees and subcontractors that will be shuttled to and from the Site. At least 50% of AECOM and AIS Site workers will be shuttled to and from the Site in accordance with PDF AQ-11 and PDF TRAF-4.

The yard will also be used to store equipment and materials, such as limited amounts of certified clean fill soil, SVE piping, and other construction materials and equipment as may be needed.

A copy of the laydown yard site planning submittal is provided in Appendix J.

8.0 PROPERTY-SPECIFIC REMEDIATION PLANS, EXCLUSION ZONES, AND SECURITY

8.1 PSRP PROCESS

A Property-Specific Remediation Plan (PSRP) will be prepared for each property where remedial actions are planned, including excavations, SVE/bioventing and/or sub-slab depressurization. During the process of developing the PSRPs, SOPUS representatives will meet with homeowners and non-homeowner residents to discuss relocation plans during remedial activities, to identify property-specific features that may require special measures, and to discuss property restoration options. Each PSRP will be reviewed by the RWQCB.

PSRPs will consist of a text description of the property-specific remediation components and planned restoration, and include property-specific grading plans and detailed engineering design information needed to obtain a Grading Permit. This will include the following components:

- Property Survey – A topographic survey will be conducted and a base map will be prepared to document existing conditions, property boundary, site elevations, site grade, building location(s), existing hardscape and landscaping, and underground/overhead utilities as required for the remedial excavation design and site restoration. This base map will form the basis for the grading plans.
- Demolition Plan – A plan will be prepared to depict the details for removal of existing landscape and hardscape, removal of existing known utilities that may conflict with the remedial excavation activities, and will include details on any items that need to be protected during the work activities.
- Excavation Plan and Details – A plan will be prepared to depict the details for each planned excavation and will include plan extent and cross sections showing recommended setbacks from existing structures to be protected, and excavation depths based on the remedial investigation and geotechnical evaluation. The plan will also include general methods of excavation and types of excavation equipment to be used to accommodate such features. If a homeowner requests that a particular area or feature not be removed to allow excavation (e.g., a large tree, hardscape feature, etc.), the PSRP will discuss procedures to protect that feature and requirements for a Land Use Covenant to advise of the presence of impacted soil that was left in place at the time of remedial excavation.
- Site Grading Plan – A plan will be prepared to depict the final grading elevations and will include all drainage features, retaining walls and details (if required), perimeter and interior fencing (e.g., block walls, wood fences, etc.), and restoration of existing utilities removed to accommodate the remedial excavation activities. These plans will also depict the location of new SVE wells and associated piping with appurtenances as required.
- Landscape and Irrigation Plan – A plan will be prepared to depict the landscape, irrigation, and hardscape items to be replaced at each property.
- SSD System Plan – A plan will be prepared to depict the locations and details for the SSD system for each property where one will be installed. This plan will include planned locations of each foundation penetration, fan unit, electrical details and proposed electrical

panel/service modifications (if any), piping and other details required, and will include findings from diagnostic testing conducted at each property.

- Relocation Information – The PSRP will contain general information about residents' relocation, including the length of time it is anticipated they will be relocated from their homes. Details regarding locations where residents will be staying, financial assistance, and other personal and confidential information will be transmitted to affected residents separately.

A tentative outline for the PSRPs is provided in the text box on the following page.

Tentative PSRP Outline

Property-Specific Remediation Plan (PSRP)

1. Introduction
    - Rationale for remediation at property
2. Overview of Planned Remediation
    - 2.1. Planned Remedial Activities, as applicable
        - Excavation
        - SVE/Bioventing
        - Sub-slab Depressurization
    - 2.2 Property Restoration
3. Site Security and Restricted Access During Remedial Activities
4. Homeowner Meeting(s) Summary
    - 4.1 Relocation
    - 4.2 Special Conditions for Relocation (e.g., aquarium, atypical pets, etc.)
    - 4.3 Special Conditions for Remediation (e.g., tree to be saved, aboveground spa, deck, etc.)
        - 4.3.1 Need for Deed Restriction
5. Remediation Design, Plans, and Permits
    - 5.1 Excavation Design and Setbacks
    - 5.2 Grading Plans
    - 5.3 Permits
    - 5.4 Temporary Relocation of Various Features/Items
    - 5.5 Hard and Softscape Demolition
6. Remedial Excavation/Backfill
    - 6.1 Excavation Methods
    - 6.2 Anticipated Excavation Quantities
    - 6.3 Precise Grading
7. SVE/Bioventing Well Installation Details
    - 7.1 Well and Piping Locations
8. Sub-slab Depressurization (SSD) System (if applicable)
    - 8.1 Diagnostic Test Findings
    - 8.2 Number and Locations of SSD Units
9. Site Restoration
10. Long-Term Monitoring
11. Next Steps
    - 11.1 Property Condition Documentation
    - 11.2 Tentative Schedule

Figure – Aerial of Property with House Outline Showing Main Features to Remove/Protect-in-Place

Appendices

A Property Owner Interview Check List and Photographs

B Remedial Excavation Plans (will include plans for Demolition, Remedial Excavation, Precise Grading, and Erosion Control)

C Landscape and Irrigation Plan

D Sub-Slab Depressurization System Plan

8.1.1 Property-Specific Topographic Surveys

Prior to preparation of a Grading Permit Application, a property topographic survey will be conducted by a California-licensed Professional Land Surveyor. Design topographic mapping will be conducted for all residential parcels where RAP implementation activities will occur. In general, the survey work will be completed in groups that coincide with the clusters of homes planned for remedial excavation as a unit. One or two 2-man survey crews will collect survey data needed to prepare the topographic maps. The base map that has already been prepared for the overall neighborhood and streets will be used in combination with this property-specific surveying to generate a detailed topographic base map of the Carousel Tract and local surrounding area for use in designing aspects of the Site remediation.

Features to be surveyed at each parcel include site elevations, site grade, building location(s), house corners, slab finished floor elevations, walls, fences, curb, gutter, sidewalk, driveways, patios and patio covers, pools, large trees, shrubs, lawn areas, rocks, and any other visible surface features or indications of utilities. The survey crew will also take photographs to document these features. To perform these surveys, the survey crew will access all open areas of the front and back yards of the homes, including patios and driveways. The surveys will also document utilities that encroach into that parcel.

8.1.2 Homeowner/Tenant Interviews to Explain Process, Obtain Relocation Information, and Discuss Site Restoration Options

At least eight weeks prior to the relocation date, a meeting will be held with the homeowners/ residents to explain the aspects of the RAP implementation that will be performed at their property, and to provide information about location options for relocation and financial assistance to facilitate relocation, including relocation or boarding of pets and assistance with transportation, if needed. Additionally, these meetings will present project information related to property restoration options, which will include a discussion of the landscape design process, sample design concepts, and restoration options.

For relocation purposes, residents will be asked for general information about persons living in the home, such as the number of adults and children and the ages of the children. During the interview, the resident will be asked for feedback about preferred location for their relocation; however, the final location will be determined based on availability of apartments that address the resident's specific needs. Special needs, such as long-term vehicle storage, special medical needs, or transportation needs will be discussed and accommodations may be made to reduce the amount of disruption for the residents. If the resident has pets that will not be staying at the temporary housing location, the resident will be given the option to board the pets at a facility selected and reserved by Cartus, or to make their own arrangements to board pets with an allowance of $30 per day per pet. Shell will pay for updated shots if the pet is not current on vaccinations required for boarding. Refer to Attachment B in Appendix D for information to be obtained during the interview.

About 4 weeks prior to the relocation date, the Residents will be notified of the final details regarding relocation including the temporary housing location, the dates in which the move-in could be performed, the anticipated duration of the relocation, and the financial assistance amount to be provided.

8.1.3 Remedial Excavation Design and Grading Plan Preparation

Preparation of property-specific remedial excavation design and grading plans is discussed in Section 9.2, below. The excavation and grading plans will define areas to be excavated, features to be removed, features to be protected-in-place, and locations of identified utilities. Utilities will either be protected-in-place or temporarily removed from service and then restored. After review and approval by the LACDPW and City of Carson, a Grading Permit will be issued for the specific property being excavated.

8.1.4 Residential SVE/Bioventing Well and Piping Locations

To address residual hydrocarbons not excavated, including impacted areas beneath concrete foundations and floor slabs of homes, SVE/bioventing wells will be installed on each property identified in the Revised RAP. A minimum of two wells will be required to achieve adequate SVE/bioventing influence coverage. On some properties, existing features (i.e., swimming pools, covered patios, or other structures) not being removed may require installation of an additional well. On each identified property, one well will be installed in the front yard and one or two wells in the back yard. Exact locations will vary for each residence based on the areas where RAOs are not met and well spacing required to achieve coverage beneath the house. Well and piping components will be entirely below grade and not visible from the surface. A small valve box will be located at the back of the sidewalk that will have a sampling port and valve to shut in SVE/bioventing wells at a particular property.

8.1.5 SSD System Locations

As discussed in Section 11.3.1, prior to finalizing SSD system designs, a diagnostic test will be conducted at each of the 29 properties identified for SSD system installation (28 properties identified in the Revised RAP and one additional residence directed by the Regional Board in its approval of the Revised RAP). The diagnostic test will be conducted after the date of the initial individual homeowner meeting and PSRP submittal a minimum of 4 weeks before remedial excavation work is scheduled to commence. Homeowner preferences for how the system is constructed will be discussed at the time of the diagnostic test. Based on findings of the diagnostic test and homeowner preferences, the number of suction pits, pipe routing, number of fans, and required electrical service modifications (if any) will be identified and included in the SSD system design package.

8.2 ESTABLISHMENT OF EXCLUSION ZONES

An exclusion zone will be established before the start of active remediation activities at each cluster of properties to provide a physical and visual barrier that will keep local residents and passersby out of the work area. Only appropriately trained and qualified personnel will be allowed in the exclusion zone while active work is occurring. The exclusion zone will be integral with noise mitigation controls that will be implemented in accordance with Final EIR requirements, PDF NOISE-5 and Mitigation Measures (MM) Noise-1 and Noise-2.

8.3 SECURITY DURING HOMEOWNER RELOCATION

Onsite security will be provided by a combination of off-duty law enforcement officers and non-law enforcement security personnel when residents are relocated during the hours that AECOM or its subcontractor personnel are not present onsite, typically from 5:00 pm to 7:00 am Monday through Thursday and 24 hours per day from 5:00 pm Friday through 7:00 am Monday. Each security team at the Site will include at least one off-duty officer.

A security officer will be stationed on each street where RAP implementation activities are taking place. Two to three officers will be needed, depending on the location of the active work plus an additional officer to relieve the onsite officer(s) for meal and rest breaks. AECOM may add or subtract personnel on an as-needed basis.

In the event of a security-related emergency, including suspicious persons/activities at or near the residence, security officers will immediately contact emergency services by calling 911, followed by the resident or their designated legal representative, and AECOM, who will notify Shell.

9.0 EXCAVATION DESIGN

9.1 GEOTECHNICAL INVESTIGATION AND RECOMMENDATIONS

9.1.1 Summary of Geotechnical Investigation

AECOM conducted a geotechnical investigation for the Former Kast property between July 28 and August 26, 2015. The exploration program included drilling 40 hollow-stem auger borings to 20 feet and 33 hollow-stem auger borings to 10 feet bgs at representative locations throughout the Site. An AECOM field representative visually classified the soil samples and cuttings in accordance with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (Caltrans, 2010) and maintained a detailed record of subsurface materials.

When subsurface conditions permitted, California split-spoon samplers and standard penetration test (SPT) samplers were advanced in alternating order at approximately 2.5-foot vertical intervals in the upper 10 feet and at approximately 5-foot vertical intervals from below 10 feet bgs to the bottom of the borings. Relatively intact samples were obtained using the California sampler. The SPTs were performed in accordance with ASTM International (ASTM) D1586 guidelines.

The borings were backfilled by pumping a mixture of cement and bentonite grout. High-solids cement/bentonite grout was used from bottom to 10 feet bgs and hydrated bentonite from 10 feet bgs to approximately 1 foot bgs. The upper foot of the borings was backfilled with topsoil.

Selected soil samples were tested at the AECOM geotechnical laboratory in Santa Ana, California. The laboratory testing included measurement of water content, particle-size distribution, wash analyses, liquid limit and plastic limit, direct shear, and unconsolidated undrained triaxial testing.

The field and laboratory data were evaluated to develop recommendations for design of excavations and excavation and backfill methods. The findings and recommendations of the geotechnical investigation are provided in this section of the RDIP, and the complete geotechnical report is included on a CD in Appendix K. The geotechnical report includes Site-specific recommendations for design excavation design, including proximity to footings and foundations in accordance with PDF GEO-2.

9.1.2 General Excavation Recommendations for Impacted Soil Removal

Recommendations for impacted soil removal were developed based on the onsite soil types encountered and the location of proposed excavations relative to existing structures. Observations will be conducted throughout the excavation process by an AECOM representative. Any unanticipated conditions will be brought to the attention of the AECOM Resident Engineer and Geotechnical Engineer for corrective measures. Unanticipated conditions may be, but not limited to, water seepage, localized loose soils, and structural movement.

The contractor will monitor the structure during remedial excavation. If signs of distress are recorded, including soil caving, development of fissures, subsidence, bulging or heaving at the bottom of the excavation, the Resident Engineer and Geotechnical Engineer should be notified promptly. The contractor should take immediate action to stop the development of distress. An appropriate shoring system will be available and installed if signs of instability are present during the excavation or backfill soil placement.

A Cal/OSHA-certified competent person will verify the safety of conditions for field personnel, determine the classification of soil and determine the excavation maximum allowable slope.

No person shall enter excavations deeper than 5 feet without appropriate shoring or sloping of excavations with access and egress points provided.

Figures from the geotechnical report (Appendix K) illustrating the recommendations for excavations are provided as Figures 9-1 through 9-4.

9.1.3 Setbacks/Sloping of Excavation Walls

9.1.3.1 Excavation between Adjacent Properties – Side Yards

Excavation of side yards to a maximum depth of 5 feet bgs can be performed between adjacent properties along the entire length of the houses, provided that a one-to-one horizontal to vertical (1H:1V) slope is maintained from the bottom of house foundation to the bottom of the excavation and potential settlement (see Figure 9-1).

The stability of the planned remedial excavation and adjacent house was analyzed as follows:

- Bearing Capacity – was calculated considering the influence of the 1H:1V descending slope from the bottom of the house foundation using the Vesic method.
- Slope Stability – the 1H:1V slope with house surcharge.

The results of these analyses are in Appendix C of the geotechnical report included as Appendix K.

The proposed excavation to 5 feet bgs is unlikely to expose the concrete reservoir slab. Therefore, concrete breaking equipment may not be required for the excavation between adjacent properties.

9.1.3.2 Front/Backyard Excavation

5-Foot Excavations

The remedial excavation recommendations for 5-foot deep excavations adjacent to houses are the same as recommendations for side-yard excavations presented in Section 9.1.3.1, above.

10-Foot Excavations

The remedial excavation recommendations for 10-foot deep excavations adjacent to houses will consist of an open pit or slot trenching/open pit combination.

The concrete reservoir base may be exposed locally in 10-foot deep excavations. In accordance with the RWQCB-approved Revised RAP, the reservoir base will be removed where it is exposed to the extent practicable and where it can be removed safely. The use of a vibratory breaker attachment, or stinger, to break and remove the concrete slab may be necessary. During this operation, excavation shoring to avoid soil caving or fissure development may be necessary. This will be determined during construction, based on the field conditions.

Option 1 – Open pit excavation:

The impacted soil can be removed using an open pit excavation as presented in Table 1, below, provided that the following measures are taken:

- Considering that the excavation is temporary, a factor of safety of 1.2 to 1.3 was considered to be adequate.
- The open pit remedial excavation in the vicinity of the houses will consist of a 1H:1V slope to a maximum depth of 4 feet below the bottom of the foundation, followed by a 5-foot vertical excavation, as shown on Figure 9-2, Option 1. The vertical portion of the open pit must be excavated and backfilled within the same day. The minimum width of this zone is 5 feet, measured from the side of the pit adjacent to house foundation.
- Controlled low-strength material (CLSM) should be used as backfill material within this zone.
- If 0.25 inch or more of vertical movement of the house foundation is measured, the contractor must take appropriate action to prevent any additional foundation settlement, and the remedial excavation will continue using Option 2. If signs of distress are recorded, including foundation, stucco or drywall cracks, soil caving or development of fissures, subsidence, bulging or heaving at the bottom of the excavation, the Resident Engineer and Geotechnical Engineer should be notified promptly. The contractor should cease the excavation until the onsite conditions are evaluated.

Based on the results of slope stability analyses, the use of back cut slopes in combination with vertical sidewalls are feasible for onsite soil. These recommendations are summarized in Table 1, below, and shown on Section D-D", Option 1 on Figure 9-2.

Table 1 – Front/Backyard 10-Foot Excavation – Option 1

Soil Type	Excavation Depth (feet)	Horizontal Setback Distance from Foundation to Bottom of Excavation (feet)	Vertical Sidewall Height (feet) and Back Cut Slope
Clays and clayey/silty sands(1)	10	5	5 feet vertical + 1H:1V(2)

Notes:

(1) Clays and clayey/silty sands correspond to Cal/OSHA Soil Type A. All tested onsite soils correspond to Soil Type A.

(2) The vertical portion of the excavation must be backfilled by the end of the day.

Option 2 – Slot Trenching/Open Pit Combination:

If 0.25 inch or more of vertical movement of the house foundation is measured, the contractor must take appropriate action to prevent any additional foundation settlement and the remedial excavation will continue using a slot trenching/open pit combination. This option is illustrated on Section D-D', Option 2 on Figure 9-2 and on Figure 9-3 and summarized in Table 2, below.

In the immediate vicinity of the house foundations, the impacted soils will be removed using a series of parallel unsupported slot trenches with the long direction perpendicular to the foundation. The maximum width of the slot trench is 4.5 feet. The minimum distance between open trenches is equal

to 9 feet. If consecutive trenches are named A,B,C,A,B,C…only trenches with the same designated letter can be opened at the same time, as indicated on Section E-E' on Figure 9-3.

When two walls join to form an interior right angle, a minimum setback from each wall of 10 feet should be maintained (refer to the plan on Figure 9-3). The resultant 10-foot by 10-foot corner zone can be excavated to a maximum depth of 5 feet, with maximum trench width equal to 5 feet. Excavation to a depth of 10 feet is not approved within this interior corner zone.

Table 2 – Front/Backyard 10-Foot Slot Trench – Option 2

Trench Depth (feet)	Maximum Trench Width (feet)	Minimum Distance between Open Trenches (feet)	Maximum Number of Open Trenches
10	4.5	9	3

In addition to slot trenching, the impacted soil can be removed using an open pit excavation using a setback distance from any house foundation equal to the depth of the excavation. Considering that the excavation is temporary, a factor of safety of 1.2 to 1.3 was considered to be adequate.

Based on the results of slope stability analyses, the back cut slopes in combination with vertical sidewalls are feasible for onsite soil. These recommendations are summarized in Table 3, below.

Table 3 – Front/Backyard 10-Foot Open Pit – Option 2

Soil Type	Excavation Depth (feet)	Setback Distance from Foundation to Bottom of Excavation (feet)	Vertical Sidewall Height (feet) and Back Cut Slope
Clays and clayey/silty sands(1)	10	10	4 ft vertical + ¾H:1V

Note:

(1) Clays and clayey/silty sands correspond to Cal/OSHA Soil Type A. All tested onsite soils correspond to Soil Type A.

The stability of the proposed remedial excavation and adjacent house foundation was analyzed as follows:

- Bearing Capacity was calculated considering the proposed excavation, using the Vesic method.
- Trench Stability was evaluated considering the house surcharge.
- Global Stability was evaluated for the proposed excavation considering house surcharge.

9.1.3.3 Excavation – Pool on Adjacent Lot

Remedial excavation in the vicinity of pool will consist of a combination of slot trenches and open pit excavation. The open pit excavation recommendations are summarized in Table 3.

The slot trench excavation recommendations for the vicinity of pools are summarized in Table 4, below.

Table 4 – Remedial Excavation - Adjacent to Pools

Remedial Excavation Depth (feet)	Remedial Excavation Description	Setback Distance from pool (feet)	Maximum Trench Width (feet)	Minimum Distance between Open Trenches (feet)	Maximum Number of Open Trenches
5	1H:1V from setback	Equal to pool deck width, but not less than 3 feet from outer pool side wall	5	10	3
10	Slot Trench and Pit Excavation (See Figure 3.4, Section B)				

The slot trenches should be excavated in full and backfilled completely before moving to the adjacent trench. All portions of excavations within 15 feet of the pool should be backfilled within 24 hours.

9.1.3.4 Excavation – Along Screen/Retaining Walls

Screen/retaining walls between properties or along the perimeter of the Former Kast Property may be protected in place. The maximum depth of the proposed remedial excavation along the project perimeter is 5 feet. The remedial excavation recommendations to remove the impacted soils located in the zone of influence of the screen/retaining walls are the same as excavation recommendations for side-yard excavations.

9.1.4 Remedial Excavation Backfill

For excavations between properties up to 5 feet in depth and open pit excavations up to 10 feet in depth, the backfill material consists of imported soil, or other material as approved on a case-by-case basis by the Geotechnical Engineer, from the base of excavation to 1 foot below ground surface and topsoil for the upper 1 foot. The backfill material shall be free of deleterious organic matter (e.g., vegetation) and cobbles larger than 3 inches in diameter, and shall be approved by the Geotechnical Engineer. Backfill material will be moisture conditioned and placed in maximum 8-inch loose lifts. The bottom of the excavation will be scarified and moisture conditioned, and the backfill material should be compacted to at least 90% relative compaction in accordance with ASTM D1557. The upper 1 foot of soil backfill within landscaped areas will be topsoil that is suitable for vegetation growth and will be compacted to not more than 85% relative compaction in accordance with ASTM D1557. A sheepsfoot wheel attached to the excavator arm or other mechanical means are recommended for use for compaction of the imported backfill material. Field personnel can enter the temporary excavation only after a competent person has observed the trench and verified safe conditions for entry.

For trench/pit excavations up to 10 feet in depth, the lower part will be backfilled with 2-sack slurry (also referred to as flowable fill or CLSM). CLSM will be designed to have permeability comparable to that of native soil to promote air/vapor transport during SVE/bioventing operations. The upper part of trench will consist of import soil backfill material. The backfill material can be placed and compacted after the CLSM has hardened. The hardening time is typically approximately 6 to 8 hours; however, more time should be allowed if sufficient hardening is not achieved.

The backfill material will be free of deleterious organic matter (e.g., vegetation) and cobbles larger than 3 inches in diameter, and approved by the Geotechnical Engineer. Backfill material should be moisture conditioned and placed in maximum 8-inch loose lifts when standard heavy compactors are used and 4-inch loose lifts for lightweight compactors. If CLSM is not used in the lower part of the pit excavation, the bottom of the pit will be scarified and moisture conditioned. The backfill material should be compacted to at least 90% relative compaction in accordance with ASTM D1557. The upper 1 foot of soil backfill within landscaped areas should be topsoil suitable for vegetation growth and should be compacted to not more than 85% relative compaction. A sheepsfoot wheel attached to the excavator arm or other mechanical means are recommended for use for compaction of the imported backfill material.

Clean soil used for the backfill of the excavations will be imported from an offsite source. The soil will be tested prior to its placement by AECOM to determine its competence as a suitable backfill material. The testing criteria are discussed in Section 9.8. Geotechnical testing will include gradation, plasticity index, shear strength, maximum density, optimum water content, permeability and corrosivity tests.

9.1.5 Utilities and City Sidewalks/Driveway Approaches Setback

Utilities present at the Site and the setback distances required from a geotechnical perspective are summarized below.

9.1.5.1 Water Mains

Water service is provided by Cal-Water. The main lines are located on residential properties approximately 3.5 feet from the inner edge of the sidewalk, at an approximate depth of 3 to 4 feet. Water mains are of asbestos-cement (transite) pipe construction with joints at 13-foot intervals. According to Cal-Water, the water line cannot be exposed in excavation. From a geotechnical standpoint, the minimum setback distances from water mains are:

- For temporary excavation trenches perpendicular on the pipeline, the minimum horizontal distance from the edge of the pipe to the excavation open face is 1.5 feet.
- For temporary excavation pit/trench running parallel to the pipeline, the minimum horizontal distance from edge of the pipe to the excavation open face is 2 feet. The length of the excavation pit/trench running parallel to the water line should be 12 feet maximum.
- The vertical clearance should be 1.5 feet minimum provided that no construction traffic will surcharge the water line during the remedial excavation.
- Light compaction equipment should be used above water line.
- If construction equipment will operate over the water lines, they should be protected by placement of steel or HDPE plates to distribute the load of such equipment during operation.

9.1.5.2 Electrical Power

Electrical power is provided by SCE by overhead lines connected to each house via roof lines. The minimum setback from the power poles and guy wires will follow the recommendations set forth by SCE. Based on discussions with SCE, excavation from the face of a power pole or guy wire may proceed at a 1H:1V slope.

9.1.5.3 Other Utilities

Sewer, gas and communications main lines are located beneath the City streets or sidewalks and will not be affected by the planned residential excavation work. There is no setback requirement for these utility lines. The laterals to the houses will be capped, removed and replaced. However, if any main utility lines are located within proposed remedial excavations, they will be protected in place; the minimum setback distances recommended for water mains are applicable.

9.1.5.4 City Sidewalks/Driveway Approaches Setback

The proposed remedial excavation at each designated residence will be extended to the back of City sidewalk/driveway approaches. Due to the proximity of the excavations, it should be noted that cracking of concrete may occur; therefore, the contractor should provide a means necessary to protect sidewalks/driveways during excavation activities.

9.1.6 Shoring Requirements/Recommendations

If it is assessed during preparation of a PSRP or based on conditions observed in the field that shoring is required, a shoring specialist engineering firm will prepare shoring design specifications for review and approval by the City of Carson and LACDPW.

Standard trench shoring will be available onsite for use in trenches that are deeper than 5 feet if personnel need to enter the trench, or in the event that a situation arises where it is necessary for unstable soil conditions.

9.2 GRADING AND SITE RESTORATION PLANS

Property-specific grading plans will be prepared based on planned excavations at each property, findings from the geotechnical evaluation, and detailed property surveys. The remedial excavation grading plans will include details on the demolition of hard and soft scape features, removal of existing utilities in conflict with the planned remedial excavations, remedial excavation plan and sections, backfill and final grading, replacement of utilities, drainage improvements, flatwork paving and fencing details.

The design basis for excavation will combine planned excavation depths with setback or excavation sloping requirements. Setback and sloping requirements will be based on recommendations by the Geotechnical Engineer, but may also be specified by the City of Carson in accordance with appropriate elements of Sections J101, J104, J106, and J108 of the County Grading Code as amended by the City of Carson. If Shoring Permits are required per the PSRPs or geotechnical report, the plans and engineering reports to support the shoring installation will be included in the remedial excavation grading plan and submitted to the City for approval.

The excavation and grading plans will define areas to be excavated, features to be removed, features to be protected-in-place, and locations of identified utilities. Utilities will either be protected-in-place or temporarily removed from service and then restored. After review and approval by the City of Carson, a Grading Permit will be issued for the specific property being excavated.

Grading plans will be prepared for clusters of up to 10 properties that will be excavated at a time and included in a single submittal for City and LACDPW review. Additionally, for each residence, a site restoration plan will be prepared to depict the required landscape, irrigation, and hardscape items to be replaced at each property.

9.3 UTILITIES

Prior to starting demolition of existing landscaping and hardscape and initiation of excavation for each cluster of properties, Underground Services Alert (USA) will be notified prior to subsurface activities, to allow marking of underground utilities that may exist in the area. The outline of the planned trench or excavation area will be clearly marked with white paint or surveyors flagging as required by USA. USA will contact utility owners of record within the vicinity and notify them of our intention to conduct subsurface explorations in proximity to buried utilities. The utility owners of record, or their designated agents, will be expected to clearly mark the position of their utilities on the ground surface throughout the area designated for excavation. Face-to-face onsite meetings with utility line writers will be held to provide increased level of confidence that existing utilities are identified, located, and clearly marked.

In addition, a specialty geophysical contractor skilled in utility line location will be subcontracted to locate and identify potential subsurface obstructions for work in city streets. Utility lines will be clearly marked in the field for removal or avoidance.

Hand excavation ("pot holing") will be utilized to confirm the location and depth of the transite pipe water mains located in the front yards of approximately one-half of the properties. Shell anticipates working closely with Cal-Water on this aspect of the utility location work. Other underground utilities will be located, as deemed necessary, by hand excavation.

9.4 NOTIFICATIONS

Affected homeowners/residents at each cluster of properties will be notified of the construction schedule at least one month prior to start of work. This notification to homeowners/ residents will include information on temporary living accommodations and transportation as outlined in Section 8.1 of this RDIP.

Also prior to start of work, a Work Notice will be prepared for distribution to the affected community by the Regional Board, if required. This notification will be circulated at least 2 weeks prior to start of work at each cluster.

Notice of pending work will also be provided to the Regional Board, City of Carson, RAP Implementation Task Force, Los Angeles County Sheriff's Department and Fire Department, Southern California Gas Company (Gas Company), and Cal-Water at least 72 hours prior to start of work on each block of properties.

The SCAQMD will be notified at least 24 hours before the start of excavation using the appropriate SCAQMD form specified in the Rule 1166 Mitigation Plan and Permit. SCAQMD will also be notified within 24 hours of detecting VOC-contaminated soil as defined in the Rule 1166 Permit.

The timing of these notifications will be dependent upon review and approval of PSRPs, grading plans, and issuance of Grading Permits by the City.

9.5 TRAFFIC CONTROL

As described in Section 6.4, AIS will provide traffic control measures as set forth in the Encroachment Permits and the associated Traffic Control Plans. Traffic control will be performed during the excavation at residential properties, installation of sub-surface depressurization systems at residential properties, as necessary, and installation of SVE/bioventing wells and associated laterals and piping in both yards and streets.

For daily onsite excavation and/or SVE/bioventing installation activities, AIS will position flagmen as dictated in the individual Traffic Management Plans and Encroachment Permits issued by the City of Carson. The flagmen will direct truck traffic during work hours of 8:00 am to 4:00 pm, and will enforce right-turn-only access for project-related vehicles where feasible. Flagmen will be positioned during partial street closure work as required in the Encroachment Permits. If full street closures are required, per the City, they cannot begin set up until 9:00 am and the street must be totally accessible to the public by 3:00 pm. Flagmen will also be positioned at residential excavations, as necessary, to direct truck traffic in and out of loading and unloading areas during onsite activities. Required signage, barricades, cones, delineators, and no-parking signs will also be provided.

AIS has been a direct contractor to Caltrans since 2007, providing emergency response, utility locating, and drain cleaning services, and has extensive experience in standard street closures. AIS personnel with experience in traffic control requirements and procedures will be assigned to this task for the project.

9.6 PRE-CONSTRUCTION AND POST-CONSTRUCTION PROPERTY CONDITION DOCUMENTATION

In accordance with PDF GEO-3, prior to start of remedial excavation activities at individual properties, the conditions of existing structures, hardscape, and landscaping will be thoroughly reviewed and documented. Observations and documentation of property conditions will be conducted in the presence of the homeowner or the homeowner's representative. Documentation will consist of written notes, digital photographs, and videos. Existing cracks or other distress present in structures or concrete will be documented and measured. Cracks in structures and hardscape that will not be removed will be monitored by direct measurement using a dial caliper capable of measuring distances to ±0.001 inch or using commercially available crack monitoring devices installed on the existing cracks, such that any potential change of crack size during the pilot test can be monitored and documented.

Existing landscaping that will be removed or potentially damaged during pilot testing will be documented so that it can be evaluated for replacement in accordance with the Landscape Restoration Program (see Section 12).

At the conclusion of the remedial construction work at the property, a post-construction survey will be conducted and results will be compared with the pre-construction survey to identify any changed conditions that may potentially be attributed to the remediation work. If damages to the property that are attributed to the construction work are identified, Shell will develop and implement a repair and restoration process to repair the damage.

9.7 EXCAVATION METHODOLOGIES AND ANTICIPATED EQUIPMENT

9.7.1 Planned Excavation Sequencing

The planned sequence of residential excavation and SVE infrastructure construction work will proceed throughout the tract in clusters of residences. The cluster boundaries and planned excavation sequence is shown on Figure 9-5 and discussed below. Properties included within each cluster and the planned remediation activities for each property (excavation, SVE/bioventing, and/or sub-slab depressurization) are summarized in Table 9-1.

The sequence of remediation activities by cluster has been established to begin construction near the topographic high point of the tract at the southern and southeast part of the tract and move to the low point in the northwest corner to best maintain control of the SVE/bioventing piping grades from high to low (generally south to north) since they must provide for gravity flow of condensate fall-out within the vapor stream. Based on this work flow, construction work will begin near the southeast corner of the tract and proceed to the northwest corner of the tract. If the sequencing of remedial construction must change due to unforeseen circumstances, adjustments may be made, if feasible; however any significant changes will affect the construction schedule and timing for startup of the SVE/bioventing system on the initial legs of the system.

Each cluster will consist of a minimum of 4 to a maximum 10 residences to be excavated within the same timeframe. Typically, each cluster will include residences on either side of the cluster boundary and may also include properties within the cluster boundary where no excavation is scheduled to occur; residents at these additional will also need to be relocated while the work is being conducted so actual cluster size where residences will vacate their property will be a maximum of 13. The average number of properties to be excavated per cluster is 7.5.

During the work within each cluster, the SVE system piping and wells will be installed in the street when the piping is located on the side of the street where that particular cluster is located. This is to allow the SVE piping and wells to be constructed concurrently with each residential excavation to minimized disruption to the neighborhood. During the work within each cluster, half of the street will be closed but traffic will be maintained in each direction on the other half of the street utilizing traffic control delineators and signage at all times.

The planned first cluster consists of homes on the south side of E. 248th Street and the north side of E. 249th Street adjacent to Neptune Avenue and will include SVE piping and wells in Neptune Avenue and E. 248th Street. Clusters 2 through 8 will then proceed to the east then north along the east side of Ravenna Avenue and the west side of Panama Avenue. Once the end of Ravenna and

Panama is reached, the SVE/bioventing piping and wells in E. 248th Street and Ravenna Avenue will be complete.

The sequence will then move to Clusters 9 and 10 at the north side of E. 244th Street which will include the northerly most section of the east side of Panama Avenue and will move west to the corner where Marbella Avenue intersects E. 244th Street. Block 10 will also include the northerly-most section of the west side of Marbella Avenue. At the completion of Clusters 9 and 10, the SVE piping in the northerly portion of Panama Avenue and all SVE piping and wells within E. 244th Street will be completed to the manifold building. The work at the manifold building and SVE compound will also commence in Cluster 10.

From there the sequence will then move to Cluster 11 at the south side of E. 249th Street and will then proceed east to the east side of Panama Avenue and Clusters 12 through 14A and 14B will move north to join Cluster 9. At the completion of Clusters 11 through 14B, all of the SVE piping will be installed in E. 249th Street and Panama Avenue. At this point the SVE/bioventing piping and wells for Panama Avenue, Ravenna Avenue and E. 244th Street will be complete, and the SVE compound and manifold building will also be completed. Start-up and shake down of the SVE system can proceed pulling from essentially half of the wells in the tract.

At this point the sequence will move to Cluster 15 at north side of E. 248th Street along the east side of Neptune Avenue and west side of Ravenna Avenue. The sequence of Clusters 16 through 19 will move north to E. 244th Street. Once complete the SVE piping and wells will be completed in Neptune Avenue.

The sequence will proceed to the south end of Marbella Avenue and Neptune Avenue and will start Clusters 20 through 25 including the east side of Marbella Avenue and the west side of Neptune Avenue moving north until E. 244th Street. At the end of Cluster 25 the SVE piping and wells will be completed in Marbella Avenue and the tract as a whole.

The last sequence, Clusters 26 and 27, will start at the south end of Marbella Avenue and will move north to pick up the last residences on the west side of Marbella Avenue terminating at Cluster 10. At this point all residential excavation and installation of SVE/bioventing wells will be complete.

A figure showing the entire sequence is provided on Figure 9-5.

9.7.1.1 Excavation of Interior Clusters

For interior clusters (e.g., a cluster of homes bounded by Neptune Avenue on the west and Ravenna Avenue on the east), the exclusion zone and sound attenuation barrier will extend approximately to the middle of Neptune and Ravenna Avenues. One-half of the roadway will be kept open for through traffic on the opposite sides of the streets. Sound panels also will be placed along the property line on the adjacent properties to the north and south. It is anticipated that residents of adjacent properties will be relocated in addition to residents of properties within the clusters. If a resident of an adjacent property wishes to remain in their house, consideration will be given on a case-by-case basis. Fences and block walls between adjacent properties will be removed as part of hardscape demolition to facilitate access to back yards. Work will then proceed using two AIS construction crews on the properties within the cluster that are being excavated.

9.7.1.2 Excavation where Adjacent Properties are Not Excavated

In cases where properties within a cluster are not scheduled for excavation, the residents will still need to be relocated along with residents from excavated properties. Access to their property will be blocked by installation of the exclusion zone and sound attenuation barrier, and the potential exists that some utilities would be interrupted. In most cases, block walls and fences between excavated and non-excavated properties will need to be removed in order to accomplish excavation. Some disruption to hardscape and landscaping may occur at these non-excavated properties associated with block wall/fence removal and restoration, and the construction crews will need access to enter their properties.

If there are non-excavated properties for which Shell's contractors are not permitted access, the excavation approach may need to be modified to allow block walls and fences to remain in place. This will be determined during preparation of the PSRPs.

9.7.1.3 Excavation of Properties at Exterior of Tract

Exterior properties include those along the border of the tract and include those along the west side of Marbella Avenue, east side of Panama Avenue, north side of E. 244th Street, and south side of E. 249th Street. Properties along Marbella either back up to residential properties of the Monterey Pines community or to a flood control box culvert easement between the Carousel Tract and the former Turco Products facility. Properties along E. 244th Street back up to the LA County MTA railroad right-of-way, and those on E. 249th Street back up to Lomita Boulevard. All of the planned excavations in back yards along the perimeter of the tract are to 5 feet bgs.

Rear fences and block walls along these perimeter properties will not be removed. Excavation of these yards will be done using slot trenching and in accordance with recommendations of the Geotechnical Engineer.

Planning and outreach efforts for work along properties adjacent to the Island Avenue and Monterey Pines communities will include residents of properties that back up to locations where remedial excavations occur. To the extent possible and if it can be done safely, sound attenuation panels will be placed along back property lines of excavated properties or adjacent properties during excavation work. If requested, residents in the Island Avenue and Monterey Pines communities adjacent to locations where these excavations are occurring will be offered relocation under the same program as residents within the Carousel community.

9.7.1.4 Plan for Working around Non-Excavated Properties or Properties with No Access

When a property not scheduled for excavation is adjacent to a property to be excavated or otherwise within a cluster of properties, the residents of the non-excavated property will need to be relocated along with the other residents in that cluster. This is because the entire cluster will be isolated within the sound attenuation and containment zone enclosure and access will be interrupted. Also, noise levels within the area would exceed the City of Carson noise standard and construction equipment and trucks will be operating within the area. With concurrence of the homeowner, fences and block walls separating non-excavated and excavated properties will be removed and subsequently replaced to facilitate excavation of the adjacent property to its property line. If SVE/bioventing wells are scheduled to be installed at non-excavated properties, installation of wells and SVE piping will occur

while the residents are relocated. The residents will be provided the same relocation support as residents of excavated properties.

In the event homeowners/residents refuse access to implement remediation activities or to be relocated if they are included within a cluster of properties but their property does not require remediation, the Regional Board's help will be sought to obtain their cooperation. If homeowners/residents refuse access or to be located despite Regional Board requests, their property will have to be avoided and remedial excavation designs for adjacent properties will be modified as required to protect their property. This may result in reduced volumes of soils that can be excavated due to potential inability to excavate to the property line. It may also necessitate modifications to sound wall setup, possibly affecting the ability to reduce sound levels at nearby receptors to below City noise standards, and lengthen the time required to implement the remedial actions.

9.7.2 Mobilization/Demobilization and Equipment

Following RWQCB approval of all PSRPs within an individual cluster of properties, receipt of Grading Plans, and satisfaction of all notifications, AIS will mobilize personnel and equipment to individual clusters of properties scheduled for remedial excavation. Mobilization activities will include, but may not be limited to:

- Staking and marking of sewer piping and main water lines as indicted in the Grading Plans.
- Placing sound loading cages and installing sound panels.
- Installing stormwater BMPs.
- Setting up two trailer mounted electric 185 cubic foot per minute (cfm) compressors to be used for foam application, misting systems and miscellaneous pneumatic equipment. Compressor trailers will be equipped with permanent installed sound panels to suppress noise.
- Delivering the excavation and loading equipment for two teams. The equipment will be mobilized/demobilized by AIS-owned and operated trucks and trailers. Each cluster team is anticipated to be equipped, at a minimum, as follows:
    - Two 18,000-lb mini-excavators equipped with rubber tracks
    - Two 10,000-lb mini-excavators equipped with rubber tracks
    - Hydraulic breaker attachments for subsurface concrete removal
    - Four 54-inch-wide skid steers equipped with rubber tracks
    - Two 350-gallon water trailers; each trailer will be equipped with electric pumps for quiet operation
    - Two 2,500 psi electric pressure washers for direct dust and odor control
    - Rubber tire loader
    - One 6 x 20-foot trailer containing power tools, rakes, shovels, brooms, hand tools, eye wash station, first aid kit, bottled water, shade cover for personnel work breaks, chairs, table etc.
    - Electric concrete saw cutter, conveyor system, and loading cage and other sound mitigation devices, and
    - Skip loaders and compaction equipment, drill rigs.

- Delivering additional types of equipment, as needed, to work areas, since each cluster of properties will be unique and may require smaller or larger equipment depending on specific plan requirements.

At the completion of remedial construction work at individual clusters of homes, AIS will remove any remaining equipment and leave the Site in a condition to the satisfaction of AECOM and the City, per requirements of the Grading Permit. As part of demobilization for each cluster of homes, AIS will:

- Remove secondary sound panels;
- Remove sound panels and misting systems at side yards and/or backyards;
- Remove trailer-mounted 185 cfm compressors and foam application equipment;
- Remove sound loading cages;
- Remove excavation, loading and other equipment; all equipment will be demobilized by AIS-owned and operated trucks and trailers;
- Remove all barricades and traffic control signs;
- Provide final hand and mechanical sweeping of the sites and the streets;
- Walk the properties with the AECOM Resident Engineer/Construction Manager to prepare a punch list of items to be completed before final demobilization; and
- Complete the punch list tasks to the Resident Engineer's/Construction Manager's satisfaction.

As part of site demobilization and completion of punch list items, and in consultation with the Resident Engineer/ Construction Manager, AIS will repair/replace any damaged asphalt areas within the streets as an interim measure. The entire roadway surface of the Carousel Tract will be ground and overlaid with new asphalt (one-inch thick) at the completion of excavation, piping and well installation, or as agreed to with the City. The intent is to resurface the streets after work involving heavy truck traffic has been completed to avoid damage to newly placed asphalt. Traffic loops, speed bumps and pavement striping will be replaced in kind per City of Carson Public Works Department requirements. All manhole covers, valves, monitoring wells and utility access points will be protected during asphalt grinding and overlaying.

9.7.3 Preparation for Excavation Work

9.7.3.1 Utilities Protection and Restoration

AIS will research the City's archives for as-built drawings of public and private utility lines. All discovered information combined with AECOM's underground utility location survey results for the Carousel Tract and will be utilized during the excavations to insure all active utility lines are located and protected.

The exact locations of unpressurized utility lines, especially if the lines are made of non-ferrous material, are sometimes difficult to locate by geophysical methods. Before any excavations are done, AIS will pothole and locate each of the utility lines such as sewer, telecommunication, water lines, gas, and reinforced concrete pipe (RCP) storm drain lines. Potholing will consist of hand digging and using air-knifing equipment where applicable.

After permits are obtained, notifications made, and upon mobilization, AIS will cut and cap utilities at the back of sidewalk, including water, gas, and sewer laterals and telecom and cable TV lines. AIS will arrange onsite meetings with Gas Company representatives to have gas meter(s) removed from sides of residential structures. Following completion of excavation, backfill, gas line replacement, and hardscape restoration, the Gas Company will reinstall gas meters removed during construction.

If necessary, AIS will meet with SCE representative(s) to disconnect overhead main power lines from power poles located in backyards of each property if they pose a hazard to personnel conducting excavation activities. AIS will protect existing power poles by maintaining a one-to-one slope around poles or by other means as required by SCE. Upon completion of excavation activities, any power lines removed will be restored by SCE.

AIS will contact Cal-Water to shut off and lock out each water meter. Water laterals will then be cut and removed during excavation. At the completion of each cluster of properties, and after water laterals have been reinstalled, Cal-Water will return to remove locks and re-open meters.

AIS will pothole and expose the sewer laterals connected to each property approximately 2 feet from the back of the sidewalks. L.A. County Sanitation Districts will be contacted to witness cutting and capping of the sewer laterals.

AIS will air knife each shallow and nested SVE/bioventing well location in the streets to 10 feet below grade, or to refusal depth at the residual concrete reservoir slab to assure no utilities are present in the well installation boreholes.

9.7.3.2 Sequential Hardscape Demolition Activities

After a cluster of properties have been cleared for excavation, AIS will begin clearing and grubbing operations. The first priority will be to create rear, side and/or front yard access. This will be accomplished by removing block walls and fencing between adjacent properties. Ancillary structures (gazebos, sheds, patios etc.) will be removed down to their foundations or protected as specified in the PSRP for the specific property.

Once access to properties has been established, trees and other vegetation and shrubbery will be removed. Shrubbery and trees will be cut at ground level for handling as non-impacted green waste. The roots containing potentially impacted soil will be handled as impacted waste materials during the excavation phase. All reasonable efforts will be made to separate the soils from the roots.

In accordance with PSRPs for individual properties, AIS will remove all remaining hardscape, including block walls, chain-link and wooden fencing, partitioning walls around courtyards, gates, brick planters, decorative rocks, etc. If homeowners specifically request that hardscape features or large trees be left in place, which will be addressed in the PSRPs, and as stated in the Revised RAP, a Land Use Covenant may be required to run with the land and advise future owners that impacted soil remains beneath the feature. Demolition of hardscape will be done by saw cutting of concrete surfaces using an electric concrete saw to re-size concrete into equipment manageable sizes. Jack hammers will not be used, or their use will be minimized to the maximum extent possible. This process will minimize noise and vibration from concrete breaking.

Removed materials from softscape and hardscape demolition will be moved to the front yards and separated as green waste, construction debris and recyclable concrete/asphalt. Materials containing potentially impacted soil will be scraped and/or dry brushed during stockpiling.

9.7.4 Excavation Approach

There are 208 properties scheduled for excavation. There is potential that additional properties will be added once sampling and evaluation of soil analytical data for properties not previously investigated, including a property-specific HHRA, have been completed. All properties that will have excavation performed will be excavated to a minimum depth of 5 feet bgs around each home with excavation extending to the property lines, subject to setback and safety requirements. Excavation will typically start in the backyards then proceed with the side yards and ending with the front yards. Of the 208 properties, there are 85 properties that will require additional targeted deeper excavations from 5 to 10 feet bgs in one or both front and back yards.

Excavations within 5 feet of structures may consist of vertical excavation with no shoring using slot trenching; vertical excavation to the base of the building foundation and sloped excavation from this point to the base of the excavation; helical anchor shoring; slide rail shoring; or a combination thereof.

Typical excavations to 5 feet bgs will be conducted as follows. Conventional excavation using a rubber-tracked excavator will start adjacent to houses and extend vertically to the bottom of the footings at approximately 1 to 1.5 feet bgs. At this point the excavation will continue at a 1H:1V descending slope from the bottom of the foundation to the planned excavation depth of 5 feet bgs. After excavating to 5 feet bgs along the length of the home, the remainder of the yard will be excavated to 5 feet bgs using this same conventional excavation method. The 5-foot excavation will extend to the property line where fences and walls between adjacent properties have been removed, subject to setbacks if necessary to protect adjacent properties. More detailed excavation methods to be used at each property will be developed during the PSRP design process based on recommendations from the Geotechnical Engineer and included in the PSRPs.

Conceptually, excavation is planned to begin in the back yards of properties. Excavated soil will be moved through the side yards to the front yard by Bobcat or similar skid steers or using an electric-powered conveyor and stockpiled or direct loaded into approved waste containers (such as drums, bins, or directly into trucks) for offsite transport, consistent with PDF H/WQ-3. If impacted soils are stockpiled in an area that previously has been excavated to planned total depth, the soils will be stockpiled on plastic sheeting. If the area is planned for excavation but has not yet been excavated, plastic sheeting will not be required. Upon completion of backyard excavation, the side yards will be excavated and the soil again moved to the front yard. Upon completion of side yard excavations, the front yards will be excavated and stockpiled or direct loaded where practical. All stockpiles will be covered if inactive for periods of more than one hour and at the end of each workday, as required under SCAQMD Rule 1166. Additionally, odor suppressants will be applied to stockpiled soil as described in Section 9.13.4.

Air conditioning units, water heaters, etc. that cannot be temporarily removed during hardscape removal will be left in place during excavation at a 1H:1V slope from the edge of the feature. Front yards that have a water main pipeline approximately 3½ feet from the back of sidewalk will be

excavated using setbacks recommended by the Geotechnical Engineer to protect the fragile transite pipelines. Based on recommendations of the Geotechnical Engineer, a lateral setback of 1.5 to 2 feet from the water mains and 1.5 foot of soil cover over the pipelines will be maintained.

Targeted deeper to 10 feet bgs in back and front yards will be accomplished by open pit excavation with back cut slopes as specified in the geotechnical report or a combination of slot trench and open pit excavation. Per the recommendations of the Geotechnical Engineer (Section 9.1.3.3) slots will be 10 feet in length and not wider than 4.5 feet and no more than three trenches may be open at the same time with the minimum distance between open trenches equal to 9 feet. CLSM fill will be placed in the bottom of the excavation and extend to approximately 5 feet bgs; the remainder of the slot will be backfilled using clean imported fill soil. Following completion of slot trenching adjacent to structures, the remaining portion of the yard will be excavated using conventional open-pit excavation, subject to recommended slot trenching and/or setback distances from adjacent structures.

In accordance with Regional Board requirements, concrete slabs from former reservoir bases will be removed where they are encountered in excavations. Based on site investigation work, the former reservoir slabs may occur at approximately 7 to 10 feet bgs in areas of the Site where the oil storage reservoirs formerly existed. In addition, remnant pieces of reservoir slabs may be encountered at shallower depths where they were buried by the demolition contractor during Site redevelopment. The concrete is approximately 4 to 8 inches thick and reinforced with wire mesh. The excavator bucket will be used to remove the concrete; however, if not feasible, a hydraulic breaker will be attached to the excavator arm and used to break the concrete into equipment-manageable pieces. As recommended by the Geotechnical Engineer in Section 9.1.3.2, it may be necessary to install excavation shoring in slot trenches to avoid soil caving or fissure development during use of a hydraulic breaker. This will be determined during construction, based on the field conditions.

AIS will limit the use of the breaker to minimize noise impacts. Concrete removed from excavations will be moved using skid steers and stockpiled for disposal purposes. Stockpiled concrete will be covered with plastic and eventually loaded out with soil.

Excavated soil will be moved through the side yards to front yards using skid steer loaders or conveyors. AIS has found that electric conveyor belts can be used efficiently in many instances to move soil from the back and side yards to front yards for stockpiling and loading as well as for shuttling import material to back yards. Electric conveyors provide silent soil movement and will reduce emissions from diesel exhaust. AIS plans to use a conveyor system with the following technical specifications:

- 5 horsepower (hp) electric motors that provide sufficient power to move the soil at a height and angle for direct truck loading.
- 5 cubic yard hopper with a belt capable of breaking up the soil to eliminate jamming.
- 32-inch wide conveyor belts, capable of moving up to 750 tons of soil per day.
- One 50-foot stacker conveyor with wheels and adjustable brackets and one 50-foot piggy back conveyor with wheels with adjustable brackets. The height-adjusting brackets allow the conveyor height to be easily and quickly adjusted for truck loading or flat for stockpiling.
- A Dust Boss, Model DB-R mounted at the end of the stacker conveyor to provide consistent dust control during conveyor operations.

Soil will be directly loaded into approved waste containers (such as drums, bins, or directly loaded into end dump trucks or Super 10 dump trucks) for transporting to the applicable disposal facility as profiled. AIS will provide suitable containers based on the nature of the excavation work being conducted and the level of impact in excavated soils. In most cases, soil will be loaded into trucks for transport to the receiving facility. If soil with total VOC concentrations of greater than 1,000 ppmv is excavated, they will be placed in a covered container (e.g., a bin) within not more than 15 minutes or loaded into a truck for offsite transport within 15 minutes, in accordance with the Rule 1166 Mitigation Plan and Permit. In the event that it is necessary to temporarily stockpile soil onsite before loading, soils will be covered with plastic until they can be loaded into approved waste containers.

9.8 ESTIMATED EXCAVATION VOLUMES

The estimated soil volume to be excavated from 0 to 5 feet bgs from these 208 properties is approximately 127,100 cubic yards, or approximately 216,100 tons based on a soil density of 1.7 tons/cubic yard. The estimated soil volume from targeted excavation from 5 to 10 feet bgs is 20,500 cubic yards, or approximately 34,900 tons.

There are three properties that have had soil sampling conducted since completion of the Revised RAP and Addendum to the Revised RAP. Geosyntec will conduct an HHRA for these three properties before excavation activities commence in the area of the tract in which they are located, and they will be added to the list of properties for excavation if appropriate. There are also nine properties that have not been investigated as of October 15, 2015. Whether excavation is needed at the three properties recently sampled or the nine remaining unsampled properties, will be established based on analysis of sampling data obtained and HHRAs for these properties when access is obtained. The results of these risk assessments will be evaluated to determine planned remedial actions, and may increase the volume of excavated soils.

If a homeowner requests that a particular area or feature not be removed to allow excavation (e.g., a large tree, hardscape feature, etc.), the measures taken to protect that feature, including any additional required setbacks, may decrease the volume of excavated soils. Setbacks required by the geotechnical engineer, GMED, or utility companies may also result in a decrease to the estimated volume.

9.9 BACKFILL CRITERIA

9.9.1 Soil and Topsoil

Certified clean soil will be imported for backfill of excavations from an offsite source. AIS has identified a source of virgin backfill soil from a quarry that meets project needs. Before importing the backfill soil to the site, additional samples of the proposed import soil will be submitted for laboratory geotechnical and chemical characterization analysis in accordance with the DTSC Clean Fill Advisory and PDF GEO-5. Geotechnical tests include gradation, plasticity index (PI), maximum density, optimum moisture and corrosivity tests. The Geotechnical Engineer will approve the backfill soil prior to its import, placement, and compaction at the site. Different topsoil backfill

materials may be placed in the upper foot of the fill section to support landscaping, or fill soil from the same source as backfill may be amended to support vegetation growth.

Imported backfill material must meet specific geotechnical as well as chemical parameters. Import material will be less than 3 inches in any dimension and free of sod, roots, brush, debris, trash, or other organic or foreign matter. Required geotechnical tests include gradation, plasticity index (PI), maximum density, optimum moisture, and corrosivity.

- Import material shall be classified as SM or SC according to Unified Soil Classification System (USCS).
- Import material shall have a Plasticity Index (PI) of less than 12.
- Import material shall have 95 to 100% passing 2-inch sieve size.
- Import material should not be corrosive to concrete and metals as determined by corrosivity tests.
- Import material from all sources shall be tested for the above parameters by an American Association of State Highway and Transportation Officials (AASHTO), Army Corps of Engineers and City of Los Angeles certified geotechnical testing laboratory and the testing results shall be provided to AECOM for acceptance or rejection at least 72 hours prior to material being delivered to the site.

In accordance with PDF GEO-5, the chemical characterization process for import soil will be consistent with the *Clean Imported Fill Material Information Advisory*, published by the CalEPA DTSC in October 2001. Samples will be collected and analyzed as close to the import date as practicable and shall be collected a maximum of 90 days before import. Samples shall be randomly collected from the import fill source at the following frequency from each fill source:

- Up to 1,000 cubic yards — 1 sample per 250 cubic yards
- 1,000 to 5,000 cubic yards — 4 samples for first 1,000 cubic yards plus 1 sample per each additional 500 cubic yards
- Greater than 5,000 cubic yards — 12 samples for first 5,000 cubic yards plus 1 sample per each additional 1,000 cubic yards.

To assess the chemical properties of the backfill sources, samples of clean fill will be collected from the designated borrow area. All backfill soil samples will be placed in laboratory supplied glass jars and transported under chain-of-custody documentation to a state-certified laboratory for chemical analyses. The analytical results will be reviewed and compared to applicable regulatory criteria for acceptance prior to use as a backfill source. The samples will be analyzed for:

- TPH (as gasoline, diesel, and motor oil) using EPA Method 8015B (M);
- VOCs using EPA Method 8260B/5035;
- SVOCs using EPA Method 8270C;
- PAHs using EPA Method 8270 SIM;
- CCR Title 22 Metals using EPA Methods 6010/7471A; and
- pH using EPA Method 9045.

Depending on the backfill source, the soil samples may be further analyzed for:

- Polychlorinated biphenyls (PCBs) using EPA Method 8082; and
- Chlorinated pesticides and herbicides using EPA Method 8081A and 8151A, respectively.

The acceptance criteria for TPHg, TPHd, and TPHmo will be 100 milligrams per kilogram (mg/kg). Acceptance criteria for VOCs and SVOCs in backfill soils will be "not detected" above their respective laboratory reporting limits. Typical laboratory reporting limits for non-impacted soil are provided in Table 9-2. Criteria for metals will be based on California background concentrations, the DTSC arsenic background evaluation concentration of 12 mg/kg, and the CalEPA residential soil California Human Health Screening Level (CHHSL) of 80 mg/kg for lead.

Maximum risk-based concentrations for the following individual PAHs in backfill soils will be below:

- Benz(a)anthracene – 1.6 mg/kg;
- Benzo(a)pyrene – 0.16 mg/kg;
- Benzo(b)fluoranthene – 1.6 mg/kg;
- Benzo(k)fluoranthene – 1.6 mg/kg;
- Chrysene – 16 mg/kg;
- Dibenz(a,h)anthracene – 0.11 mg/kg;
- Indeno(1,2,3-cd)pyrene – 1.6 mg/kg; and
- Naphthalene – 4.1 mg/kg

Additionally, for the above-listed PAHs (with the exception of naphthalene), the sum of PAHs as benzo(a)pyrene-equivalents shall be not greater than the regional background value of 0.9 mg/kg.

Acceptance criteria for PCBs will be "not detected" above laboratory reporting limits (Table 9-2). Acceptance criteria for pesticides and herbicides will be below USEPA Region 9 Regional Screening Levels (RSLs) for residential soil, January 2015 version. For pH, a range of 5.5 to 8.5 shall be considered acceptable for use as backfill.

Fill soils will be monitored as they are imported and placed for visible and olfactory evidence of impact and with a PID.

9.9.2 Controlled Low-Strength Materials (CLSM)

The CLSM used for backfilling during slot trenching and other excavations as needed for short-term strength development will consist of a fluid, workable mixture of aggregate, cement, and water. Aggregate for sand/cement slurry will be a clean, washed fine aggregate or clean mortar sand conforming to the provisions of ASTM C404. Cement shall be Type IP or Type II. Water used for mixing the slurry will be clean, potable water free of organic contaminants, oils, salts, or other deleterious materials.

Based on testing of CLSM from a batch plant source the required mix design will be 2-sacks of cement per cubic yard of sand slurry (2-sack slurry) Based on permeability testing of various CLSM mixes, 2-sack slurry was found to have a permeability of 2.3×10^{-4} for a 5-day cure time. This

permeability is comparable to or lower than permeability of Site soils and therefore CLSM backfill will not create short circuiting for SVE/bioventing operations.

9.10 MONITORING DURING IMPLEMENTATION

A number of types of monitoring will be performed during Site remediation activities. These include:

- Excavation monitoring;
- Worker health and safety in accordance with the Health and Safety Plan (HSP);
- Monitoring and reporting to comply with SCAQMD Rule 1166 Mitigation Plan requirements;
- Dust monitoring for SCAQMD Rule 403 compliance;
- Monitoring for odors;
- Noise monitoring; and
- Meteorological monitoring of atmospheric conditions, including wind direction and speed using a portable meteorological station.

9.10.1 Full-Time Excavation Observation

A qualified AECOM person working under the direction of the Resident Engineer, who is a California-licensed Professional Engineer (Civil), will conduct full-time monitoring during excavation activities in accordance with PDF GEO-4. Any conditions encountered in the field that are different than those anticipated (i.e., irrigation water seepage, localized loose soils, clean sand, etc.) will be brought to the immediate attention of the Resident Engineer and Geotechnical Engineer for corrective measures. In addition, an AIS Cal/OSHA-trained competent person will be present at each excavation area.

9.10.2 Personnel Health and Safety

AECOM will conduct real-time monitoring of the worker's breathing zone per the HSP during field operations with the potential for workers to be exposed to VOCs. Monitoring will be conducted using a PID with an 11.7 eV lamp or equivalent for total non-methane organic vapors as described in the HSP. Monitoring of the breathing zone will be conducted not less than every 15 minutes, as described in the HSP. Action levels for upgrading of personal protection equipment (PPE) are also provided in the HSP.

In addition to monitoring with a PID, the work area and excavations will be monitored with a flame ionization detector (FID) for methane in the ppmv range and a four-gas meter for methane in the percent level, oxygen, carbon dioxide, and hydrogen sulfide. Methane will be monitored at the point of operations, in the general work area, and in restricted spaces, and if methane concentrations exceed 10% of the LEL work will stop, the source will be evaluated, and the area will be ventilated using fans to disperse the methane.

Written documentation of monitoring for worker health and safety will be maintained on field forms to maintain records that will include name of person taking readings, equipment calibration and

"bump check" time and readings, date and time of readings, concentrations detected, changes in PPE implemented based on readings detected per the HSP.

9.10.3 VOCs per 1166 Compliance

Appropriately-trained AIS personnel will perform Rule 1166 monitoring in accordance with the Rule 1166 Permit at each point of excavation, during remedial excavations and excavation activities associated with SVE piping installation. Monitoring will be conducted using a PID calibrated with hexane. Monitoring will be conducted at a distance of not more than 3 inches from the working face or from excavated soils. Monitoring will be performed at a frequency of not less than once every 15 minutes. Upon the detection of VOC-impacted soils, monitoring shall be conducted at a minimum rate of one reading for every 5 cubic yards of soil excavated. All readings shall be taken no later than three minutes after each load of soil is excavated. Readings will be logged on SCAQMD forms in accordance with the Rule 1166 Mitigation Plan.

AIS will make additional notifications to SCAQMD when PID readings at or above 50 ppmv are detected and a reference number obtained. If PID measurements of 1,000 ppmv or greater are detected for a sustained period of 15 seconds, excavation work will be stopped and SCAQMD will be notified within one hour of the detection. AIS will also submit written/faxed notifications to SCAQMD to obtain a reference number for each occurrence. The AIS Project Coordinator will track permit notifications, reference numbers and annual permit renewal dates for continuous permit maintenance and compliance. Documentation copies by reference number will be maintained onsite at the laydown yard office. AIS will submit all required documentation consisting of monitoring logs, PID calibration reports, associated manifests and final report to close out each individual notification reference number will be submitted to SCAQMD at the conclusion of work for each cluster of homes.

9.10.4 Meteorological Monitoring

Meteorological monitoring will be conducted using a portable meteorological station (met station) to monitor wind speed and direction and temperature within the containment area of excavation clusters. The met station will be equipped with a data logger to maintain continuous measurements of monitoring data. The station will have a visible weather vane so that field crew conducting real-time monitoring can accurately establish upwind and downwind directions relative to the work area.

Excavation and loading operations will cease if the wind speed is greater than 15 miles per hour (mph) averaged over a 15-minute period or instantaneous wind speeds exceed 25 mph.

9.10.5 Dust Monitoring

AECOM will conduct dust monitoring during excavation and loading operations to monitor for dust and particulate matter at the excavation site property boundary using a miniRAM™ dust monitor, or equivalent, in accordance with SCAQMD Rule 403 requirements and PDF H/WQ-2.

Rule 403 requires implementation of control measures to prevent, reduce, or mitigate fugitive dust emissions and includes a performance standard that prohibits visible dust emissions from crossing any property line. Any operation which generates fugitive dust is required to comply with the following:

1. Use best available control measures specified in Rule 403 to minimize dust emissions.

2. Do not allow particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) levels to exceed 50 micrograms per cubic meter ($\mu g/m^3$) above background (upwind readings) from leaving the Site boundary.

   PM_{10} levels may be determined by simultaneous sampling, as the difference between upwind and downwind samples collected on high-volume particulate matter samplers or other USEPA-approved equivalent method for PM_{10} monitoring. If sampling is conducted, samplers will be:

   (A) Operated, maintained, and calibrated in accordance with 40 CFR, Part 50, Appendix J, or appropriate USEPA-published documents for USEPA-approved equivalent method(s) for PM_{10}; and

   (B) Reasonably placed upwind and downwind of key activity areas and as close to the property line as feasible, such that other sources of fugitive dust between the sampler and the property line are minimized.

Should Rule 403 dust control standards be exceeded, mitigation measures will be implemented as discussed in Section 9.16.

9.10.6 Odor in Accordance with SCAQMD Rule 402

AECOM will conduct monitoring for odors based on worker perception. Periodically during excavation and loading operations at a frequency of not less than once every 30 minutes, odors will be monitored at the downwind boundary of the cluster of residential properties being excavated. Depending on findings, frequency of monitoring may be increased to once every 15 minutes or decreased to hourly. Odors will be qualitatively compared and ranked on a scale of 1 to 5 in accordance with the odor perception scale provided below.

Odor Value	*Odor Terminology*	*Odor Description*
0	No odor	No detectable odor.
1	Very faint odor	An odor that would not be noticed by the average person, but that could be detection by the experienced inspector or a very sensitive individual.
2	Faint odor	An odor so weak that the average person might detect if his/her attention was called to it, but that would not otherwise attract attention.
3	Distinct Easily Noticeable Odor	An odor of moderate intensity that would be readily detected and might be regarded with disfavor.
4	Strong Decided Odor	An odor that would force itself upon the attention and that might make the air very unpleasant.
5	Very Strong Odor	An odor of such intensity that the air would be unfit to breathe.

If distinct easily noticeable odors (Odor Value 3) are detected at the downwind property boundary, mitigation measures described below will be applied and a recheck of doors will be performed.

9.10.7 Noise Monitoring

A qualified AECOM acoustics technician/engineer will conduct noise monitoring at the start of remedial activities, including residential excavations, street trenching, and SVE well installation and other noise-generating activities to confirm that the noise attenuation measures described below are effective at reducing noise levels at nearby receptors to below 75 decibels (dBA) for short-term activities lasting less than 20 days and long-term noise levels are below 65 dBA for activities lasting 21 days or longer. If noise levels greater than 75 dBA are recorded for short-term noise sources or 65 dBA are recorded for long-term sources, the AIS site superintendent will be notified and noise mitigation or the work methods will be modified until noise levels are consistent with requirements per the EIR.

Additionally, the Regional Board may have an independent acoustical consultant perform noise compliance inspections and acoustical record evaluations on their behalf, at Shell's expense, in accordance with MM NOISE-1 and MM NOISE-2.

9.11 Noise Impacts and Noise Mitigation Measures

Noise mitigation is one of the major challenges and a significant risk element for the project. In accordance with PDF NOISE-1, AIS will equip all construction machinery and equipment, fixed or mobile, with properly operating and maintained noise mufflers, consistent with manufacturers' standards. Per PDF NOISE-2, engine idling from construction equipment such as excavators and haul trucks will be limited, to the extent feasible, and will not exceed 5 minutes unless required for safety reasons. As required under PDF NOISE-3, expected hours for construction equipment use onsite will be 7:30 am to 4: 30 pm Monday through Friday, with hauling activities from 8:00 am to 4:00 pm. Project-related heavy truck traffic will be limited to specific routes as described in the Construction Traffic Management Plan and Haul Route Plan (PDF NOISE-4 and PDF TRAF-1 and TRAF-2). In accordance with PDF NOISE-5 and MM NOISE-2, during excavation, acoustical sound attenuation blankets approximately 12 to 14 feet in height will be installed between the excavation site and adjacent occupied houses, provided that this can be done without creating a safety hazard, to reduce community noise exposure from stationary sources of substantial noise, such as generators and water buffalos (trailer).

AIS retained the services of Behrens and Associates, Inc., Acoustics, Noise and Vibration Consultants, to model unmitigated and mitigated noise levels that may be generated using the particular construction equipment planned for use. The Kast Project Site Noise Model Report (Noise Model) provided predicted unmitigated and mitigated remediation operation noise levels, an assessment of the noise impact relative to the City of Carson noise standards and mitigation measures to attain the required noise levels. Following are relevant points from the Noise Model.

The noise impact modeling was completed with SoundPLAN Version 7.4 software which meets ISO9613.1/2 compliance requirements. The operations were modeled while taking into consideration the topographical features and ground cover of the site and adjacent surroundings. To establish a worst-case scenario for the neighboring properties during operations, all of the equipment was assumed to be operating simultaneously in the noise modeling.

The following noise mitigation measures were identified in the Noise Model for a typical 10 house cluster of homes:

- 512 linear feet of 14.7-foot high and 512 linear feet of 12-foot high acoustical barrier walls around the project perimeter with a Sound Transmission Class (STC) rating of at least 25 with no openings or gaps in the wall.
- Two 12-foot high acoustical barrier walls each 232 feet long with a STC rating of at least 25 to be installed along the property lines of the vacant residences with no opening or gaps in the wall.
- Three 12-foot high free-standing acoustical panel walls each 56 feet long with a STC rating of at least 25 to be installed around the water trailer pump and air compressor.

A diagram showing a typical exclusion zone and sound attenuation barrier configuration is shown on Figure 9-6.

Per the requirements of MM NOISE-1, residents of properties will be offered noise mitigation measures (e.g., hearing protection, sound proofing, white noise machines, etc.) acceptable to the residents or relocation for the duration of nearby active remediation activities which may create ambient noise levels at their property in excess of 75 dBA for 20 days or less or in excess of 65 dBA for 21 days or longer.

As noted in Section 9.10.7, AECOM will conduct noise monitoring at the startup of remedial excavation activities to confirm that mitigated short-term noise levels are below 75 dBA and long-term noise levels are below 65 dBA. At Shell's expense, an independent third-party acoustical consultant working at the direction of the Regional Board will perform periodic inspections and acoustical record evaluations as required by the Final EIR. If the maximum noise levels stated in MM-NOISE-1 are exceeded, Shell will offer noise mitigation measures (e.g., hearing protection, sound proofing, white noise machines, etc.) acceptable to the residents or relocation to nearby affected residents during active remediation activities resulting in these exceedances.

9.12 VIBRATION MITIGATION MEASURES

Vibration due to jack hammer use to break up hardscape flatwork during demolition prior to excavation was identified as a potentially significant environmental impact requiring mitigation, and MM VIB-1 requires that residents of properties located within 60 feet of the use of jack hammers on private property be offered relocation for the duration of jack hammer use. Vibration mitigation will be accomplished via selection and use of non-vibration-inducing equipment wherever possible. AIS will utilize electrical saw cutting equipment to cut and re-size concrete into equipment-manageable sizes rather than using a jack hammer to mitigate vibration during breaking of concrete.

9.13 VAPOR, ODOR, AND DUST CONTROL

In accordance with PDF AQ-7, vapor and odor control and dust suppression will be performed during all excavation activities as required by SCAQMD Rule 1166 for vapors, Rule 403 for fugitive dust mitigation, and Rule 402 for nuisance odor mitigation. Water misting will be used for dust suppression and a solution of BioSolve® and water, at a minimum, will be used for odor control.

Additional odor, dust and vapor control will be accomplished by using a misting system at areas of concern. AECOM will provide dust and odor monitoring and communicate to AIS any concerns or exceedance of acceptable levels requiring further mitigation.

Rule 403 also requires "dust trail-out" prevention methods to be implemented. AIS will inspect each vehicle prior to leaving loading and unloading areas, inspecting tires, mud flaps, bumpers, fenders, track plates, outsides of truck beds, etc. The onsite loading crew tasked with these inspections will remove any loose debris by dry brushing. The removed loose debris will be collected and added to truckloads and/or stockpiles. The loading personnel will also periodically sweep and maintain the loading and unloading areas, including maintenance of rock plates. A street sweeper staged at the laydown area will also be available on an "as needed" basis for use at any location within one hour of request.

During the excavation pilot test, AIS tested different techniques for dust, odor and vapor control including an EcoSorb unit, BioSolve® and water solution and Rusmar AC565 long-duration foam. Based on experience from the pilot test, we determined that BioSolve® and Rusmar AC-565 foam are most effective to help combat fugitive nuisance odors and vapors, and these techniques may be used in unison.

During the pilot test, BioSolve® and water was used consistently as a dust suppressant and for control of odors and vapors. This solution was found to be successful at dust control, and effective at controlling low levels of odor and vapors encountered at excavation depths of 0 to 5 feet bgs.

BioSolve® and water solution offers a safe, simple and cost-effective method of suppressing fugitive dust, odors and low levels of VOC emissions from hydrocarbon contaminated soils. BioSolve® is non-toxic, odorless, and completely biodegradable and poses no threat to workers, neighboring residents or ground water. It works by encapsulating hydrocarbons and reducing their vapor pressure. BioSolve® will not add to soil volume or treatment costs.

BioSolve® will be mixed with water in a trailer-mounted water tank, and the mixture will be applied to the soil with a pressure washer by fine mist tip. The pressure washer application helps with maximum coverage for vapor, odor, and dust control. AIS will also utilize a misting system to broadcast BioSolve® mixed with water. A misting system will be installed along the top of each set of sound panels for fugitive odor/dust control. During the loading of impacted soil, a pressure washer will be used to direct the mist to achieve the most efficient odor/dust control. BioSolve® and water will be used as needed during excavation, movement of soil to designated loading areas and during loading operations to control dust and lower levels of VOCs. Water alone will be used during backfill and compaction activities.

To control odors and vapors from more highly impacted soils excavated from depths of 5 to 10 feet bgs, or if encountered at shallower depths, AIS will utilize Rusmar AC-565 long-duration foam, consistent with the requirements of PDF AQ-6 and PDF AQ-8. Rusmar AC-565 foam was found to be the most effective method for controlling higher levels of VOC release encountered at 5-foot and deeper excavations during pilot testing. The foam was applied during the pilot test to excavation faces and to cap buckets of soil being loaded into trucks and roll-off bins.

Rusmar foam will be readily available at all times for application during times of higher VOC levels where BioSolve® proves ineffective. Foam will be premixed and applicators available at each excavation site for use as needed.

Rusmar AC-565 long-duration foam will be easily applied during excavation to provide a thick, long-lasting viscous barrier for immediate control of dust, odors and VOCs. It is recognized by the USEPA and the U.S. Army Corps of Engineers as providing superior emission control and has been used at Superfund and other hazardous waste sites across the United States and Canada. The foam is easily dispensed, non-reactive, non-hazardous, non-combustible compound and covers any contamination source. It has little to no odor, is completely biodegradable and poses no threat to workers, neighboring residents or ground water. The foam will not add to soil volume or treatment costs.

Stockpiles will be covered if inactive for a period of one hour, in accordance with SCAQMD Rule 1166 requirements. Stockpiles left overnight will have vapor and odor suppressants applied, as appropriate, and be covered with plastic for vapor suppression. Excavations may also be covered with plastic on an as needed basis for overnight vapor suppression.

In accordance with PDF AQ-8 and with the 1166 Permit, logs of water purchase or usage and suppressant application (including brand/manufacturer, date of application, area treated and amount applied) will be maintained by AIS and made available to the Regional Board and SCAQMD for inspection upon request.

9.14 WASTE RECYCLING/DISPOSAL

AIS will prepare waste profiles for the transport and disposal of non-hazardous soil and sub-surface concrete. The Revised RAP identified Soil Safe in Adelanto, California as the Shell-approved thermal treatment and disposal facility for non-hazardous soil. Soil Safe can also accept concrete debris at up to 20% of the volume per load. The Soil Safe facility is located in the Mojave Air Quality Management District approximately 100 miles from the Site.

Shell has subsequently evaluated and approved the Chiquita Canyon Landfill located in Castaic, California approximately 60 miles from the Site for disposal of non-hazardous soil, particularly less impacted soil excavated from 0 to 5 feet bgs. This proposed location will eliminate approximately 80 round trip highway miles for each load of soil, significantly reducing traffic and air quality impacts related to transportation of excavated soil for disposal. Chiquita Canyon can accept soils impacted with gasoline range hydrocarbons up to an average of 1,000 mg/kg, diesel range hydrocarbons up to an average of 10,000 mg/kg, and total petroleum hydrocarbons up to an average of 50,000 mg/kg for disposal in their Subtitle D lined disposal cell.

It is anticipated that soils excavated from depths of 0 to 5 feet bgs and some soils from targeted deeper excavations from 5 to 10 feet bgs will be disposed at the Chiquita Canyon Landfill. If more highly impacted soils are excavated that do not pass Chiquita Canyon's acceptance criteria, they will be transported to Soil Safe in Adelanto, California for thermal treatment and disposal/recycling.

No existing profiles are currently in place for potential non-RCRA California hazardous soil and RCRA hazardous soils. Sampling and laboratory analysis testing will be conducted if suspect

hazardous soils are encountered. The number of samples will be determined based on volume of each stockpile or roll-off bin. Testing, at a minimum, will be required as follows:

- EPA Method 8015M for gasoline, diesel and oil;
- EPA Method 8260B for VOCs; and
- EPA Methods 6010B/7471A for Title 22 Metals.

Non-RCRA California hazardous soil and RCRA hazardous soil will be profiled and transported by registered hazardous waste haulers under appropriate manifest for disposal to Clean Harbors in Buttonwillow, California for direct landfill.

AIS will submit copies of hazardous waste manifests to DTSC within 30 days of disposal, as required.

Material removed during the hardscape and softscape demolition activities will consist of green waste, recyclable concrete and asphalt and construction debris. These types of materials require no prior sampling or profiling.

- Green waste including trees, shrubs, bushes, grass, etc., without root systems will be transported to the Waste Management Carson Transfer Facility at 321 W. Francisco Street, Carson, California for recycling, in accordance with PDF AQ-12.
- Recyclable concrete/asphalt after dry brushing to remove loose impacted soil will be transported to the Lovco Concrete Plant, 23320 S. Alameda Street, Carson, California.
- Also in accordance with PDF AQ-12, construction debris including brick, wooden fences, wood, chain-link fencing, rocks, etc. will be transported to Waste Management Carson Transfer Facility, 321 W. Francisco Street, Carson, California. The facility will separate the materials for either recycling and/or disposal.

9.15 TRAFFIC MANAGEMENT AND WASTE TRANSPORTATION

In accordance with PDF GHG-1, the project will comply with the use of low-carbon vehicle fuels as required under State law. Per PDF AQ-1, all off-road diesel construction equipment remaining onsite for more than 15 work days will meet USEPA Tier 3 off-road emission standards, if commercially available locally. Documentation of all off-road diesel construction equipment onsite including Tier 3 certification will be maintained and made available to the Regional Board for inspection upon request.

In accordance with PDF AQ-2, all on-road waste haul trucks exporting soil to the recycling and/or disposal facilities will be model year 2007 or newer or retrofitted to comply with USEPA Year 2007 on-road emissions standards. Documentation of all on-road trucks exporting soil will be maintained and made available to the Regional Board for inspection upon request.

Per the requirements of PDF AQ-3, AIS will prohibit the idling of on- and off-road heavy duty diesel vehicles for more than 5 minutes at a time unless needed for safety reasons.

Consistent with the requirements of PDF AQ-9, prior to leaving the site, each haul truck, and other delivery trucks that come in contact with site waste, will be inspected and put through procedures, such as brushing, to remove loose debris from tire wells and on the truck exterior. Haul truck

operators (drivers) will be required to have the proper training and registration by the State and as applicable to the material they will be hauling. Trucks transporting hazardous waste are required to maintain a hazardous waste manifest that describes the content of the materials. These manifests will be prepared by AIS in accordance with hazardous waste regulations, and approved by the designated Shell representative prior to export offsite. The trucking company will be a certified hazardous waste transportation contractor, if the material is profiled as hazardous. A log of manifest data will be maintained by the AIS Project Coordinator and made available to the Regional Board for inspection upon request. AIS will submit copies of hazardous waste manifests to DTSC within 30 days of disposal, as required.

In accordance with PDF AQ-10, waste haul trucks and soil delivery trucks entering and exiting the site will be required to follow the approved traffic plan that establishes the trucking route, days and hours of truck operation, and various requirements to provide traffic, pedestrian and bicycle safety. Truck operators will be provided with a trucking route map and hours of operation allowed.

As specified in PDF AQ-11, to minimize traffic congestion at or near the site, construction worker parking will be provided at the project laydown yard located at Lomita Boulevard and Main Street approximately ½ mile from the Site. A van will be provided to transport construction workers from the offsite parking location to the Site.

PDF TRAF-1 requires the project Contractor to submit a Haul Route Plan to the City of Carson for review and approval prior to implementation of the RAP. The PDF specifies that proposed haul route will be restricted to the City's designated truck route roadways and as shown on Figure 5.7-2 of the EIR. The Haul Route Plan is provided in Appendix E.

PDF TRAF-2 requires that the project Contractor to prepare a Construction Traffic Management Plan that will be submitted to the City of Carson for review and approval prior to the implementation of construction activities specified in the RAP. This plan comprises Site traffic control plans, including but not limited to such elements as the designation of haul routes for construction-related trucks, the sequencing of construction activities, any driveway turning movement restrictions, temporary traffic control devices, travel time restrictions for construction-related traffic, consolidation of construction truck deliveries, flag control, and designated staging and parking areas for workers and equipment. Because the construction activities occur within a public street right-of-way, the following design features also apply:

- A site-specific Traffic Control Plan will be prepared and submitted to the City of Carson for each cluster of properties to be excavated for review and approval prior to the start of any construction work. This plan will include such elements as the location and hours of any necessary lane closures, local traffic detours (if any), protective devices and traffic controls (such as barricades, cones, flag persons, lights, warning beacons, temporary traffic signals, warning signs), the location and hours of any necessary access limitations for abutting properties, and provisions to maintain emergency access through construction work areas.
- Generally accepted construction safety standards will be followed to separate pedestrians from construction activity through such measures as protection barriers and signage indicating alternative pedestrian access routes where existing facilities would be affected. This would include the sidewalks around the perimeter of an active excavation site.

- Advance notice of planned construction activities will be provided to any affected residents and property owners in the vicinity of the construction site.
- AECOM will coordinate with emergency service providers (police/sheriffs, fire, ambulance and paramedic services) to provide advance notice of ongoing construction activity and construction hours.

In accordance with PDF TRAF-3, one travel lane will be kept open at all times or detours will be provided during residential property remediation, well installation and street trenching phases.

Per PDF TRAF-4, offsite parking will be provided at the laydown yard and a van will be used to shuttle approximately 50% of onsite workers to and from the Site.

9.15.1 Construction Traffic Control and Mitigation

Flagmen will be positioned at the two streets that allow entrance to the neighborhood on days when neighborhood trucking activities occur; one flagman will be positioned at Neptune Avenue and one flagman at N. Lagoon Avenue. The flagmen will control access and egress of trucks entering and leaving the Site. As a loaded truck leaves the neighborhood another truck will be called by the flagmen to enter the neighborhood and directed to the loading area. These flagmen will keep truck traffic within the neighborhood to a minimum, reminding drivers of the "Right Turn Only" rule and 5 minute idling rule.

Signage will be erected for the areas surrounded by noise attenuation panels as required by the Encroachment Permit to be issued by City of Carson. Additional flagmen will be provided at residential excavations as necessary to direct truck traffic into and out of loading/unloading areas during onsite activities.

During partial street closure work for installation of the SVE system in the streets, additional flagmen will be provided as required by the Encroachment Permits issued by the City. Street closures cannot begin set up until 9:00 am and the street must be totally accessible to the public by 3:00 pm.

9.15.2 Haul Routes

Construction traffic will be limited to approved routes, in accordance with the Traffic and Circulation analysis in the EIR and as prescribed in the Construction Traffic Management Plan and Haul Route Plan (Appendix E). Haul routes with maps and directions for each of the destination facilities where wastes or other materials will be transported are included as figures E-3 through E-7 in Appendix E. Drivers will be required to follow these routes when both arriving at and leaving the Site. Wherever possible, drivers will be required to use routes that include right turns, rather than left turns, and where required left turns will only be permitted at signal controlled intersections.

9.15.3 Waste Transportation

Waste materials will be transported to a number of receiving facilities depending on the nature and classification of wastes. Green waste and construction debris will be transported to a Waste Management transfer station located in the City of Carson and recyclable asphalt and asphalt will be transported to the Lovco recycling facility, also located in Carson. The majority of impacted soils that will be excavated are non-hazardous wastes and will either be transported to the Chiquita Canyon Landfill in Castaic, California or to the Soil Safe Recycling facility located in Adelanto, California. Excavated RCRA and non-RCRA California hazardous waste, if encountered, will be

transported under hazardous waste manifests to the Clean Harbors disposal facility in Buttonwillow, California. All hazardous wastes will be properly managed, manifested, and transported by a registered hazardous waste hauler to a proper waste management facility. Haul routes to these facilities are provided in Appendix E.

10.0 SVE/BIOVENTING SYSTEM DESIGN

SVE and bioventing are the approved remedial technologies to address petroleum hydrocarbons, VOCs, and methane in soil vapor and to promote degradation of residual hydrocarbon concentrations that do not meet RAOs and are not removed by excavation. Use of SVE/bioventing will address impacted areas beneath existing paved areas, City sidewalks, and concrete slabs and foundations of the homes, in addition to unexcavated areas with the goal of achieving SSCGs over time.

10.1 WELL FIELD LAYOUT

SVE/bioventing wells will be installed both on private property (residences) and within City streets throughout the 44-acre Site. Based on SVE pilot testing, the effective ROVI in the shallow zone ranged from 24 to 78 feet, the intermediate zone ranged from 112 to 131 feet, and the deep zone ranged from 75 to 156 feet. The smaller ROVI in the shallow zone will require more vertical extraction wells than the intermediate and deep zones.

Based on the SVE pilot test ROVI results for the intermediate zone, a total of 63 triple-nested well clusters (shallow, intermediate, and deep zone) will be installed in the streets with an average spacing of approximately 125 feet. The three existing triple-nested SVE wells from the SVE Pilot Test will be used as part of the well network, reducing the number of nested wells to be installed to 60. Based on the estimated ROVI of 50 feet for the shallow zone, an additional 65 shallow zone wells will be installed between the nested wells in the streets to provide increased vapor extraction coverage within the shallow zone. Shallow zone wells will also be installed in the front and back yards of residences requiring remediation of the shallow zone soil. Due to potential short-circuiting from surface landscaping, the shallow zone ROVI for the residential wells is estimated to be 25 feet. Therefore, a total of approximately 472 shallow zone residential wells will be installed. The well field layouts for the shallow, intermediate, and deep zone wells are shown on Figures 10-1 and 10-2, and in more detail on Plan No. C-003 through C-013 with well construction details on Plan No. C-017 in the SVE system construction drawings provided in Appendix L. Refinements to the number and locations of residential SVE wells may be made during preparation of PSRPs for each property.

10.2 WELL INSTALLATION (MEANS, METHODS, WELL DESIGN)

Each boring location for wells installed in City streets will be air knifed to approximately 10 feet bgs for utility clearance. Once boreholes are cleared to approximately 10 feet bgs, borings for the SVE/bioventing wells will be advanced to completion depth utilizing a hollow-stem auger rig equipped with nominal 8-inch (for single completion shallow wells) or 11¾-inch outside diameter augers for triple completion locations. Soil cuttings will be examined visually and classified according to the USCS. A boring log will be maintained to record the vertical variations in lithology, water-content, color, gradation of the soils, total organic vapor concentrations measured using a PID, and evidence of odor or staining, if present.

During drilling operations, a PID calibrated to 100 ppmv isobutylene will be used to monitor the presence and level of organic vapors in the borings, to screen soil samples, and monitor the workers' breathing zone for health and safety purposes. A portion of each soil sample will be placed inside a

plastic sample bag and set aside to promote possible volatilization of chemical constituents. Following this equilibration period, the total organic vapor concentration in the sample headspace will be measured with the PID. The organic vapor readings will be recorded on boring logs prepared by the field geologist during drilling activities. The boring logs will include the following information: boring number and location, date, and time; lithologic description in accordance with the USCS; description of evidence of soil impacts (i.e., odor, staining); and PID readings.

Borings in the street will be completed with installation of either single or triple-nested SVE/bioventing wells. The wells will be constructed of 2-inch diameter schedule 40 polyvinyl chloride (PVC) casing and factory-slotted screen with 0.020-inch slots. The screen annulus will be filled with #2/12 filter pack sand from approximately 1 foot below to 1 foot above the screened interval. To prevent infiltration of cement/bentonite grout seals, 1 foot of dry granular bentonite chips will be placed above and below each screened section for both the single-completion and triple-nested wells. Intervening areas without screens will be filled with cement/bentonite grout.

Triple-nested wells in the street will consist of shallow, intermediate, and deep screens placed at approximate depth intervals of 5 to 10 feet bgs, 15 to 25 feet bgs, and 30 to 40 feet bgs, respectively. A minimum separation of 5 feet will be maintained between each screen interval. Each of the three well casings will be labeled with the location name and a designation of "S", "M", or "D" corresponding to shallow, intermediate, or deep screens, respectively. Each nested well will be capped and completed within a temporary traffic-rated well vault until trenching for connection of lateral piping from the wells to the main header is completed. At that time, the temporary vault will be removed and replaced with a permanent flush-mount, traffic-rated well vault surrounded by a concrete skirt. A typical triple-nested well construction diagram is presented on Plan No. C-017 in the SVE/bioventing system construction drawings in Appendix L.

Single-completion wells in the street will consist of a shallow screen placed at an approximate depth interval of 5 to 10 feet bgs. The well casing will be labeled with the location name and a designation of "S" corresponding to shallow screen. Each well will be capped and completed within a temporary traffic-rated well vault until trenching for connection of lateral piping from the well to the main header is completed. At that time, the temporary vault will be removed and replaced with a permanent flush-mount, traffic-rated well vault surrounded by a concrete skirt. A typical single-completion well construction diagram is presented on Plan No. C-017 in the SVE/bioventing system construction drawings in Appendix L.

Single-completion wells on residential properties will be constructed similar to the single-completion shallow zone wells installed in the streets except that no vault will be installed at the well head and connection to the lateral will be entirely below ground and not visible from the surface. At residential properties where remedial soil excavation will be performed, wells will be installed following backfill placement either by hand or using a small Bobcat skid steer or similar equipment with a power auger attachment. Conveyance piping will be laid prior to final backfill and fine grading and will be brought to the back of sidewalks for later connection to piping in the streets. A landscape valve box will be installed at the back of sidewalk that contains a shut-off valve and sampling port. At residential properties that will not have excavation performed but that will have SVE/bioventing wells, well and piping installation will be done in the same general timeframe as nearby properties that are being excavated and SVE/bioventing wells and piping are installed. At

non-excavated properties, the wells will be installed by hand and piping will be laid in hand excavated trenches. Hardscape and landscaping that is affected by well and/or piping installation will be restored to like conditions following installation.

Each well will be surveyed relative to the California State Plane Coordinate System horizontal (North American Datum of 1983 [NAD83]) and vertical (North American Vertical Datum of 1988, 2005 Adjustment [NAVD88]) datums by a California-licensed Professional Land Surveyor. The survey will include well location, elevation of the land surface, and elevation of top of casing at a defined measuring point (north side). Elevation measurements will be recorded to the nearest 0.01 foot.

Equipment used during well installation will be decontaminated prior to use at each boring location to reduce the potential for the introduction of contamination and cross contamination. Equipment that contacts potentially impacted soil or water will be decontaminated consistently to assure the quality of samples collected. Augers will be decontaminated prior to and after each use by steam cleaning. Steam cleaning will either be performed onsite in a designated decontamination area or at the drilling contractor's yard.

Decontamination water produced will be placed in U.S. Department of Transportation (DOT)-approved 55-gallon drums and labeled as decontamination water with the generator name and address, date generated, and source (specific boring numbers). Soil cuttings will be containerized in DOT approved roll-off bins or 55-gallon drums. The bins and drums will be covered and labeled with the generator name and address, accumulation date, and contents. The generated waste will be profiled, removed from the Site, and properly disposed at an appropriately licensed facility.

10.3 CONVEYANCE PIPING LAYOUT AND TRENCHING AND PIPING INSTALLATION

A Site-wide utility survey has been performed to identify underground utilities and other subsurface features present at the Site. Prior to starting trenching activities, USA will be contacted in accordance with State law. Utility lines will be clearly marked in the field for avoidance or for removal and replacement. Hand excavation and/or "potholing" will be utilized to locate and confirm the location and depth of known utilities, including transite pipe water mains.

The main trenches will run along the major streets of the Carousel Tract (Panama, Ravenna, Neptune, and Marbella Avenues) and along E. 244th Street. The dimensions of the four main trenches will vary throughout the Site; their typical dimensions will be approximately 5 feet wide by 4 feet deep. The dimensions in the western part of the E. 244th Street will be approximately 6 feet wide by 5 feet deep, to accommodate all of SVE/bioventing conveyance piping from the four main trenches. Approximately 8,100 cubic yards (13,770 tons) of soil will be excavated, loaded and transported for disposal/recycling during installation of SVE/bioventing piping. The trenches will be sloped toward the northwest corner of the Site to allow for drainage of accumulated condensate from SVE/bioventing operations. The natural Site gradient will allow for an adequate slope while maintaining a constant trench depth. Trenching will require the same monitoring and vapor and odor mitigation as residential excavations. As necessary, odors will be controlled using Rusmar long-acting vapor suppressing foam or equivalent.

A total of 16 pipe headers will be distributed in the main trenches. Each main trench will contain one header for the shallow residential wells, shallow street wells (single-completion and nested), intermediate nested wells, and deep nested wells, respectively. The number of wells connected to each header will vary; the intent of the design will be for each header to have the capacity to convey 3,000 standard cubic feet per minute (scfm) to the treatment system.

Prior to trenching, the existing asphalt will be removed. Removal of the asphalt will include saw-cutting, removal using excavating equipment, loading, and hauling to a transfer facility for recycling. Excavated soil will be direct-loaded into transport trucks for hauling to a disposal or treatment facility. Following trenching and pipe installation, the trenches will be backfilled with a 2-sack cement/sand slurry mixture and the asphalt roadway surface will be restored.

The SVE/bioventing piping system will be Schedule 40 solvent-welded PVC of varying diameters. Conveyance pipe used to connect the wells to the main headers in the street will be 2-inch diameter PVC. The main headers within the streets are anticipated to be 4- to 14-inch diameter PVC. The SVE/bioventing piping layout and pipe sizing are included in the SVE/bioventing system construction drawings in Appendix L. The pipe will be placed on pipe supports placed at the base of each trench. Pipe spacers will be used wherever pipe will be stacked to maintain proper pipe separation and organization. Each section of pipe will be pressure tested to verify that is has been glued correctly. Once the pipe has been installed and pressure tested, the pipe "bundles" will be secured to the trench base to prevent rising of the pipe when the slurry mixture is poured. All above ground conveyance pipe will be steel and painted to prevent corrosion.

10.4 SVE TREATMENT SYSTEM DESIGN

The SVE and treatment systems will be rated for a total combined flow of 3,000 scfm at up to 12 inches of mercury (in-Hg) vacuum at the wellhead (15 in-Hg at the blower inlet) and will initially use thermal oxidation technology to treat the extracted vapors. The SVE and treatment system equipment will consist of an entrained-moisture separator, two 1,500 scfm positive displacement blowers each with a 150 hp motor, two thermal/catalytic oxidizers, and a control panel.

The SVE system components will have a combined footprint of approximately 360 square feet (two 9-foot by 20-foot thermal/catalytic oxidizer skids, two 6-foot by 10-foot blower skids, and a 5-foot diameter entrained moisture separator) and will be housed within a structure. The structure will be constructed large enough to allow access to the SVE equipment for maintenance and with sound attenuation insulation to reduce operating noise levels. In accordance with MM NOISE-3, either a qualified acoustical engineer with expertise in design of sound isolations will be retained to ensure that exterior noise from the SVE/bioventing system (i.e., outside the building enclosure) complies with the City's exterior noise limits (55 dBA) or provide documentation (e.g., manufacturer's specification sheet for an off-the-shelf product) to the satisfaction of the City, as applicable, that the design will achieve the standard.

10.4.1 Manifold Location and Structure

The 16 pipe headers on the western part of E. 244th Street will remain in a common trench until stubbed up within a parcel where the manifold will be located at a location to be determined near the

northwest corner of the tract. The entire manifold will reside in an enclosed structure. The structure will be constructed large enough to allow access to all headers.

10.4.2 Manifold Design and Installation

The complete manifold will comprise 16 pipe headers divided into four groups of four headers each, one for shallow residential wells, one for shallow nested wells, one for intermediate nested wells, and one for deep nested wells. At a minimum, each pipe header within the manifold will contain a pitot tube to measure flow, a vacuum gauge, a sample port, both manual and actuated butterfly valves, and a sump for collection of entrained liquid and/or condensate. Each sump will have a drop tube and a level sensor. A pneumatic double-diaphragm pump will be used to remove liquid from the sumps.

10.4.3 Treatment Compound Location

Currently, there are three potential offsite locations for the treatment system. The three locations are on the former Turco Property (owned by Pedro First, Ltd., an affiliate of Black Equities Group, Ltd. and occupied by American Logistics International), the Main Street Business Park located at 24412 S. Main Street owned by 24412 So. Main Street, LLC and managed by Surf Properties, and vacant land north of the MTA/BNSF rail line owned by County Sanitation District No. 8 and leased to CBB Carson Properties and managed by SB Management Corporation, part of Black Equities Group, Ltd. At this time, it is assumed that the treatment compound will be located on the former Turco Property. A reinforced concrete slab on grade pad will be poured to support remediation equipment and construction of a concrete masonry unit (CMU) block building. The overall footprint of the concrete slab is approximately 80 feet long by 30 feet wide. Not including the bathroom, the actual building footprint is approximately 70 feet long by 30 feet wide.

10.4.4 Extraction and Treatment System Specifications and Design Criteria

The SVE and treatment systems will be installed to treat 3,000 scfm of extracted soil vapors. Two systems, each capable of extracting and treating 1,500 scfm, will be installed. The SVE system will consist of the following components:

- SVE Blower: Each blower will consist of a positive displacement blower with a 150 hp 480V/3-Phase/60 Hertz (Hz) totally enclosed fan-cooled (TEFC) premium efficiency belt-drive motor. Each motor will be controlled via a variable frequency drive (VFD) speed controller. The blower will be equipped with an inlet filter, discharge silencer, vacuum relief valve, and check valve on the discharge of the blower. Inlet and discharge flexible connectors will be provided. Anti-vibration mounts and local electrical disconnects will be included. Each blower skid will be enclosed in a sound enclosure.
- Moisture Separator: The vapor/liquid separator will be welded steel construction with internal and external powder-coat finish. The separator will have a total liquid capacity of 100 gallons. Internal to the separator will be a moisture demister pad. The separator will be equipped with a PVC site glass and three-point liquid level control. The separator will be equipped with a 1-inch manual drain valve and 6-inch clean out port. A differential pressure gauge will be placed across the demister element.
- Condensate Removal Pump: The Pump will be capable of 5 gpm at 15 in-Hg with a ¾ hp 3-phase TEFC motor. A check valve, throttle valve, and sample port will be on the pump discharge. The pump will feature inlet and outlet isolation valves and unions for easy removal for servicing.

- Manual Dilution Control: A 6-inch valve with gear operator will be installed on the inlet of the SVE blower.
- Automatic Purge/Dilution Control: An 8-inch fully modulating automatic valve assembly with an air filter will be placed on the inlet of the SVE blower. Once the fresh air purge of the oxidizer is complete, the valve will be automatically switched to dilution control and will work on a proportional-integral-derivative loop with the oxidizer exit temperature thermocouple.
- Automatic Inlet Isolation Valve: A 12-inch fully modulating automatic valve assembly with open and closed limit switches will be placed on the process inlet.
- Inlet Instrumentation: The inlet of the SVE system will be equipped with two vacuum indicators and a sample port.
- Outlet Instrumentation: The outlet of the SVE blower will be equipped with sample ports, pressure gauge and temperature gauge.
- Vacuum Transmitter: A vacuum transmitter with display will be installed on the blower inlet.

The SVE system will utilize a natural gas-fired oxidizer to destroy VOCs that are discharged from the SVE blower. The treatment system (oxidizer) will consist of the following components:

- Reactor: The reactor housing will be constructed of 7-gauge rolled steel. The inlet and outlet connections will be flanged and the exterior will be painted.
- High Temperature Refractory: All internal reactor surfaces will be completely insulated with a ceramic insulation media rated for 2,200 degrees F.
- Gas Pre-Heater: The unit will be equipped with a direct gas-fired low NOx primary air burner with combustion air blower and ratio control.
- Fuel Gas Piping Assembly: The fuel gas piping assembly will be pre-piped. The gas train will meet all code requirements and be suitable for Factory Mutual (FM) approval. All components will be rated for outdoor operation and continuous use.
- Main Control Panel (MCP): The main control panel will be National Electrical Manufacturers Association (NEMA) 4 construction. The programmable logic controller (PLC)-based control panel will feature alarm detection and an hour meter to record run time. Temperature control will be provided with temperature control devices and limit switches. Temperature retransmit will be standard. The control panel will be Underwriters Laboratories (UL) labeled and listed as an assembly.
- Motor Control Center (MCC): The MCC will be NEMA 3R construction and will contain all 480V/3-Phase/60 Hz controls including the VFDs for the SVE blowers and main electrical disconnect for the system. The MCC will have a lockable power disconnect. A 480V/120V transformer will provide control voltage to the MCP. Cooling vent fans will be provided. The control panel will be UL labeled and listed as an assembly.
- Flame Arrestor: A flame arrestor will be mounted on the inlet of the oxidizer and utilized to prevent flame propagation to the source. A spiral crimped stainless-steel element will be removable for inspection and cleaning. A differential pressure gauge will indicate pressure drop across the flame arrestor.

- Exhaust Stack: A stainless-steel exhaust stack will terminate at least 15 feet above grade level. The exhaust stack will be equipped with sample ports for field testing.
- Heat Exchange Module: A heat exchange module will pre-heat the incoming vapors prior to combustion and will lower the supplementary energy consumption of the oxidizer. The heat exchanger will be nominal 50% thermally efficient and will be tube-and-shell design. The heat exchanger will be manufactured with stainless-steel internals and will be internally insulated. The heat exchanger exterior will be carbon steel exterior with high temperature paint.
- Catalyst Module: A catalyst module will be installed when the extracted soil vapor concentrations decline to less than 2,000 ppmv.
- Temperature Chart Recorder: A digital temperature recorder with removable SD card will be provided to record the combustion chamber temperature. Once the catalyst module is installed, the catalyst outlet temperature will also be recorded.
- Telemetry: A telemetry system will allow remote access to the system controls. The operator will be able to view data and will also receive an email and/or text for any alarm events. The telemetry system will be real time and may also give the system manufacturer the ability to log in and make any PLC program changes or modifications and remote support throughout the duration of the project.

10.4.5 Piping and Instrumentation Diagram

A piping and instrumentation diagram for the SVE and treatment systems is presented in the SVE system drawings in Appendix L. The control panel for the SVE and treatment systems will be located inside the control room (office) portion of the remediation structure. All instrument inputs will be routed to the PLC, and the PLC will be programmed with all required data processing algorithms and equipment control and alarm thresholds.

10.4.6 Acoustical Mitigation (Sound Proofing) to 55 dBA Exterior Noise Level

Sources of nuisance noise can include the vacuum blowers (approximately 87 dBA each) and the combustion air blowers (approximately 78 dBA each). The vacuum and combustion air blowers will be constructed inside removable acoustic steel sound enclosures specifically for noise attenuation of blowers. These enclosures will be designed to reduce operating noise levels by approximately 20 dBA. In addition, the SVE/bioventing treatment system will be installed inside a compound with a CMU block wall. The CMU block construction will further reduce the sound levels by approximately 20 dBA. As a result, sound levels immediately outside the treatment system building will be at or below 55 dB in accordance with EIR MM NOISE-3 and the City of Carson Noise Ordinance for night-time operation. The system will also have an effluent stack of sufficient diameter so that the discharge velocity of treated vapor will not create nuisance noise.

In accordance with MM NOISE-3, an independent acoustical engineer will review and approve sound attenuation aspects of the system design and conduct sound measurements during system startup to document that exterior noise levels are below 55 dBA. If necessary, additional acoustical attenuation panels will be added to the interior walls of the enclosure.

10.4.7 SVE System Permit

In June 2015, an application was submitted to the SCAQMD to obtain a permit for the SVE and oxidizer treatment systems. It is anticipated that the PTC will be finalized and issued in late 2015. The PTC will allow for well and piping installation and system construction to begin and will include system operating conditions and monitoring requirements. Upon completion of system installation, the PTC will be processed into a PTO that will contain conditions required for system operation. Key operating conditions of the SCAQMD permit may include:

- Maximum flow of 3,000 scfm measured at the inlet of the oxidizer;
- Minimum oxidizer combustion temperatures of 1400 degrees F in thermal mode and 600 degrees F in catalytic mode;
- Reduction of emissions of total gaseous non-methane organic compounds (TGNMOC) by 98% by weight or to 20 ppm or less (measured as hexane); and
- Performance of a source test within 60 days of startup to document compliance with permit requirements.

The SCAQMD PTC, once received, will be provided as an attachment to the next Quarterly Remediation Progress Report.

10.4.8 Other Permits

Excavation of trenches for installation of SVE system piping will require an Encroachment and Excavation Permit from the City. Encroachment and Excavation Permits will also be required for equipment staging and operations, lane closures in public streets, and for encroachment onto sidewalks and City property/easements. The City Engineering Department will require a Traffic Management Plan as part of the Encroachment Permit Application. A Trash Bin/Containers Permit may also be needed for roll-off bins, if they will be placed on the street along with the Excavation and Encroachment Permit.

Additionally, excavation of trenches will be done under a Rule 1166 Plan and Permit from the SCAQMD. A Site-specific Rule 1166 Permit (Plan No. 577559) was issued by SCAQMD on September 1, 2015. The SVE trenching work will be done under the same Rule 1166 Permit as the excavations on residential properties. A copy of the permit is included in Appendix H.

The contractor retained to perform the excavation work will have a valid Cal/OSHA T1-Trenching/Excavation Permit per CCR Title 8 Section 341.

The SVE system(s) will be installed in a structure, which will require plumbing, electrical, building, and construction permits from the City of Carson. The SVE system structure will be constructed of masonry block walls with sound attenuation insulation to reduce operating noise levels to below the City of Carson Noise Ordinance level of 55 dBA for night-time operation.

10.5 SVE System O&M Plan

The SVE/bioventing system O&M Plan is included in Appendix M and summarized in this section of the RDIP. The SVE/bioventing system will be operated cyclically (pulsed) to extract impacted soil vapor and introduce oxygen into the subsurface to stimulate biodegradation of petroleum

hydrocarbons and VOCs until RAOs are met. The SVE component will remove gasoline-range hydrocarbons and the lighter fractions of the diesel-range hydrocarbons. The bioventing component will result in biodegradation of the heavier fractions of the diesel-range and motor oil-range hydrocarbons. The system is designed to operate 24 hours per day, 7 days per week. During initial startup, the SVE/bioventing system will extract from all extraction wells that have been installed and connected to the system at that time. Due to the phased implementation of the remedial actions, not all 726 wells will have been installed by the time of initial SVE system startup, so initial extraction may be cycled through up to 8 of the 16 vapor collection headers. Vapor will be extracted from each header for 7 days, followed by a bioventing period of approximately 30 to 60 days. Adjustments to SVE/bioventing cycling frequencies may be made after 1 year of operation. It is expected that recovered vapors from SVE system operation will decline over time, and SVE operation can be discontinued in some wells and active operation shifted to other parts of the Site. In this case, the wells would still need to be operated periodically to introduce oxygen to the subsurface in a bioventing mode of operation.

10.5.1 Baseline Monitoring

Baseline samples will be collected from each SVE well, or for residential wells, from the sample port located in the valve box installed at the back of sidewalk, prior to initial extraction. Samples will be screened in the field using portable instruments (PID for VOCs and a landfill gas meter for oxygen, carbon dioxide, and methane). Samples will also be collected and sent to a National Environmental Laboratory Accreditation Program (NELAP)-certified laboratory and analyzed for TPH by EPA Method TO-3 and VOCs by EPA Method TO-15.

10.5.2 Operational Monitoring

Based on the strategic excavation sequencing, it is anticipated that the SVE/bioventing operations will begin along the E. 249th Street, Panama Avenue, E. 248th Street, Ravenna Avenue, and portions of E. 244th Street "legs," following the completion of Cluster 14B approximately at the end of the third year of remedial action implementation. Initially, the SVE system will be extracting from the eight manifold legs, corresponding to the Panama and Ravenna "legs" and will be monitored daily during the initial 7 days of operation, then weekly thereafter to comply with anticipated SCAQMD permit requirements. The remaining headers will be placed on-line following the completion of Clusters 19 (Neptune "leg") and 25 (Marbella "leg"). During operational monitoring, flow rates, SVE system temperatures, and SVE influent and effluent VOC data will be collected weekly, or as stipulated by the SCAQMD permit. It is anticipated that, in order to comply with SCAQMD permit requirements, SVE system influent and effluent samples will be collected monthly for laboratory analysis.

Following startup of the SVE/bioventing system, SVE wells will be screened in the field once per quarter using portable instruments (PID for VOCs and a landfill gas meter for oxygen, carbon dioxide and methane). If the PID concentration drops below a trigger concentration (defined in Section 5.2 of the SVE/bioventing system O&M Plan in Appendix M) and methane is below 1,000 ppmv, samples will be collected and sent to a NELAP-certified laboratory and analyzed for TPH by EPA Method TO-3 and VOCs by EPA Method TO-15. If laboratory results show vapor concentrations below trigger concentrations, the well will be isolated from the system, allowing system operation to focus on higher-concentration wells. Once a well is offline, it will be resampled

two additional times over the next 6 months to confirm the concentrations remain low. If the concentrations rebound, the well will be placed back online until the concentrations again drop below trigger concentrations. If the concentrations remain below the trigger concentrations, the well will remain offline and be removed from the sampling program for up to 1 year. At the end of 1 year, the well will be placed back online in SVE/bioventing mode and the periodic field screening process repeated.

Regular measurements of vacuum at the SVE wells will be performed to confirm the ROVI and evaluate the integrity of the system. If the design ROVI is not confirmed by these vacuum readings, system operating parameters may be adjusted or the need for installation of additional wells will be evaluated. If integrity of the system appears to have been compromised (i.e. apparent breaks in pipe or excessive water/condensate accumulation), action will be taken to correct the specific situation.

10.5.3 Routine Inspection and Maintenance

During normal operations, the SVE/bioventing system will be inspected weekly. A work control and maintenance record system to manage and document the accomplishment of preventive and corrective maintenance work performed will be established and recorded in an annual preventative maintenance plan. A list of preventive maintenance and periodic inspections, along with forms that will be required to be completed during the inspections, is provided in Appendix M. Corrective maintenance and repair work, including service call work, will be accomplished during the normal work day.

In addition, as part of the O&M activities, field personnel will periodically need to access well boxes in the streets. The frequency of accessing well boxes will be established during system startup. Field personnel will not need to access residential properties for O&M purposes. Residential wells will be accessed via the valve boxes installed at back of sidewalk for monitoring purposes and to shut in wells at that residence if appropriate. It is anticipated that the SVE/bioventing system will be operated on a continuous basis and shut down only during performance of routine maintenance described below.

10.5.4 SVE/Bioventing System Recordkeeping

SVE/bioventing system operation parameters and maintenance logs, including a log of alarms and corrective actions, will be documented in their corresponding field sheet. Copies of these field sheets will be kept onsite and the originals will be kept at the laydown yard field office.

10.5.5 Troubleshooting

Qualified O&M personnel will perform and document system troubleshooting. The Lead Engineer will be notified prior and after system troubleshooting. Troubleshooting is discussed in more detail in the O&M Plan.

The O&M Plan, tables and forms are included in Appendix M.

10.5.6 Signage

The necessary public information and signage will be posted on the exterior of the treatment system building. Specifically, signs will state the following:

CAUTION

UNAUTHORIZED PERSONS KEEP OUT

NO SMOKING

Prop 65 Warning

In Case of Emergency, Contact:

Company Name, Personnel Name(s), and Telephone Number(s)

10.6 BASELINE AND PERIODIC SAMPLING OF SOIL AND SOIL VAPOR TO ASSESS EFFECTIVENESS OF SVE/BIOVENTING SYSTEM PERFORMANCE

To monitor SVE/bioventing effectiveness, samples of soil and soil vapor will be collected at 16 representative locations in City streets prior to start of SVE/bioventing system operation to establish baseline conditions. Planned probe locations to monitor SVE/bioventing system performance are shown on Figure 10-3. Results of the baseline sampling will be used to evaluate overall system effectiveness and will be reported in an initial 5-year review report and subsequent reports submitted on a 5-year basis.

10.6.1 Boring and Soil Vapor Monitoring Well Locations

Recommended soil boring and multi-level nested soil vapor monitoring well locations are shown on Figure 10-3 and in the SVE system construction drawings in Appendix L. The vapor monitoring well and boring locations will be situated in between the SVE/bioventing wells so that results are not strongly influenced by close proximity to the extraction wells. Some of the soil vapor monitoring wells/probes will be installed near existing street soil vapor probes that are currently sampled quarterly, as the existing probes will likely be decommissioned during trenching in the street for SVE conveyance pipe installation.

10.6.2 Soil Vapor Well Design Specifications

Multi-depth soil vapor probes/wells will be installed at each of the 16 street locations at depths of 1.5, 5, 7.5, 20, and 35 feet bgs. The 7.5-, 20-, and 35-foot sampling screen depths will target the midpoint of the SVE well screens. The soil vapor monitoring probes will consist of vapor sampling implants constructed of double woven stainless-steel wire screen approximately 6 inches in length attached to measured sections of ¼-inch outside diameter semi-rigid Nylaflow® tubing. The Nylaflow® tubing for each of the five probes installed at each location will be color-coded to correspond to depths of 1.5, 5, 7.5, 20, and 35 feet bgs. Consistent color coding will be used for all 16 multi-level probes/wells.

Three separate borings will be advanced at each location. The borings for the 7.5-, 20-, and 35-foot (triple-nested) soil vapor monitoring probes will be cleared to 10 feet bgs using an air knife rig and advanced below 10 feet bgs with 7-inch outside diameter hollow-stem augers using a rotary drill rig.

The borings for the 1.5- and 5-foot soil vapor monitoring probes will each be advanced to their respective total depth using a 3.25-inch outside diameter hand auger.

Upon completion of each boring, the probes will be suspended in the borings, granular filter pack material (#2/12 sand) will be placed around the probes, and each zone will be isolated with a neat cement/bentonite seal. For the triple nested and 5-foot probes, the granular filter pack will extend approximately 9 inches below and above each of the 6-inch screens. For the 1.5-foot probes, the granular filter pack will extend approximately 1 inch below and above each of the 6-inch screens. The total filter pack thickness will be approximately 24 inches for the triple-nested and 5-foot probes and 8 inches for the 1.5-foot probes. Approximately 12 inches of dry granular bentonite will be added above and below the 7.5- and 20-foot probe filter packs and above the 5- and 35-foot probe filter pack to provide a seal and prevent the infiltration of neat cement/bentonite grout. Approximately 3 inches of dry granular bentonite will be added above the 1.5-foot probe filter pack to provide a seal and prevent the infiltration of neat cement/bentonite grout. Neat cement with approximately 5% bentonite will be added above and/or below the dry granular bentonite to form a permanent seal. Vapor probe wells will be completed with a locking flush-mount traffic-rated well vault surrounded by a concrete skirt. Each probe will be terminated inside the well vault and capped with a gas-tight fitting.

10.6.3 Baseline Soil Vapor Monitoring Well Sampling Approach

The 16 multi-depth soil vapor monitoring wells (each with five vapor probe points at approximate depths of 1.5, 5, 7.5, 20, and 35 feet bgs) will be sampled prior to starting the SVE system. Samples will be screened in the field using portable instruments (PID for VOCs and a landfill gas meter for oxygen, carbon dioxide, and methane). Samples will also be sent to a NELAP-certified laboratory and analyzed for VOCs by EPA Method TO-15 and fixed gases (including methane) by ASTM Method D-1946. As described in Section 5.2 of the O&M Plan (Appendix M), these baseline data will be evaluated to establish correlations between PID data and VOC concentrations for use as trigger concentrations to establish when samples will be collected for laboratory analyses for determination of when wells will be changed from the SVE/bioventing to purely bioventing mode of operation.

10.6.4 Baseline Soil Sampling Approach

Soil samples will be collected from 16 soil boring locations in the streets at representative locations using a Geoprobe rig. Samples will be collected at depths of 7.5, 20, and 35 feet bgs (midpoint of SVE well screen intervals). Soil samples will be analyzed for TPHg, TPHd, and TPHmo by EPA Method 8015M, and VOCs by EPA Method 8260B/5035. Samples will also be extracted using the Synthetic Precipitation Leaching Procedure (SPLP) to evaluate leachability of COCs in soil and reductions in leachability over time.

10.6.5 Soil and Soil Vapor Sampling Schedule during Implementation

Following SVE/bioventing system startup, soil vapor samples will be collected from the 16 multi-depth SVE wells and soil vapor probes installed in the streets quarterly for a period of 2 years, semi-annually for a period of 3 years, annually for a period of 5 years, and once every 5 years thereafter during system operation. Soil vapor samples will be screened in the field with portable field instruments and analyzed for VOCs by EPA Method TO-15 and fixed gases (including methane) by

ASTM Method D-1946. Periodic measurements of vacuum at these SVE wells and soil vapor probes will be performed to evaluate and confirm the radius of influence of the system. If the design radius of influence is not confirmed by these vacuum readings, system operating parameters may be adjusted or need for installation of additional wells will be evaluated. Results of the periodic sampling will be used to optimize system operations as well as evaluate overall system effectiveness at reducing COC concentrations and degradation of longer-chain hydrocarbons. Analytical results for these sampling events will be reported semi-annually along with semi-annual groundwater monitoring data and in an initial 5-year review report and subsequent reports submitted on a 5-year basis.

As discussed in Appendix G, after 5 years of SVE/bioventing system operation and at 5-year intervals thereafter, Geoprobe borings will be advanced and sampled at the same depths at locations adjacent to the previous borings and samples will be collected for comparative analysis with prior samples (Section 10.6.4) from the same locations. Soil samples will be analyzed for TPHg, TPHd, and TPHmo by EPA Method 8015M, and VOCs by EPA Method 8260B/5035. Samples will also be extracted using SPLP to evaluate leachability of COCs in soil and reductions in leachability over time.

10.6.6 Reporting

A summary of SVE/bioventing system operations (operating data, maintenance logs, alarm details, and corrective actions taken) will be included in Quarterly Remediation Progress Reports to the RWQCB. Results of soil vapor monitoring (including both laboratory and field data) and soil sampling will be summarized and included in the Quarterly Remediation Progress Reports for monitoring periods during which samples are collected.

11.0 SUB-SLAB DEPRESSURIZATION (SSD) SYSTEMS

This section describes the design, installation, and testing of SSD systems to be installed as part of the corrective actions proposed for the former Kast property. The purpose of the SSD systems is to mitigate the potential vapor intrusion pathway at the Site. The SSD systems use small fans to create a vacuum (negative pressure) beneath the slab of a structure and remove air from below the slab and exhaust it above the building. This process keeps vapors emanating from the soil below from entering the building. The SSD design, installation, and operation will be in general accordance with the DTSC Vapor Intrusion Mitigation Advisory (DTSC, 2011).

11.1 IDENTIFICATION OF PROPERTIES FOR SSD SYSTEM INSTALLATION

The Amended CAO for the Former Kast Property issued by the Regional Board requires installation of SSD systems at 29 properties. In addition, while data collected from the Carousel neighborhood do not indicate that vapor intrusion is an issue at any of the residences, SOPUS has offered a sub-slab depressurization system to any of the homeowners in the Carousel neighborhood who request one to alleviate concerns about potential impacts to their indoor air from the Site (URS and Geosyntec, 2014). The 29 properties identified for sub-slab vapor mitigation are shown on Figure 11-1.

Additional sub-slab soil vapor data are being collected at properties where the Phase II Site characterization sampling has not been completed. As these data are compiled, they will be evaluated following methods presented in the Revised HHRA (Geosyntec, 2014) to assess whether a SSD is required in order to meet the RAOs for soil vapor to indoor air or if concentrations exceed the methane SSCG of 0.5%.

11.2 SUMMARY OF FINDINGS FROM SSD PILOT TEST

A SSD diagnostic pilot test was conducted in June 2015. Data collected during the SSD diagnostic pilot test were used: 1) to assess the general air permeability of subsurface materials; and 2) to collect data necessary for SSD system design (e.g., spacing/number of suction points and fan size required) for the building tested. Additionally, these data are used to facilitate planning, diagnostic testing, and mitigation system design for SSD systems to be installed at homes in the Carousel Tract.

The diagnostic pilot test involved installation and suction testing at four temporary suction point locations and monitoring of sub-slab to indoor air differential pressure data at within the building.

11.2.1 SSD Diagnostic Pilot Test Building Conditions

The SSD diagnostic pilot test was conducted at a single story residential structure with an attached garage at 24628 Marbella Avenue. The construction style is slab-on-grade with wood-framed walls. The building footprint covers approximately 1,900 square feet (sf) divided into approximately 1,500 sf of living space and 400 sf of garage space.

The foundation of the main portion of the building appeared to be a monolithic slab construction (i.e., slab and footing were poured at the same time) with an average slab thickness of approximately three inches, and footing dimensions of approximately 14 inches thick by 14 inches deep. A cutout in the

slab was observed at the drain end of the bathtub and a small crack was noted in the slab near one of the temporary suction points.

The foundation of the garage area of the building was at a slightly lower elevation than the main portion of the house, indicating separate slab areas. A stem wall around the perimeter of the garage was observed indicating the garage slab was poured separately from the garage footing (i.e., floating slab). An open crack, approximately ¼-inch wide was observed in the joint between the garage slab and stem wall.

A gravel base layer below the slabs was not observed during the testing. Sub-slab soils consisted of dense brown medium to fine sand with some silt and trace amounts of organic fibers.

11.2.2 SSD Diagnostic Pilot Test Results

Results of diagnostic pilot test indicate the following for the suction points placed around the main portion of the building:

- The vacuum field associated with a suction point vacuum of 5 in-WC extended across approximately 60% of the building footprint and nearly across the narrow side (north-south) of the building with vacuum levels of at least 0.004 in-WC.
- The observed vacuum field extents were generally isotropic, except at two of the temporary suction points in the main portion of the building where the vacuum field reduced sharply in the vicinity of the bathroom area. This is believed to be a result of vacuum loss from the slab cutout in the bathroom.
- A grade beam may be present running laterally across the wide sides of the building; however, a significant drop in sub-slab vacuum levels was not observed across the presumed location of the grade beam.
- Due to the additive effect of the vacuum response from individual suction points, higher sub-slab vacuum levels will be created with concurrent operation of multiple fans. Based on the results of the diagnostic pilot test, concurrent application of a suction point static vacuum of 5 in-WC or less at suction points centrally located along the wide sides of the building is expected to result in a sub-slab vacuum of 0.004 in-WC or greater at all monitoring points.

Results of diagnostic pilot test indicate the following for the suction point placed outside of the garage:

- Most of the garage slab was depressurized (at least 0.004 in-WC vacuum) by one temporary suction point at 5 in-WC.
- The suction field at the garage did not extend to the main portion of the house.
- The garage slab was a floating slab and consequently, higher sub-slab permeability and resultant higher airflow were expected around the perimeter. To minimize vacuum loss for floating slab construction, sealing of the perimeter joint will be important to reduce vacuum loss and improve vacuum field coverage.

11.3 SSD DESIGN

The general SSD design is based on the results of the diagnostic pilot test and experience with SSD system installation at other residential properties. However, variability in construction style, sub-slab

soil permeability, slab leakiness, homeowner preferences for fan and pipe locations, and other factors are anticipated to affect SSD designs at the Site. Thus, the SSD system configuration will be evaluated independently based on diagnostic testing and homeowner preferences at each building prior to mitigation system installation. A general SSD design has been prepared to facilitate the property-specific installation of the mitigation systems. However, this general design will likely need to be modified for each location based on the results of the site-specific diagnostic pilot test.

11.3.1 Diagnostic Pilot Test

Prior to finalizing the SSD design for a property, a diagnostic pilot test will be conducted to obtain property-specific design data. The diagnostic testing will be conducted between the date of initial individual homeowner meetings and PSRP submittal a minimum of 4 weeks prior to the start of excavation activities at the property. This testing will not require homeowner relocation, and is estimated to occur over 2 days of activity.

The SSD diagnostic test procedures will generally follow the methodology described in the SSD diagnostic pilot test work plan (Geosyntec, 2015). The diagnostic testing methodology consists of the following activities:

- Suction Point Installation – 2 to 4 suction points will be installed around the perimeter of the house. Additional suction points may be appropriate for houses with a larger footprint (e.g., greater than 2,000 square feet). An additional 1 to 2 suction points will be installed around the perimeter of the garage and/or addition to the home. Suction points will be sealed and left in place to facilitate later system installation.
- Communication Test Points – 2 to 4 communications test points will be installed through the slab within the building, addition, or garage to collect vacuum field extension readings during the diagnostic testing. With homeowner concurrence, these test points will be sealed and left in place to facilitate later system installation.
- Vacuum Field Extension Testing – Vacuum field extension testing will be conducted at each temporary suction point by applying varying vacuum levels at the suction points using a portable fan. The resultant sub-slab vacuum response will be monitored at the communication test point locations using a digital pressure gauge capable of reading to -0.0001 in-WC. Airflow will also be monitored using either a pitot tube or thermal anemometer. A PID and landfill gas meter will be used during vacuum field extension testing to screen the extracted air for the presence of VOCs, methane, oxygen, and carbon dioxide. Field readings will be recorded by field staff on a daily field report log.
- Short Circuiting and Backdraft Testing – During vacuum field testing, an evaluation of potential airflow short circuiting will be conducted by placing a smoke pen near cracks or openings in the slab or foundation wall. Cracks and openings may be sealed temporarily (using foam backer rod and/or duct tape) if required to perform adequate vacuum field extension testing. Additionally, combustion appliances (e.g., hot water heater, furnace) in the structure will be backdraft tested using a smoke pen during vacuum field extension testing. Backdraft testing is conducted to evaluate whether a mitigation system will cause exhaust gases from the appliance(s) to accumulate in the structure as opposed to venting to the outdoors. If a backdraft potential is identified, a qualified heating ventilation and air conditioning (HVAC) contractor will be consulted for assistance with final system design.

Additionally, during diagnostic pilot testing, the electrical service panel will be evaluated by a licensed electrician to determine if adequate electrical supply is available in existing electrical panels (a dedicated breaker will be used for the SSD systems, if possible), and whether the electrical supply meets local codes. If electrical evaluations determine modifications to a property's electrical system is required, then recommendations for these modifications will be made on a property-specific basis.

11.3.2 General SSD Design

The drawings, notes and details for the general SSD design are provided in Appendix N. This information should be considered as guidance for vapor intrusion mitigation system installation, not as precise specifications, as each structure will differ to some degree regarding the optimal mitigation approach.

It is expected that the SSD systems will consist of two strategically placed suction points with static vacuums of approximately 2 to 5 in-WC on opposite long sides of each building. Additionally, separate suction points will likely be used for garages and additions. However, the specific number and layout of the suction points will be determined upon review of the diagnostic test results.

A fan or combination of fans with static vacuum and flow capacity of approximately 2 to 5 in-WC and approximately 20 cfm, respectively coupled to 2 to 4-inch diameter schedule 80 PVC piping is recommended for the SSD systems. The general SSD design depicts the presence of single suction points connected to single fans (i.e., multiple "systems" per structure) in an effort to minimize the amount of external horizontal piping, which could present aesthetic concerns to the homeowners. However, subsurface piping may be used to manifold multiple suction points to a single fan. Additionally, suction points installed on the inside of the structures which may be combined together to a single fan may be considered where appropriate as a modification to the design criteria ("General Note #7" indicates suction points can be installed inside with homeowner approval). It is recommended that homeowner's concerns be considered prior to locating suction points, pipe runs, and fan locations.

The SSD design/installation will also include the following components:

- A vacuum gauge, manometer, or other indicator to let homeowner know system operation status;
- Backdraft testing following installation;
- Electrical service modifications, where required, and
- Confirmation that homes have a carbon monoxide monitor, as required in all homes by California law.

Monitoring of the SSD systems will be performed as discussed in Section 6.8 and Appendix G.

11.4 SSD PERMITTING

SOPUS and AECOM met with the SCAQMD on February 13, 2015, and discussed permitting requirements for the SSD systems. According to SCAQMD staff, air permits are not required for installation or operation of the SSD systems at single-family residential properties.

Excavation, Building, and Electrical Permits will be required prior to the installation of the SSDs. These permits will be obtained from the City of Carson prior to installation.

12.0 PROPERTY LANDSCAPE RESTORATION PROGRAM

Consistent with PDF GEO-7, following backfilling operations, the affected area will be landscaped to like conditions or as agreed to with the property owner. SOPUS will provide the homeowner with a selection of alternative landscape restoration options for consideration that will be prepared by a landscape architect/contractor. Any landscaping features (fences, patios, etc.) removed or damaged by remediation activities will be repaired or replaced as agreed.

The property landscape restoration program includes development of an interactive design management website, individual property assessments, three-dimensional (3-D) visual planning designs, residential landscape design concepts and alternatives, and preparation and implementation of unique construction plans for each of the residences affected by implementation of remedial action measures. A public outreach program will be developed to present project information, design process, sample design concepts, and construction options to affected homeowners.

12.1 WEBSITE DEVELOPMENT

The interactive design management website will expedite homeowners' completion of the step-by-step process from initial application to final acceptance of the design. The website will include an overall project summary page and process descriptions for application, property assessment, and design development. Individual homeowners will have password-protected, secure access to information regarding their individual property, design approvals, construction documents, and final project closeout approval. The website will also provide up-to-date project phasing and overall 3-D visual simulations to assist with the public outreach program.

12.2 INDIVIDUAL PROPERTY ASSESSMENTS

An assessment program will be implemented to create specific itemized assessments of each affected property. An electronic homeowner-assessment sheet will enable individual homeowners to perform their own preliminary detailed assessment for their front, side, and back yards and submit it online through the project website. Independent assessments of each property will also be performed by qualified personnel. These independent assessments will include detailed measurements and photographs to provide an accurate record of existing site conditions. Information from both assessments will be used to develop a final assessment report for each property.

The final assessment reports will include a site plan depicting landscape planter areas, turf, hardscape paving and any other definable elements. The report will also include a completed visual site assessment form and detailed inventory form depicting all site landscaping elements and individual item classifications with quantity and sizes as necessary to complete site evaluation process and provide enough information to redesign and restore hardscape and landscaping after remedial excavations are completed.

12.3 3-D VISUAL PLANNING DESIGNS

A 3-D model of existing project conditions will be developed and used to create visual simulations for planning development. This model will be updated as the project progresses and will be used to assist in developing future design concepts, design alternatives, and final project designs.

12.4 RESIDENTIAL LANDSCAPE DESIGN CONCEPTS AND ALTERNATIVES

In order to develop preliminary residential design concept packages, meetings with individual homeowners will take place to review site assessments and construction design alternatives. Design concept packages will include preliminary plans depicting house layout, hardscape, landscaping, courtyards, and assets. Design concept packages may also include 3-D visual illustrations of the design. Design concepts will be finalized based on input from the homeowner. Homeowners will be required to submit finalized concept plans, and sign their design approval form, through the project website.

12.5 PREPARATION AND IMPLEMENTATION OF CONSTRUCTION DOCUMENTS

Landscape construction documents and specifications will be prepared based on the homeowner's approved design concept package. Landscape construction documents will include hardscape paving, landscaping, irrigation, courtyards, and other similar assets. Landscape construction documents will meet all required local codes and current water use restrictions and regulations. Plans and details in a typical residential landscape construction package include:

- Landscape Construction Plans/Details;
- Planting Plans/Details;
- Irrigation Plans/Details;
- Wall and Fence Plans/Details; and
- Landscape Lighting Plan (if applicable).

While all landscape and hardscape items are planned to be replaced to like conditions, current water restrictions and regulations may restrict landscape design options and require enhanced solutions, including use of drought-resistant vegetation and limitations on the area that can be replanted in natural turf.

Homeowners will be provided assistance with conducting final landscape inspections once construction has been completed. These inspections will include reviewing landscape installation and completing functional tests of automatic irrigation systems (and lighting, if applicable). During inspection, a final punch list will be developed of any outstanding items needing to be completed prior to final project acceptance. Punch list items will be reviewed and addressed as required. Upon verification that all punch list items have been addressed, homeowners will be notified and requested to sign a project substantial compliance letter within 30 days of project acceptance stating that the project was completed as agreed.

13.0 LNAPL RECOVERY

To address the requirements of PDF H/WQ-4, Shell will continue periodic LNAPL recovery where LNAPL has accumulated in monitoring wells MW-3 and MW-12 to the extent technologically and economically feasible, and where a significant reduction in risk to groundwater will result. If LNAPL accumulates in the future in other wells to a measurable thickness, LNAPL recovery will commence from those wells, and if LNAPL accumulates at a thickness of greater than 0.5 foot in other wells, a dedicated pump will be installed to facilitate periodic LNAPL recovery.

Monitoring of LNAPL and water levels, and LNAPL recovery volume monitoring will continue during monthly LNAPL recovery events. When LNAPL recovery shows a declining trend, recovery trends will be evaluated, a recommendation may be made to the RWQCB to reduce the frequency of LNAPL recovery.

Prior to beginning LNAPL recovery activities, air monitoring readings are collected from both the well location and operator breathing zones using a PID and FID, to monitor methane and organic vapors, and using a 4-gas meter, which monitors methane, carbon dioxide, oxygen, and hydrogen sulfide levels.

LNAPL recovery in each monitoring well is gauged using an interface probe to measure LNAPL thickness. Once thickness has been determined, field personnel initiate LNAPL extraction via pumping using a nitrogen tank and dedicated tubing. The wells are gauged using the interface probe during pumping activities to confirm thickness of remaining LNAPL. If LNAPL thickness is less than 0.05 feet, then pumping is discontinued. LNAPL recovery is stopped when the volume of LNAPL extracted equals the calculated volume of LNAPL in the well prior to pumping or if the percentage of LNAPL in the recovered fluids is less than 75%, whichever is sooner. Recovered LNAPL is pumped into a 16-gallon drum and disposed of at an approved disposal facility.

Monthly removal of LNAPL from monitoring wells MW-03 and MW-12 and continued monitoring of well MW-18 will be reported in the semi-annual groundwater monitoring reports.

In the future, Shell proposes to assess the economic and technical feasibility of continued hydraulic recovery of mobile LNAPL using LNAPL transmissivity (Tn) as a criterion. The Interstate Technology & Regulatory Council (ITRC) suggests that hydraulic LNAPL recovery systems are at the practical limits of effectiveness at Tn in the range of 0.1 to 0.8 ft^2/day and that "further lowering of Tn is difficult and can be inefficient; that is, it can take very long to marginally reduce Tn without much benefit in terms of reduction of LNAPL mass, migration potential, risk, or longevity" (ITRC, 2009). Tn will be assessed using baildown tests in wells with a minimum of 0.5 foot of LNAPL, as described by ASTM E2856-13 (ASTM, 2013). Evaluation of Tn may be used as an alternative end point for LNAPL recovery. Shell may also further evaluate the approach to LNAPL based on the Western States Petroleum Association (WSPA) LNAPL Decision Tree (Los Angeles LNAPL Workgroup, 2015).

Monthly removal of LNAPL from monitoring wells MW-03 and MW-12 and continued monitoring of well MW-18 will be reported in the semi-annual groundwater monitoring reports.

14.0 GROUNDWATER MONITORING

In accordance with PDF H/WQ-5, a stable or decreasing plume of Site-related COCs will be maintained beneath the Site. This will be achieved through removal of wastes in soil, reduction of COCs in soils through soil SVE and bioventing, which would reduce COCs entering groundwater via onsite soils, and MNA of groundwater. MNA is the approved remedy for Site-related COCs in groundwater. MNA relies on naturally-occurring processes to decrease concentrations of chemical constituents. 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. Per PDF H/WQ-7, the RAO is for the shallow groundwater zone and Gage aquifer to be returned to background levels for Site-related benzene and naphthalene through natural biodegradation.

Periodic groundwater monitoring will continue as part of the remedial action in accordance with PDF H/WQ-6. Semi-annual monitoring of both shallow zone and Gage wells will be conducted for a 5-year period following implementation of SVE/bioventing. In accordance with the Regional Board's letter dated March 23, 2011 regarding groundwater monitoring synchronization with monitoring at other nearby sites with impacted groundwater, semi-annual monitoring will be conducted during the third week in April (second quarter) and third week in October (fourth quarter) of each year (plus or minus one week).

Gauging and sampling will be conducted under the direction of AECOM. Groundwater level gauging and sampling will be conducted as part of each groundwater sampling event. Groundwater levels in all Site monitoring wells will be gauged with an electric water level indicator or, if appropriate, an interface probe. Groundwater levels from all wells will be collected within an approximately 24-hour period. Groundwater purging and sampling will be performed using low-flow sampling procedures previously implemented at the Former Kast Site. During purging and sampling, field parameters will be monitored using a properly calibrated water quality monitor with a flow through cell. The monitored field parameters will include temperature, pH, ORP, DO, turbidity, and specific conductance.

A list of wells to be gauged and sampled is listed in Table 14-1 with well construction details and aquifer designation. A total of 18 shallow wells and four dual-completion Gage aquifer wells (each with a shallow screen and deep screen) (designated S or D) will be gauged and sampled during the monitoring events. Wells with measurable (LNAPL, however, will not be sampled (presently the only wells with measurable LNAPL are onsite wells MW-3 and MW-12; MW-18 has consistently demonstrated a sheen, but not a measurable LNAPL thickness, since Shell took possession of the well from Pedro First LLC, owner of the former Turco Products site, on October 21, 2014). During gauging and sampling events, record keeping will include upkeep of daily field sheets, purge and sampling logs for each well, and calibration logs for the water quality monitoring equipment.

Groundwater samples will be transported to a State-approved laboratory for chemical analysis. The samples will be transported under chain-of-custody procedures. The groundwater samples collected in the second and fourth quarters will be analyzed for the following parameters:

- VOCs plus fuel oxygenates by EPA Method 8260B;

- TPHg, TPHd and TPHmo by EPA Method 8015B/D (M); and
- Title 22 Metals by EPA Methods 6020/6020A and 7470A.

In addition, groundwater samples collected during the second quarter events will be analyzed by the laboratory for the following selected MNA parameters:

- Nitrate by EPA Method 300.0;
- Sulfate by EPA Method 300.0;
- Iron by EPA Method 6020A;
- Methane by RSK 175 (M); and
- Carbon dioxide by RSK 175 (M)

Note that other MNA parameters such as pH, DO, and ORP will be measured in the field during each semi-annual sampling event.

Quality assurance/quality control (QA/QC) samples will also be collected. Duplicate and field blank samples will be collected for approximately 10% of the sample locations and analyzed for VOCs, TPH and metals. Trip blanks will be shipped with each sample shipment and will be analyzed for VOCs only if there are indications of potential sample handling, cross-contamination, or other factors that may affect sample integrity.

Several steps will be taken to verify the quality of the groundwater data reported from the laboratory and the consistency between field and laboratory activities. Chain-of-custody forms will be checked daily before final delivery of the samples to the laboratory. Upon receipt of the laboratory reports, the chain-of-custody documentation will be checked against the analyses requested to ensure that all analyses were performed and applicable hold times were met. Results reported by the laboratory will be presented in tabular form, and the data input to the project database will be verified. QA/QC documentation for the analytical data reported by the laboratory will be part of the laboratory reports. In addition, Level III data validation will be performed on the laboratory reports following USEPA National Functional Guidelines for Organic and Inorganic Data Review. Results of the Level III validation will be presented in monitoring reports.

Monitoring reports will be prepared for each sampling event. Each report will include a summary of the worked performed, tabulated data, a well location map, groundwater potentiometric surface maps, and if appropriate, maps presenting COC concentrations. The fourth quarter reports will include time-series plots for water levels and primary COCs (i.e., benzene, TPH, etc.), and a discussion of discernable increasing and/or decreasing concentration trends. In addition, any relevant findings regarding MNA will be discussed. After the third year of monitoring (six sampling events) it is anticipated that statistical analysis will be implemented to augment the evaluation of selected COC concentration trends.

The semi-annual MNA program will commence in the fourth quarter of 2015. After 5 years of monitoring, the MNA program will be re-assessed for frequency of monitoring and laboratory analytical program, and adjusted as appropriate with RWQCB concurrence. Following completion of the excavation and 5 years of SVE system operation, the need for active remediation of groundwater will be assessed. If concentrations of Site-related COCs continue to be stable or

decreasing based on statistical analysis, the MNA monitoring program will continue. If the groundwater plume is not stable or declining, an evaluation of additional groundwater treatment technologies will be conducted and implemented as needed, per the requirements of PDF H/WQ-6.

15.0 REPORTING

15.1 REMEDIATION PROGRESS REPORTS

As part of the RAP Implementation, Shell's contractors will submit Remediation Progress Reports on a quarterly basis. The progress reports will detail work accomplished during the previous quarter, any impediments or problems encountered within the field that are different than anticipated and measures taken to resolve those issues, documents or other items submitted for review for which review comments or approval is outstanding, and work planned for the following quarter. These progress reports will also provide an indication that identified PDFs or required MMs have been implemented, include sub-slab soil vapor probe sampling data and include annual inspections of the SSD system. Additionally, as required by the Amended CAO, copies of any permits or approvals related to the remedial actions received during the quarter will be provided as attachments to these Quarterly Reports.

15.2 PROPERTY-SPECIFIC REMEDIAL ACTION COMPLETION REPORTS (RACRS)

AECOM will prepare and submit Remedial Action Completion Reports (RACRs) to document remedial actions implemented (excavation, backfill and restoration; on-property SVE well and piping installations; and installation of sub-slab depressurization systems) and document concentrations of specific COCs remaining in onsite soils following excavation. The RACRs will also include pre-excavation and post-excavation property condition survey findings.

The RACRs will include record drawings as part of documentation of work performed. They will be submitted 45 days after receipt of permit closure approval or receipt of post-excavation sample results, whichever is later.

15.3 GROUNDWATER MONITORING REPORTS

As discussed in Section 14, groundwater monitoring will be conducted on a semi-annual basis. Groundwater monitoring reports will be submitted by July 15 for the period January to June and by January 15 for the period July to December of each year. The next scheduled sampling event is in October 2015 with the subsequent report due by January 15, 2016.

If, based on a 5-year review following initiation of SVE system operation, groundwater plumes are not stable or declining and Site COCs in groundwater do not show a reduction in concentration, an evaluation of additional groundwater treatment technologies will be conducted and implemented as needed.

15.4 MONITORING OF UTILITY VAULTS FOR METHANE OCCURRENCE

AECOM will continue conducting quarterly monitoring of 69 utility boxes, vaults, storm drains, and sewer manholes at the Site for possible accumulation of methane from the anaerobic biodegradation of petroleum hydrocarbons in onsite soils until the SVE/bioventing system becomes operational or site conditions demonstrate it is no longer necessary as discussed in Section 6.8 and in Appendix G.

Methane screening of accessible utility boxes, vaults, storm drains and sewer manholes at the Site will continue to be conducted quarterly with reports submitted by the end of the month following the end of each quarter (i.e., by the end of April, July, October, and January). Data obtained from monitoring of these probes will be reviewed and submitted to the Regional Board.

15.5 MONITORING OF EXISTING SOIL VAPOR PROBES IN STREETS

AECOM will continue to conduct quarterly monitoring of nine onsite and one offsite soil vapor probes installed at 5 feet bgs along with shallower 1- and 1.5-foot bgs probes installed adjacent to these 5-foot probes as discussed in Section 6.8 and in Appendix G. Reports will be submitted by the end of the month following the end of each quarter (i.e., by the end of April, July, October, and January). Data obtained from monitoring of these probes will be reviewed, and a recommendation may be made to adjust the monitoring schedule, as appropriate. Any recommendation for changes in the sampling frequency will be provided in separate communications to the Regional Board. This sampling will be discontinued upon startup of the SVE system and replaced by the monitoring of soil vapor wells discussed below.

15.6 MONITORING OF MULTI-LEVEL SOIL VAPOR WELLS TO EVALUATE SVE/BIOVENTING SYSTEM EFFECTIVENESS

As described in Section 10.6, prior to SVE system startup, baseline monitoring will be performed at each SVE extraction wellhead. Sixteen multi-level soil vapor probes will be sampled at a baseline and after system startup with the following frequency:

- Quarterly for a period of 2 years;
- Semi-annually for a period of 3 years;
- Annually for a period of 5 years; and
- Every 5 years thereafter.

Analytical results for these sampling events will be reported semi-annually along with semi-annual groundwater monitoring data and in an initial 5-year review report and subsequent reports submitted on a 5-year basis.

15.7 SYSTEM OPTIMIZATION AND PERFORMANCE EVALUATION REPORT

15.7.1 Initial Five-year Review Report

The initial Five-year Review Report will be submitted 5 years after Site-wide SVE system start-up. Results of the baseline and periodic sampling events will be used to evaluate overall SVE/bioventing system effectiveness as well as optimize system operation and will be evaluated in an initial 5-year review report to be submitted 5 years after Site-wide SVE system start-up, and subsequent SVE system operational review reports submitted on a 5-year basis. A Five-Year Review Report will be completed following 5 years of full-scale SVE/bioventing system operations. The specific purpose is to review Site conditions and monitoring data, evaluate remedy effectiveness and recommend changes in remedy components, if warranted.

15.8 MITIGATION MONITORING AND REPORTING

Chapter 4.0 of the Final EIR includes a Mitigation Monitoring and Reporting Program (MMRP). The amended CAO dated July 10, 2015 includes the MMRP as Attachment 3 and requires Shell to "implement the project design features (PDFs) and mitigation measures (MMs) and comply with the MMRP set forth in Chapter 4.0, of the Final Certified EIR and the following directives for the identified PDF or Mitigation Measure set forth in the MMRP:

a. PDF GE0-5 and GE0-6: Geology and Soils – Imported backfill material should be in accordance with the DTSC guidance document titled *Information Advisory - Clean Imported Fill Material* (October 2001).

b. PDF AQ-1 through AQ-12 Air Quality: Provide detailed information of the control measures to minimize VOCs, nuisance and fugitive dust emissions during soil excavation, soil loading and trenching operations in the Site-Wide Remedial Design and Implementation Plan (RDIP).

c. PDF AQ-4: Provide a detailed account of the SVE system design and construction (vapor extraction well installation, trenching, system piping, manifold installation, type and placement of remediation equipment) in the RDIP."

These specific directives are addressed in this RDIP per the requirements of the amended CAO.

The MMRP is summarized in a table in Appendix O. This table has been modified to include cross-references to indicate the locations in this RDIP where the required PDFs and MMs are addressed. As required by various PDFs and MMs, Shell and its contractors will provide the required monitoring data to the Monitoring Agencies referenced in the table as requested and in periodic compliance reports.

16.0 SCHEDULE

A preliminary baseline schedule to implement the RAP is provided on Figure 16-1. This schedule is a best estimate at this time by AECOM and AIS for implementing the RAP. AECOM and AIS have worked together to prepare the project baseline schedule to:

- Minimize disruptions to homeowners/residents and adjacent properties;
- Ensure the safety of the traveling public and construction personnel; and
- Construct the project in the most effective manner possible.

As the work progresses, we expect there will be a certain learning curve wherein project work efficiencies are identified and less efficient tasks can be improved. Once the work cycle is well established, a project rhythm will develop and the work will proceed at high efficiency.

The project schedule is a baseline that will be periodically updated as the work proceeds. The AECOM construction management team will have primary responsibility for maintaining the schedule; however, the AIS project coordinator will also maintain an updated detailed schedule for the remedial construction work. Updates to the project schedule will be included in Quarterly Remediation Progress Reports to be submitted to the Regional Board.

There are a number of potential significant scheduling problems or delays that may impact the overall schedule. Potential impacts to the schedule include:

- Homeowners/residents refusal to provide access to implement remedial actions. If homeowners/residents refuse access assistance from the Regional Board and possibly the City of Carson will be sought.
- Homeowners/residents refusal to relocate to allow implementation of remedial actions at adjacent properties. This may require redesign of planned excavations and may take longer to implement due to equipment access limitations and other logistical factors.
- Delay in securing location for SVE treatment system.
- Delay in securing SVE piping manifold location and egress location for SVE piping.
- Lengthy review time for the Site geotechnical report, PSRPs, plan check reviews for grading plans, or other submittals.
- Delays in obtaining Grading Permits or other permits required for the work.
- Extreme rainfall events that create hazardous working conditions or other weather conditions (e.g., high winds, lightning) that require shut down of excavation work.
- Need for dewatering of excavations due to rainfall, utility breaks, natural seepage or other causes.
- Ground instability requiring installation of shoring to protect structures and personnel.
- Ground instability resulting in caving of an excavation and potentially damaging structure(s).
- Ground conditions that require using alternative less efficient excavation methods.

- Work interruptions due to shut down by SCAQMD because of odor complaints from the community.
- Community, civic, or other organization protests or lawsuits.
- Changes in regulatory requirements.
- Major natural disasters, acts of God, or other *force majeure*.

17.0 REFERENCES

ASTM International (ASTM), 2015. Annual Book of ASTM Standards, Section 4 Construction, Volume 04.08, Soil and Rock.

Caltrans, 2010. Soil and Rock Logging, Classification and Presentation Manual. April 2010.

Department of Toxic Substances Control (DTSC), 2001. Information Advisory, Clean Imported Fill Material. Department of Toxic Substances Control, October 2001.

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

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

DTSC and LARWQCB, 2012. *Advisory – Active Soil Gas Investigations*. April 2012.

DTSC, LARWQCB and SFRWQCB, 2-15. Advisory – Active Soil Gas Investigations. July 2015.

Geosyntec, 2013. Revised Site Specific Cleanup Goals Report, Former Kast Property, Carson California. October 21, 2013.

Geosyntec, 2014a. Revised Human Health Risk Assessment Report, Former Kast Property, Carson, California, Site Cleanup No. 1230, Site ID. 2040330. June 30, 2014.

Geosyntec, 2014b. Revised Feasibility Study, Former Kast Property, Carson, California. June 30, 2014.

Geosyntec, 2015. Sub-Slab Mitigation Diagnostic Pilot Test Report, Former Kast Property, Carson, California, Site Cleanup No. 1230, Site ID. 2040330. August 11, 2015.

Interstate Technology & Regulatory Council (ITRC), 2009. Evaluating Natural Source Zone Depletion at Sites with LNAPL, April, 2009.

LARWQCB and DTSC, 2003. *Advisory – Active Soil Gas Investigations.* January 28, 2003.

Los Angeles LNAPL Workgroup, 2015. Final Report for the LA Basin LNAPL Recoverability Study Western States Petroleum Association, Torrance, California.

New Jersey Department of Environmental Protection (NJDEP), 2013. Vapor Intrusion Technical Guidance. March 2013 (Version 3.1).

RWQCB, 2014a. Review of Remedial Action Plan, Feasibility Study Report and Human Health Risk Assessment Report Pursuant to California Water Code Section 13304 Order. Letter to Shell Oil Products US dated April 30, 2014.

RWQCB, 2014b. Revised Site Specific Cleanup Goals for Total Petroleum Hydrocarbons as Motor Oil and Benzene. Letter to Shell Oil Products US dated May 29, 2014.

San Francisco Regional Water Quality Control Board (SFRWQCB), 2013. User's Guide: Derivation and Application of Environmental Screening Levels, Interim Final. December 23, 2013.

Shell Oil Products US (SOPUS), 2010. Completed RWQCB Chemical Storage and Use Questionnaire. August 31, 2010.

State Water Resources Control Board (SWRCB), 1992. Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304, Resolution 92-49. Amended October 2, 1996.

URS Corporation (URS), 2008a. Phase I Environmental Site Assessment Report, Former Kast Property, Carson, California, July 2008.

U.S. Environmental Protection Agency (USEPA), 1990. National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CFR Title 40, Part 300.

USEPA, 2015. Regional Screening Levels (Formerly PRGs), January 2015.

URS, 2008a. Site Characterization Work Plan, Former Kast Property, Carson, California.

URS, 2008b. Addendum to Site Characterization Work Plan, Former Kast Property, Carson, California.

URS, 2010a. Plume Delineation Report, Former Kast Property, Carson, California . September 29, 2010.

URS and Geosyntec, 2014. Revised Remedial Action Plan, Former Kast Property, Carson, California, Cleanup No. 1230, Site ID. 2040330. June 30, 2014.

TABLES

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24401 MARBELLA AVE	40	5E-01	7E-01	5E-08		No
24402 NEPTUNE AVE	11	1E-01	1E+00	3E-07		No
24402 PANAMA AVE	15	2E-01	1E+00	5E-07		No
24402 RAVENNA AVE	21	3E-01	5E+00	3E-06	TPHd; Benzene	Yes
24403 NEPTUNE AVE	16	2E-01	4E+00	6E-07	TPHd	Yes
24403 RAVENNA AVE	16	2E-01	8E-01	3E-07		No
24405 MARBELLA AVE	13	2E-01	1E+00	1E-08		No
24406 MARBELLA AVE	14	2E-01	4E+00	3E-08	TPHd	Yes
24406 NEPTUNE AVE	29	4E-01	8E-01	1E-07		No
24406 PANAMA AVE	34	4E-01	2E+00	2E-07	no COC-specific HQ >1	Yes
24406 RAVENNA AVE	14	2E-01	1E+00	5E-07		No
24409 NEPTUNE AVE	28	3E-01	1E+00	2E-08		No
24409 RAVENNA AVE	74	9E-01	9E-01	5E-08		No
24410 PANAMA AVE	19	2E-01	1E+00	3E-07		No
24411 MARBELLA AVE	25	3E-01	1E+01	3E-06	TPHd; TPHmo; 1-MN	Yes
24411 PANAMA AVE	48	6E-01	1E+00	5E-08	Arsenic > bkgd	Yes
24412 MARBELLA AVE	56	7E-01	2E+00	3E-07	no COC-specific HQ >1	Yes
24412 RAVENNA AVE	12	2E-01	3E+00	6E-07	TPHd	Yes
24413 NEPTUNE AVE	26	3E-01	4E-01	7E-08		No
24413 RAVENNA AVE	42	5E-01	7E-01	5E-07		No
24416 MARBELLA AVE	15	2E-01	9E-01	6E-09		No
24416 NEPTUNE AVE	10	1E-01	6E-01	9E-09		No
24416 PANAMA AVE	19	2E-01	2E+00	1E-08	no COC-specific HQ >1	Yes
24416 RAVENNA AVE	24	3E-01	1E+01	3E-06	TPHd; TPHmo	Yes
24417 MARBELLA AVE	22	3E-01	7E-01	3E-07		No
24417 PANAMA AVE	16	2E-01	1E+00	4E-07		No
24419 NEPTUNE AVE	28	4E-01	8E-01	3E-08		No
24419 RAVENNA AVE	16	2E-01	2E-01	1E-07		No
24420 PANAMA AVE	34	4E-01	4E+00	2E-07	TPHd; TPHmo	Yes
24421 PANAMA AVE	17	2E-01	1E+00	2E-08		No
24422 MARBELLA AVE	13	2E-01	1E+00	2E-07		No
24422 NEPTUNE AVE	14	2E-01	5E-01	2E-07		No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24422 RAVENNA AVE	13	2E-01	1E+01	4E-06	TPHd; TPHmo; Naphthalene	Yes
24423 MARBELLA AVE	64	8E-01	7E-01	1E-08		No
24423 NEPTUNE AVE	8.7	1E-01	2E-01	5E-07		No
24423 RAVENNA AVE	8.5	1E-01	8E-01	3E-07		No
24426 MARBELLA AVE	31	4E-01	1E+00	3E-07		No
24426 NEPTUNE AVE	14	2E-01	6E-01	3E-07		No
24426 PANAMA AVE	15	2E-01	3E+00	6E-09	no COC-specific HQ >1	Yes
24426 RAVENNA AVE	18	2E-01	1E+00	3E-07		No
24427 MARBELLA AVE	12	2E-01	8E-01	2E-08		No
24427 PANAMA AVE	14	2E-01	8E-01	5E-07		No
24429 NEPTUNE AVE	12	1E-01	5E-01	2E-07		No
24429 RAVENNA AVE	13	2E-01	1E+00	1E-08		No
24430 PANAMA AVE	31	4E-01	1E-01	4E-07		No
24431 PANAMA AVE	19	2E-01	2E+00	5E-07	no COC-specific HQ >1	Yes
24432 MARBELLA AVE	15	2E-01	1E+00	6E-08		No
24433 MARBELLA AVE	132	2E+00	1E+01	2E-05	Lead; TPHd; TPHmo; PCE	Yes
24436 PANAMA AVE	8.8	1E-01	7E-02	4E-07		No
24502 MARBELLA AVE	9.5	1E-01	1E+00	7E-08		No
24502 NEPTUNE AVE	8.5	1E-01	5E-01	4E-07		No
24502 PANAMA AVE	7.4	9E-02	4E-02	2E-07		No
24502 RAVENNA AVE	15	2E-01	7E-01	5E-07		No
24503 MARBELLA AVE	10	1E-01	8E-01	8E-09		No
24503 NEPTUNE AVE	12	1E-01	4E-01	2E-07		No
24503 PANAMA AVE	9.0	1E-01	2E+00	1E-08	no COC-specific HQ >1	Yes
24503 RAVENNA AVE	9.4	1E-01	3E-01	2E-08		No
24506 MARBELLA AVE	26	3E-01	1E+00	6E-09		No
24507 MARBELLA AVE	12	1E-01	1E+00	2E-07		No
24508 NEPTUNE AVE	14	2E-01	2E+00	9E-08	no COC-specific HQ >1	Yes
24508 PANAMA AVE	8.7	1E-01	2E-01	3E-07		No
24508 RAVENNA AVE	8.1	1E-01	1E+00	6E-09		No
24509 NEPTUNE AVE	14	2E-01	1E+00	3E-07		No
24509 PANAMA AVE	23	3E-01	3E+00	5E-07	TPHd	Yes

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24509 RAVENNA AVE	34	4E-01	5E-01	3E-07		No
24512 MARBELLA AVE	13	2E-01	2E+00	3E-08	no COC-specific HQ >1	Yes
24512 NEPTUNE AVE	10	1E-01	7E-01	4E-09		No
24512 PANAMA AVE	9.7	1E-01	8E-02	3E-09		No
24512 RAVENNA AVE	9.9	1E-01	3E-01	3E-07		No
24513 NEPTUNE AVE	10	1E-01	4E-01	2E-07		No
24513 PANAMA AVE	11	1E-01	6E-01	3E-07		No
24513 RAVENNA AVE	16	2E-01	3E-01	2E-08		No
24516 MARBELLA AVE	12	2E-01	1E+00	9E-08		No
24517 MARBELLA AVE	20	2E-01	2E+00	3E-07	no COC-specific HQ >1	Yes
24518 NEPTUNE AVE	25	3E-01	1E+00	5E-09		No
24518 PANAMA AVE	32	4E-01	1E-01	5E-07		No
24518 RAVENNA AVE	12	2E-01	2E-01	2E-07		No
24519 NEPTUNE AVE	12	1E-01	4E-01	4E-07		No
24519 PANAMA AVE	15	2E-01	1E-01	3E-07		No
24522 MARBELLA AVE	9.8	1E-01	5E+00	7E-08	TPHd	Yes
24522 NEPTUNE AVE	8.9	1E-01	6E-01	5E-09		No
24522 PANAMA AVE	13	2E-01	2E-01	3E-07		No
24522 RAVENNA AVE	9.6	1E-01	2E-01	3E-07		No
24523 MARBELLA AVE	48	6E-01	6E-01	3E-08		No
24523 NEPTUNE AVE	14	2E-01	1E+00	2E-08		No
24523 RAVENNA AVE	20	2E-01	7E-01	1E-07		No
24526 MARBELLA AVE	8.3	1E-01	4E+00	6E-07	TPHd	Yes
24528 NEPTUNE AVE	8.3	1E-01	5E-01	2E-07		No
24528 PANAMA AVE	7.4	9E-02	2E-01	1E-08		No
24529 NEPTUNE AVE	13	2E-01	4E-01	3E-07		No
24529 PANAMA AVE	8.2	1E-01	1E-01	5E-07		No
24529 RAVENNA AVE	23	3E-01	8E-01	3E-07		No
24532 MARBELLA AVE	12	1E-01	1E+00	2E-07		No
24532 NEPTUNE AVE	27	3E-01	4E-02	2E-08		No
24532 PANAMA AVE	11	1E-01	2E-01	3E-07		No
24532 RAVENNA AVE	6.9	9E-02	1E-01	3E-07		No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24533 MARBELLA AVE	16	2E-01	7E-01	2E-08		No
24533 PANAMA AVE	6.3	8E-02	2E-01	3E-07		No
24533 RAVENNA AVE	11	1E-01	4E-02	3E-07		No
24602 MARBELLA AVE	15	2E-01	8E-01	6E-07		No
24602 NEPTUNE AVE	9.6	1E-01	2E-01	2E-07		No
24602 PANAMA AVE	16	2E-01	1E+00	3E-07		No
24602 RAVENNA AVE	20	3E-01	3E-01	3E-07		No
24603 MARBELLA AVE	19	2E-01	7E-01	3E-07		No
24603 NEPTUNE AVE	8.6	1E-01	3E+00	4E-06	TPHd; Benzene	Yes
24603 PANAMA AVE	11	1E-01	3E-01	4E-07		No
24603 RAVENNA AVE	31	4E-01	7E+00	8E-07	TPHd; TPHmo; Thallium > bkgd	Yes
24606 MARBELLA AVE	10	1E-01	9E-01	6E-07		No
24607 MARBELLA AVE	17	2E-01	8E-01	3E-08		No
24608 NEPTUNE AVE	39	5E-01	6E+00	1E-06	TPHd; TPHmo	Yes
24608 PANAMA AVE	8.8	1E-01	3E+00	1E-06	Thallium > bkgd	Yes
24608 RAVENNA AVE	18	2E-01	2E+00	2E-08	no COC-specific HQ >1	Yes
24609 NEPTUNE AVE	10	1E-01	4E+00	3E-06	TPHd; Benzene	Yes
24609 PANAMA AVE	8.0	1E-01	7E-01	3E-07		No
24609 RAVENNA AVE	7.1	9E-02	1E+00	7E-09		No
24612 MARBELLA AVE	36	5E-01	2E+00	3E-07	no COC-specific HQ >1	Yes
24612 NEPTUNE AVE	6.6	8E-02	2E-01	2E-07		No
24612 PANAMA AVE	10	1E-01	2E-01	3E-08		No
24612 RAVENNA AVE	27	3E-01	5E-01	5E-09		No
24613 MARBELLA AVE	10	1E-01	7E-01	3E-07	Arsenic > bkgd	Yes
24613 NEPTUNE AVE	11	1E-01	7E+00	1E-06	TPHd; TPHmo	Yes
24613 PANAMA AVE	9.6	1E-01	6E-01	3E-07		No
24613 RAVENNA AVE	8.3	1E-01	8E-01	2E-07		No
24616 MARBELLA AVE	11	1E-01	3E+00	1E-06	no COC-specific HQ >1	Yes
24617 MARBELLA AVE	11	1E-01	2E+00	2E-07	no COC-specific HQ >1; Thallium > bkgd	Yes
24618 NEPTUNE AVE	14	2E-01	4E-01	2E-08		No
24618 PANAMA AVE	21	3E-01	4E+00	7E-08	TPHd; TPHmo	Yes
24618 RAVENNA AVE	4.4	6E-02	1E-01	3E-07		No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24619 NEPTUNE AVE	8.9	1E-01	8E-01	7E-07		No
24619 PANAMA AVE	11	1E-01	6E-01	4E-08		No
24619 RAVENNA AVE	7.2	9E-02	1E-01	2E-07		No
24622 MARBELLA AVE	15	2E-01	9E-01	3E-07	Arsenic > bkgd	Yes
24622 NEPTUNE AVE	9.5	1E-01	9E-01	2E-07		No
24623 MARBELLA AVE	13	2E-01	7E-01	2E-07		No
24623 NEPTUNE AVE	18	2E-01	2E+00	8E-07	no COC-specific HQ >1	Yes
24627 MARBELLA AVE	14	2E-01	1E+00	3E-07		No
24628 MARBELLA AVE	23	3E-01	2E+00	2E-06	no COC-specific HQ >1 or risk >1E-06	Yes
24628 NEPTUNE AVE	7.9	1E-01	3E-01	8E-09		No
24629 NEPTUNE AVE	14	2E-01	7E-01	2E-07		No
24632 NEPTUNE AVE	20	2E-01	3E-01	9E-08		No
24633 MARBELLA AVE	116	1E+00	7E+00	1E-07	TPHd; TPHmo	Yes
24700 MARBELLA AVE	22	3E-01	5E+00	1E-06	TPHd	Yes
24700 RAVENNA AVE	27	3E-01	2E+00	3E-07	no COC-specific HQ >1	Yes
24702 NEPTUNE AVE	11	1E-01	4E-01	9E-09		No
24702 PANAMA AVE	41	5E-01	1E+00	3E-07		No
24703 MARBELLA AVE	28	3E-01	2E+00	2E-07	no COC-specific HQ >1	Yes
24703 NEPTUNE AVE	15	2E-01	7E+00	5E-07	TPHd; TPHmo	Yes
24703 PANAMA AVE	11	1E-01	1E+00	2E-07		No
24703 RAVENNA AVE	8.5	1E-01	2E+00	2E-07	TPHd	Yes
24706 MARBELLA AVE	11	1E-01	8E-01	3E-08		No
24706 RAVENNA AVE	38	5E-01	2E+00	2E-09	no COC-specific HQ >1	Yes
24707 MARBELLA AVE	19	2E-01	9E-01	3E-07		No
24708 PANAMA AVE	20	2E-01	2E+00	9E-07	no COC-specific HQ >1	Yes
24709 NEPTUNE AVE	16	2E-01	1E+00	1E-08		No
24709 PANAMA AVE	13	2E-01	4E-01	2E-07		No
24709 RAVENNA AVE	11	1E-01	4E-01	9E-09		No
24710 MARBELLA AVE	43	5E-01	1E+00	4E-08		No
24712 NEPTUNE AVE	19	2E-01	3E-01	3E-08		No
24712 PANAMA AVE	14	2E-01	1E+00	8E-07		No
24712 RAVENNA AVE	17	2E-01	7E-01	3E-07		No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24713 MARBELLA AVE	8.2	1E-01	1E+00	2E-07		No
24713 PANAMA AVE	15	2E-01	6E-01	3E-08		No
24713 RAVENNA AVE	11	1E-01	4E+00	2E-06	TPHd	Yes
24715 NEPTUNE AVE	16	2E-01	4E+00	2E-06	TPHd	Yes
24716 MARBELLA AVE	15	2E-01	2E+00	2E-07	no COC-specific HQ >1	Yes
24716 RAVENNA AVE	21	3E-01	1E+00	1E-08		No
24717 MARBELLA AVE	8.2	1E-01	3E+00	5E-07	TPHd	Yes
24718 NEPTUNE AVE	6.6	8E-02	2E+00	1E-08	no COC-specific HQ >1; Antimony > bkgd	Yes
24718 PANAMA AVE	22	3E-01	7E-01	6E-07		No
24719 NEPTUNE AVE	34	4E-01	1E+00	9E-08		No
24719 PANAMA AVE	12	2E-01	2E-01	3E-07		No
24719 RAVENNA AVE	29	4E-01	7E+00	4E-06	TPHd; TPHmo	Yes
24722 MARBELLA AVE	11	1E-01	2E+00	6E-07	no COC-specific HQ >1	Yes
24722 NEPTUNE AVE	9.4	1E-01	6E-02	3E-07		No
24722 PANAMA AVE	18	2E-01	7E-01	4E-08		No
24722 RAVENNA AVE	31	4E-01	3E+00	6E-07	TPHmo	Yes
24723 MARBELLA AVE	12	1E-01	4E+00	4E-08	TPHd; TPHmo	Yes
24723 RAVENNA AVE	17	2E-01	4E-01	3E-07		No
24725 NEPTUNE AVE	44	5E-01	4E-01	3E-07		No
24726 MARBELLA AVE	11	1E-01	1E+00	4E-08		No
24726 RAVENNA AVE	7.6	1E-01	7E-01	3E-07		No
24727 MARBELLA AVE	13	2E-01	2E+00	3E-07	no COC-specific HQ >1	Yes
24728 NEPTUNE AVE	13	2E-01	2E+00	2E-06	no COC-specific HQ >1 or risk >1E-06	Yes
24728 PANAMA AVE	48	6E-01	1E+00	7E-07		No
24729 NEPTUNE AVE	37	5E-01	2E+00	6E-07	no COC-specific HQ >1	Yes
24729 PANAMA AVE	10	1E-01	6E-01	1E-08		No
24729 RAVENNA AVE	21	3E-01	2E-01	1E-08		No
24732 MARBELLA AVE	11	1E-01	4E-01	3E-07		No
24732 NEPTUNE AVE	12	2E-01	9E-01	6E-09		No
24732 PANAMA AVE	19	2E-01	8E-01	4E-07		No
24732 RAVENNA AVE	8.4	1E-01	1E+00	2E-07		No
24733 MARBELLA AVE	12	2E-01	3E+00	2E-06	Naphthalene	Yes

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24733 PANAMA AVE	19	2E-01	1E+00	5E-07		No
24733 RAVENNA AVE	11	1E-01	2E+00	1E-07	no COC-specific HQ >1; Thallium > bkgd	Yes
24735 NEPTUNE AVE	13	2E-01	5E+00	8E-09	TPHd; TPHmo	Yes
24736 MARBELLA AVE	16	2E-01	1E+00	2E-07		No
24736 RAVENNA AVE	7.1	9E-02	5E+00	8E-07	TPHd; TPHmo	Yes
24737 MARBELLA AVE	23	3E-01	8E+00	3E-06	TPHd; TPHmo; 1-MN	Yes
24738 NEPTUNE AVE	36	4E-01	1E+00	3E-07		No
24738 PANAMA AVE	22	3E-01	1E+00	2E-07		No
24739 NEPTUNE AVE	19	2E-01	4E+00	2E-07	TPHd; TPHmo	Yes
24739 PANAMA AVE	16	2E-01	8E+00	5E-06	TPHd; TPHmo; EthylBenzene; Naphthalene	Yes
24739 RAVENNA AVE	12	1E-01	9E+00	3E-06	TPHd; TPHmo	Yes
24740 MARBELLA AVE	16	2E-01	1E+00	2E-07		No
24741 MARBELLA AVE	21	3E-01	5E-01	3E-09		No
24743 RAVENNA AVE	11	1E-01	4E+00	9E-07	TPHd; TPHmo	Yes
24744 MARBELLA AVE	14	2E-01	1E+01	2E-07	TPHd; TPHmo	Yes
24748 RAVENNA AVE	10	1E-01	2E+00	3E-07	TPHd	Yes
24749 RAVENNA AVE	16	2E-01	4E+00	9E-07	TPHd	Yes
24752 RAVENNA AVE	14	2E-01	1E+00	5E-09		No
24802 PANAMA AVE	17	2E-01	2E+00	7E-07	no COC-specific HQ >1	Yes
24803 NEPTUNE AVE	16	2E-01	3E+00	9E-09	TPHd; TPHmo	Yes
24803 PANAMA AVE	6.0	8E-02	3E+00	1E-06	TPHd	Yes
24808 PANAMA AVE	20	3E-01	2E+00	4E-07	no COC-specific HQ >1	Yes
24809 NEPTUNE AVE	21	3E-01	2E+00	7E-08	no COC-specific HQ >1	Yes
24809 PANAMA AVE	10	1E-01	2E+00	3E-07	no COC-specific HQ >1	Yes
24812 PANAMA AVE	15	2E-01	2E+00	2E-07	no COC-specific HQ >1	Yes
24813 PANAMA AVE	35	4E-01	2E+00	2E-08	no COC-specific HQ >1	Yes
24815 NEPTUNE AVE	29	4E-01	5E-01	3E-07		No
24818 PANAMA AVE	31	4E-01	9E+00	4E-07	TPHd; TPHmo	Yes
24819 PANAMA AVE	102	1E+00	7E-01	1E-07		No
24822 PANAMA AVE	33	4E-01	2E+00	3E-07	no COC-specific HQ >1	Yes
24823 PANAMA AVE	10	1E-01	2E+00	4E-07	no COC-specific HQ >1	Yes
24825 NEPTUNE AVE	19	2E-01	4E-01	2E-07		No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
24828 PANAMA AVE	66	8E-01	7E+00	1E-08	TPHd; TPHmo	Yes
24829 PANAMA AVE	9.9	1E-01	1E+00	1E-07		No
24832 PANAMA AVE	15	2E-01	6E-01	2E-08		No
24833 PANAMA AVE	19	2E-01	9E-01	2E-07		No
24838 PANAMA AVE	46	6E-01	1E+01	3E-07	TPHd; TPHmo	Yes
24904 NEPTUNE AVE	15	2E-01	6E-01	2E-07		No
24912 NEPTUNE AVE	22	3E-01	1E-01	3E-07		No
301 244TH ST	16	2E-01	1E+00	2E-08		No
305 244TH ST	26	3E-01	1E+01	8E-07	TPHd; TPHmo	Yes
311 244TH ST	71	9E-01	2E+01	1E-05	TPHd; TPHmo; BaP	Yes
317 244TH ST	66	8E-01	3E+01	3E-07	TPHd; TPHmo	Yes
321 244TH ST	17	2E-01	8E-01	2E-07	Arsenic > bkgd	Yes
327 244TH ST	13	2E-01	9E-01	3E-07		No
331 244TH ST	10	1E-01	7E-01	2E-08	Arsenic > bkgd	Yes
337 244TH ST	10	1E-01	2E+00	2E-07	no COC-specific HQ >1	Yes
341 244TH ST	13	2E-01	6E-01	2E-07		No
344 249TH ST	36	5E-01	6E-01	7E-09		No
345 249TH ST	20	2E-01	1E+00	3E-07		No
347 244TH ST	21	3E-01	8E-01	4E-07		No
348 248TH ST	14	2E-01	1E+00	2E-07		No
348 249TH ST	43	5E-01	4E-01	2E-07		No
351 244TH ST	13	2E-01	9E-01	3E-07		No
352 249TH ST	27	3E-01	7E-01	2E-07		No
353 249TH ST	12	2E-01	6E-01	2E-07		No
354 248TH ST	20	2E-01	4E+00	8E-07	TPHd	Yes
357 244TH ST	11	1E-01	6E-01	3E-07		No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)					
	≤2 ft bgs					
	HHRA					Exceeds HHRA?
	Lead		Other COCs		Risk and/or Hazard Drivers	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk		
357 249TH ST	11	1E-01	7E-01	2E-08		No
358 249TH ST	15	2E-01	1E+00	3E-09		No
360 248TH ST	7.7	1E-01	5E-01	7E-09		No
361 244TH ST	13	2E-01	9E-01	6E-07		No
362 249TH ST	20	2E-01	1E+00	4E-08		No
363 249TH ST	35	4E-01	6E-01	3E-08		No
364 248TH ST	17	2E-01	3E+00	2E-07	TPHd	Yes
367 244TH ST	24	3E-01	3E+00	7E-10	TPHd; TPHmo	Yes
367 249TH ST	31	4E-01	7E-01	2E-07		No
368 249TH ST	13	2E-01	9E-01	3E-07		No
373 249TH ST	21	3E-01	5E-01	1E-08		No
374 248TH ST	19	2E-01	1E+00	2E-07		No
374 249TH ST	20	2E-01	8E-01	8E-09		No
377 244TH ST	15	2E-01	1E+00	3E-07		No
377 249TH ST	11	1E-01	4E+00	8E-07	TPHd	Yes
378 249TH ST	20	2E-01	3E-01	2E-07		No
383 249TH ST	15	2E-01	9E-01	4E-08		No
402 249TH ST	14	2E-01	7E-01	1E-08		No
408 249TH ST	42	5E-01	1E-01	3E-07		No
412 249TH ST	66	8E-01	1E+00	5E-07		No

Notes:

HHRA = human health risk assessment; HQ = noncancer hazard quotient

EF = exposure frequency; COC = constituent of concern

ft bgs = feet below ground surface; bkgd = background

TPHd = Total Petroleum Hydrocarbons- diesel range; TPHg = gasoline range;
TPHmo = motor oil range; BaP = benzo(a)pyrene; PCE = tetrachloroethene

Lead Hazard = 95UCL of Lead ÷ SSCG of 80 mg/kg for an onsite resident

The risk assessment was conducted using conservative health-protective assumptions. A risk or hazard exceedance does not indicate that adverse impacts to human health are occurring or will occur, but rather may indicate that actions may be taken to reduce the likelihood of future exposure.

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24401 MARBELLA AVE	29	4E-01	8E-01	4E-07			No
24402 NEPTUNE AVE	9.7	1E-01	1E+00	3E-07		TPHd	Yes
24402 PANAMA AVE	11	1E-01	1E+00	2E-07		TPHd	Yes
24402 RAVENNA AVE	17	2E-01	6E+00	3E-06	TPHd	Benzene; TBA; TPHd; TPHg	Yes
24403 NEPTUNE AVE	12	2E-01	9E+00	1E-05	TPHd; TPHmo; Benzene	Benzene; TPHd; TPHg	Yes
24403 RAVENNA AVE	14	2E-01	8E-01	2E-07			No
24405 MARBELLA AVE	12	1E-01	9E-01	5E-07			No
24406 MARBELLA AVE	14	2E-01	6E+00	9E-06	TPHd; Benzene; Ethylbenzene	Benzene; TPHd; TPHg	Yes
24406 NEPTUNE AVE	21	3E-01	8E-01	1E-07			No
24406 PANAMA AVE	32	4E-01	5E+00	2E-07	TPHd; TPHmo	TPHd	Yes
24406 RAVENNA AVE	12	1E-01	7E-01	5E-07		1,2-DCA	Yes
24409 NEPTUNE AVE	37	5E-01	3E+00	5E-08	TPHd	TBA; TPHd	Yes
24409 RAVENNA AVE	51	6E-01	1E+00	1E-08			No
24410 PANAMA AVE	20	2E-01	1E+00	3E-07			No
24411 MARBELLA AVE	18	2E-01	8E+00	4E-07	TPHd; TPHmo	TPHd	Yes
24411 PANAMA AVE	35	4E-01	6E+00	7E-06	TPHd; Benzene; Arsenic > bkgd	Benzene; TBA; TPHd; TPHg; Arsenic > bkgd	Yes
24412 MARBELLA AVE	40	5E-01	1E+01	4E-06	TPHd; TPHmo; Naphthalene	Benzene; TPHd; TPHg	Yes
24412 RAVENNA AVE	10	1E-01	3E+00	1E-06	TPHd	TPHd; TPHg	Yes
24413 NEPTUNE AVE	27	3E-01	3E+00	1E-06	TPHd	1,4-DCB; TPHd	Yes
24413 RAVENNA AVE	34	4E-01	9E-01	5E-07			No
24416 MARBELLA AVE	23	3E-01	7E+00	8E-06	TPHd; TPHmo; Benzene	Benzene; TPHd; TPHg	Yes
24416 NEPTUNE AVE	36	5E-01	2E+01	8E-08	TPHd; TPHmo	TPHd; TPHmo	Yes
24416 PANAMA AVE	19	2E-01	9E-01	1E-08			No
24416 RAVENNA AVE	12	2E-01	7E+00	1E-06	TPHd; TPHmo	TPHd; TPHg	Yes
24417 MARBELLA AVE	22	3E-01	7E-01	3E-07			No
24417 PANAMA AVE	15	2E-01	1E+00	4E-07			No
24419 NEPTUNE AVE	20	3E-01	2E+00	4E-07	no COC-specific HQ >1	TPHd	Yes
24419 RAVENNA AVE	15	2E-01	4E-01	1E-07			No
24420 PANAMA AVE	27	3E-01	3E+00	2E-07	TPHd; TPHmo	TPHd	Yes
24421 PANAMA AVE	14	2E-01	5E+00	2E-06	TPHd	TPHd; TPHg	Yes
24422 MARBELLA AVE	9.3	1E-01	2E+00	5E-07	TPHd	TPHd	Yes
24422 NEPTUNE AVE	20	3E-01	7E-01	3E-07			No

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24422 RAVENNA AVE	11	1E-01	8E+00	2E-06	TPHd; TPHmo	Benzene; TBA; TPHd; TPHg	Yes
24423 MARBELLA AVE	38	5E-01	6E-01	1E-08			No
24423 NEPTUNE AVE	7.6	1E-01	5E+00	2E-06	TPHd; TPHmo	Benzene; TPHd	Yes
24423 RAVENNA AVE	7.6	1E-01	3E+00	5E-06	Benzene	Benzene; TPHd; TPHg	Yes
24426 MARBELLA AVE	18	2E-01	8E+00	5E-07	TPHd; TPHmo	TPHd; TPHmo; TCE	Yes
24426 NEPTUNE AVE	10	1E-01	1E+00	2E-07			No
24426 PANAMA AVE	13	2E-01	2E+00	2E-07	no COC-specific HQ >1	TPHd	Yes
24426 RAVENNA AVE	14	2E-01	5E+00	3E-06	TPHd	Benzene; TPHd; TPHg	Yes
24427 MARBELLA AVE	11	1E-01	8E-01	2E-08			No
24427 PANAMA AVE	12	1E-01	1E+00	5E-07			No
24429 NEPTUNE AVE	12	1E-01	3E+00	4E-07	TPHd	TPHd	Yes
24429 RAVENNA AVE	11	1E-01	1E+00	3E-07		TPHd	Yes
24430 PANAMA AVE	24	3E-01	7E-02	3E-07			No
24431 PANAMA AVE	14	2E-01	2E+00	5E-07	no COC-specific HQ >1	PCE; TPHd	Yes
24432 MARBELLA AVE	12	2E-01	1E+00	1E-07		TPHd	Yes
24433 MARBELLA AVE	88	1E+00	7E+00	1E-05	TPHd; TPHmo; PCE	PCE; TPHd; TPHmo; TCE	Yes
24436 PANAMA AVE	7.8	1E-01	5E-02	3E-07		1,2,3-TCP	Yes
24502 MARBELLA AVE	9.0	1E-01	2E+00	6E-08	no COC-specific HQ >1	TPHd	Yes
24502 NEPTUNE AVE	6.9	9E-02	6E-01	4E-07			No
24502 PANAMA AVE	6.9	9E-02	4E-02	2E-07			No
24502 RAVENNA AVE	11	1E-01	6E+00	3E-06	TPHd	Benzene; TPHd; TPHg	Yes
24503 MARBELLA AVE	9.4	1E-01	7E-01	1E-08			No
24503 NEPTUNE AVE	11	1E-01	2E+00	3E-07	TPHd	TPHd	Yes
24503 PANAMA AVE	10	1E-01	5E+00	2E-06	TPHd	Benzene; TPHd; TPHg	Yes
24503 RAVENNA AVE	8.5	1E-01	3E-01	3E-07			No
24506 MARBELLA AVE	16	2E-01	8E+00	5E-06	TPHd; TPHmo; Benzene	Benzene; TPHd; TPHg; TPHmo	Yes
24507 MARBELLA AVE	10	1E-01	9E-01	2E-07			No
24508 NEPTUNE AVE	11	1E-01	2E+00	4E-07	no COC-specific HQ >1	1,4-DCB; TPHd	Yes
24508 PANAMA AVE	7.7	1E-01	2E-01	3E-07			No
24508 RAVENNA AVE	7.7	1E-01	3E+00	4E-07	TPHd	TPHd	Yes
24509 NEPTUNE AVE	13	2E-01	3E+00	3E-07	TPHd	TPHd	Yes
24509 PANAMA AVE	14	2E-01	3E+00	7E-07	TPHd	TPHd	Yes

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24509 RAVENNA AVE	29	4E-01	4E+00	3E-07	TPHd; TPHmo	TPHd	Yes
24512 MARBELLA AVE	10	1E-01	7E+00	2E-06	TPHd; TPHmo	Benzene; TBA; TPHd; TPHg	Yes
24512 NEPTUNE AVE	8.4	1E-01	3E+00	8E-07	TPHd	Benzene; TPHd	Yes
24512 PANAMA AVE	8.8	1E-01	8E-02	3E-07			No
24512 RAVENNA AVE	8.7	1E-01	4E+00	4E-06	TPHd; Benzene	Benzene; TPHd; TPHg	Yes
24513 NEPTUNE AVE	9.3	1E-01	4E-01	2E-07			No
24513 PANAMA AVE	8.7	1E-01	6E+00	3E-06	TPHd; TPHmo; Benzene	Benzene; TPHd; TPHg	Yes
24513 RAVENNA AVE	13	2E-01	3E-01	1E-08			No
24516 MARBELLA AVE	11	1E-01	3E+00	1E-06	TPHd	Benzene; TPHd; TPHg	Yes
24517 MARBELLA AVE	12	2E-01	2E+00	3E-07	no COC-specific HQ >1	TPHd	Yes
24518 NEPTUNE AVE	18	2E-01	3E+00	9E-07	TPHd	Benzene; TPHd; TPHg	Yes
24518 PANAMA AVE	22	3E-01	1E-01	3E-07			No
24518 RAVENNA AVE	10	1E-01	6E+00	2E-06	TPHd; TPHmo	Benzene; TPHd; TPHg	Yes
24519 NEPTUNE AVE	10	1E-01	3E+00	8E-07	TPHd	TPHd; TPHg	Yes
24519 PANAMA AVE	18	2E-01	4E+00	2E-06	TPHd	Benzene; TPHd; TPHg	Yes
24522 MARBELLA AVE	8.4	1E-01	1E+01	8E-06	TPHd; TPHmo; Benzene; Ethylbenzene	Benzene; TPHd; TPHg; TPHmo	Yes
24522 NEPTUNE AVE	9.3	1E-01	3E+00	4E-07	no COC-specific HQ >1	TPHd	Yes
24522 PANAMA AVE	10	1E-01	2E-01	3E-07			No
24522 RAVENNA AVE	8.3	1E-01	3E+00	3E-06	TPHd	Benzene; TPHd; TPHg	Yes
24523 MARBELLA AVE	38	5E-01	1E+00	2E-07			No
24523 NEPTUNE AVE	11	1E-01	1E+01	1E-05	TPHd; TPHmo; Benzene	Benzene; TPHd; TPHg	Yes
24523 RAVENNA AVE	16	2E-01	2E+00	8E-07	TPHd	TPHd; TPHg	Yes
24526 MARBELLA AVE	7.6	9E-02	1E+01	3E-05	TPHd; TPHmo; TPHg; Benzene; Naphthalene	Benzene; TBA; TPHd; TPHg	Yes
24528 NEPTUNE AVE	7.7	1E-01	1E+00	7E-07		TPHd; TPHg	Yes
24528 PANAMA AVE	12	2E-01	6E-01	1E-08			No
24529 NEPTUNE AVE	10	1E-01	7E+00	1E-05	TPHd; TPHmo; Benzene	Benzene; TBA; TPHd; TPHg	Yes
24529 PANAMA AVE	7.2	9E-02	9E-02	4E-07			No
24529 RAVENNA AVE	15	2E-01	2E+00	5E-07	no COC-specific HQ >1	TPHd	Yes
24532 MARBELLA AVE	9.2	1E-01	1E+01	9E-06	TPHd; TPHmo; Benzene; Naphthalene	Benzene; TPHd; TPHg	Yes
24532 NEPTUNE AVE	25	3E-01	4E-02	5E-07			No
24532 PANAMA AVE	9.2	1E-01	1E+00	3E-07		TPHd	Yes
24532 RAVENNA AVE	6.3	8E-02	1E-01	3E-07			No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24533 MARBELLA AVE	20	2E-01	7E-01	2E-08			No
24533 PANAMA AVE	8.4	1E-01	1E+00	2E-07		TPHd	Yes
24533 RAVENNA AVE	7.5	9E-02	2E-02	2E-07			No
24602 MARBELLA AVE	13	2E-01	8E-01	7E-07			No
24602 NEPTUNE AVE	8.3	1E-01	2E-01	2E-07			No
24602 PANAMA AVE	20	2E-01	8E-01	3E-07			No
24602 RAVENNA AVE	15	2E-01	2E-01	3E-07			No
24603 MARBELLA AVE	16	2E-01	5E+00	7E-07	TPHd; TPHmo	TPHd	Yes
24603 NEPTUNE AVE	7.9	1E-01	2E+00	5E-06	Benzene; Ethylbenzene	Benzene; TPHd; TPHg	Yes
24603 PANAMA AVE	13	2E-01	1E+00	3E-07		TPHd	Yes
24603 RAVENNA AVE	22	3E-01	6E+00	3E-07	Thallium > bkgd	TPHd; Thallium > bkgd	Yes
24606 MARBELLA AVE	8.1	1E-01	8E+00	7E-06	TPHd; TPHmo; Benzene; Naphthalene	Benzene; TPHd; TPHg	Yes
24607 MARBELLA AVE	14	2E-01	7E-01	2E-07			No
24608 NEPTUNE AVE	30	4E-01	5E+00	2E-06	TPHd	TPHd; TPHg	Yes
24608 PANAMA AVE	116	1E+00	2E+01	1E-06	TPHd; TPHmo; Thallium > bkgd	TPHd; TPHmo; Thallium > bkgd	Yes
24608 RAVENNA AVE	18	2E-01	4E+00	2E-06	TPHd	Benzene; TPHd; TPHg	Yes
24609 NEPTUNE AVE	8.5	1E-01	1E+01	8E-06	TPHd; TPHmo; Benzene; Naphthalene	Benzene; TPHd; TPHg	Yes
24609 PANAMA AVE	19	2E-01	3E+00	3E-07	TPHd	TPHd	Yes
24609 RAVENNA AVE	6.6	8E-02	1E+00	2E-07		TPHd	Yes
24612 MARBELLA AVE	26	3E-01	9E+00	6E-06	TPHd; TPHmo; Benzene	1,2,3-TCP; Benzene; TPHd; TPHg	Yes
24612 NEPTUNE AVE	8.3	1E-01	7E+00	5E-06	TPHd; TPHmo; Benzene; Naphthalene	Benzene; TPHd; TPHg	Yes
24612 PANAMA AVE	12	1E-01	1E+00	8E-07		TPHd; TPHg	Yes
24612 RAVENNA AVE	35	4E-01	5E+00	1E-07	TPHd; TPHmo	TPHd	Yes
24613 MARBELLA AVE	9.8	1E-01	7E-01	3E-07	Arsenic > bkgd	Arsenic > bkgd	Yes
24613 NEPTUNE AVE	9.2	1E-01	6E+00	3E-06	TPHd; TPHmo	Benzene; TBA; TPHd; TPHg	Yes
24613 PANAMA AVE	51	6E-01	1E+01	5E-07	TPHd; TPHmo	TPHd; TPHmo	Yes
24613 RAVENNA AVE	7.2	9E-02	2E+00	2E-06	no COC-specific HQ >1 or risk >1E-06	TPHd; TPHg	Yes
24616 MARBELLA AVE	9.4	1E-01	1E+01	1E-05	TPHd; TPHmo; BaP, 1-MN, Benzene; Naphthalene; VC	Benzene; c-1,2-DCE; TPHd; TPHg; TPHmo; TCE, VC	Yes
24617 MARBELLA AVE	11	1E-01	2E+00	2E-07	no COC-specific HQ >1; Thallium > bkgd	Thallium > bkgd	Yes
24618 NEPTUNE AVE	12	1E-01	4E+00	1E-06	TPHd	TPHd	Yes
24618 PANAMA AVE	15	2E-01	3E+00	2E-07	TPHd	TPHd	Yes
24618 RAVENNA AVE	4.6	6E-02	1E+00	6E-07		TPHd	Yes

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24619 NEPTUNE AVE	11	1E-01	5E+00	2E-06	TPHd	Benzene; TPHd; TPHg	Yes
24619 PANAMA AVE	19	2E-01	3E+00	1E-06	TPHd	Benzene; TPHd; TPHg	Yes
24619 RAVENNA AVE	7.0	9E-02	2E-01	3E-07			No
24622 MARBELLA AVE	12	1E-01	1E+01	1E-05	TPHd; TPHmo; BaP; Naphthalene; Arsenic > bkgd	Benzene; TPHd; TPHg; Arsenic > bkgd	Yes
24622 NEPTUNE AVE	17	2E-01	4E+00	1E-06	TPHd	TPHd	Yes
24623 MARBELLA AVE	11	1E-01	8E+00	2E-06	TPHd; TPHg	TPHd; TPHg	Yes
24623 NEPTUNE AVE	16	2E-01	4E+00	2E-06	TPHd	TPHd; TPHg; TCE	Yes
24627 MARBELLA AVE	11	1E-01	7E+00	3E-06	TPHd; Naphthalene	1,2-DCA; TPHd; TPHg; TCE	Yes
24628 MARBELLA AVE	18	2E-01	7E+00	6E-06	TPHd; TPHmo; Benzene; Ethylbenzene	Benzene; TPHd; TPHg	Yes
24628 NEPTUNE AVE	12	2E-01	3E-01	2E-08			No
24629 NEPTUNE AVE	10	1E-01	6E+00	2E-06	TPHd; TPHmo	Benzene; TPHd; TPHg	Yes
24632 NEPTUNE AVE	18	2E-01	3E+00	5E-07	TPHd	TPHd	Yes
24633 MARBELLA AVE	80	1E+00	5E+00	7E-08	TPHd; TPHmo	TPHd	Yes
24700 MARBELLA AVE	17	2E-01	6E+00	1E-06	TPHd; TPHmo	TPHd; TPHg	Yes
24700 RAVENNA AVE	19	2E-01	1E+00	3E-07			No
24702 NEPTUNE AVE	12	2E-01	4E+00	6E-07	TPHd; TPHmo	TPHd; TPHg	Yes
24702 PANAMA AVE	35	4E-01	3E+00	5E-06	TPHd; Benzene	Benzene; TPHd; TPHg	Yes
24703 MARBELLA AVE	17	2E-01	2E+00	2E-07	no COC-specific HQ >1	TPHd	Yes
24703 NEPTUNE AVE	11	1E-01	5E+00	9E-07	TPHd; TPHmo	TPHd; TPHg	Yes
24703 PANAMA AVE	16	2E-01	2E+00	4E-07	no COC-specific HQ >1	TPHd	Yes
24703 RAVENNA AVE	9.2	1E-01	3E+00	2E-06	TPHd	Benzene; TPHd	Yes
24706 MARBELLA AVE	10	1E-01	5E+00	2E-06	TPHd	1,4-DCB; TPHd; TPHg	Yes
24706 RAVENNA AVE	32	4E-01	2E+00	3E-09	no COC-specific HQ >1	TPHd	Yes
24707 MARBELLA AVE	14	2E-01	7E-01	2E-07			No
24708 PANAMA AVE	16	2E-01	2E+00	4E-07	no COC-specific HQ >1	TPHd	Yes
24709 NEPTUNE AVE	13	2E-01	3E+00	8E-07	TPHd	Benzene; TPHd; TPHg	Yes
24709 PANAMA AVE	12	2E-01	2E+00	1E-06	no COC-specific HQ >1	Benzene; TPHd; TPHg	Yes
24709 RAVENNA AVE	9.3	1E-01	3E+00	2E-06	TPHd	Benzene; TPHd; TPHg	Yes
24710 MARBELLA AVE	28	4E-01	8E+00	4E-06	TPHd; TPHmo; Benzene	1,4-DCB; Benzene; TBA; TPHd; TPHg	Yes
24712 NEPTUNE AVE	13	2E-01	2E+00	4E-07	TPHd	TPHd; TPHg	Yes
24712 PANAMA AVE	67	8E-01	7E+00	7E-07	TPHd; TPHmo	TPHd; TPHg	Yes
24712 RAVENNA AVE	35	4E-01	2E+00	7E-07	no COC-specific HQ >1	TPHd	Yes

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24713 MARBELLA AVE	6.9	9E-02	7E-01	2E-07			No
24713 PANAMA AVE	17	2E-01	3E+00	2E-07	TPHd	TBA; TPHd	Yes
24713 RAVENNA AVE	6.7	8E-02	3E+00	1E-06	TPHd	TPHd; TPHg	Yes
24715 NEPTUNE AVE	12	2E-01	6E+00	5E-06	TPHd; TPHmo; BaP	1,2-DCA; TPHd; TPHg	Yes
24716 MARBELLA AVE	15	2E-01	6E+00	4E-06	TPHd; Ethylbenzene	Benzene; TPHd; TPHg	Yes
24716 RAVENNA AVE	13	2E-01	3E+00	5E-08	TPHd	TPHd	Yes
24717 MARBELLA AVE	7.2	9E-02	3E+00	1E-06	TPHd	TPHd	Yes
24718 NEPTUNE AVE	5.8	7E-02	7E+00	3E-06	TPHd; TPHmo; Antimony > bkgd; no COC-specific risk >1E-06	Benzene; TPHd; TPHg; Antimony > bkdg	Yes
24718 PANAMA AVE	23	3E-01	3E+00	5E-07	TPHd	1,2,3-TCP; TPHd	Yes
24719 NEPTUNE AVE	32	4E-01	4E+00	2E-06	TPHd	1,4-DCB; TPHd; TPHg	Yes
24719 PANAMA AVE	17	2E-01	3E+00	3E-07	TPHd	TPHd	Yes
24719 RAVENNA AVE	19	2E-01	5E+00	2E-06	TPHd	Benzene; TPHd; TPHg	Yes
24722 MARBELLA AVE	9.6	1E-01	2E+00	6E-07	no COC-specific HQ >1	TPHd	Yes
24722 NEPTUNE AVE	7.7	1E-01	4E-02	2E-07			No
24722 PANAMA AVE	13	2E-01	2E+00	6E-08	no COC-specific HQ >1	TPHd	Yes
24722 RAVENNA AVE	36	5E-01	4E+00	6E-07	TPHd; TPHmo	TPHd	Yes
24723 MARBELLA AVE	9.6	1E-01	3E+00	2E-07	no COC-specific HQ >1	TPHd	Yes
24723 RAVENNA AVE	17	2E-01	1E+00	4E-07		1,4-DCB; TPHd	Yes
24725 NEPTUNE AVE	30	4E-01	4E-01	2E-07			No
24726 MARBELLA AVE	9.5	1E-01	1E+00	3E-07			No
24726 RAVENNA AVE	6.6	8E-02	1E+00	3E-07		TPHd	Yes
24727 MARBELLA AVE	20	2E-01	6E+00	1E-06	TPHd; TPHmo	Benzene; TPHd; TPHg	Yes
24728 NEPTUNE AVE	7.5	9E-02	3E+00	6E-06	Benzene	Benzene; TPHd; TPHg	Yes
24728 PANAMA AVE	80	1E+00	2E+01	7E-07	TPHd; TPHmo	TPHd; TPHmo	Yes
24729 NEPTUNE AVE	42	5E-01	1E+00	3E-07		TPHd	Yes
24729 PANAMA AVE	17	2E-01	6E-01	3E-07			No
24729 RAVENNA AVE	19	2E-01	2E-01	3E-07			No
24732 MARBELLA AVE	8.6	1E-01	3E+00	1E-06	TPHd	TPHd	Yes
24732 NEPTUNE AVE	9.5	1E-01	8E+00	2E-05	TPHd; TPHmo; Benzene; Naphthalene	Benzene; TPHd; TPHg; TCE	Yes
24732 PANAMA AVE	14	2E-01	7E-01	3E-07			No
24732 RAVENNA AVE	8.1	1E-01	2E+00	3E-07	no COC-specific HQ >1	TPHd	Yes
24733 MARBELLA AVE	10	1E-01	2E+00	8E-07	no COC-specific HQ >1	TPHd; TPHg	Yes

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24733 PANAMA AVE	32	4E-01	1E+00	5E-07		TPHd	Yes
24733 RAVENNA AVE	9.4	1E-01	1E+00	4E-07	Thallium > bkgd	1,2,3-TCP; TPHd; Thallium > bkgd	Yes
24735 NEPTUNE AVE	13	2E-01	3E+00	3E-07	TPHd	TPHd	Yes
24736 MARBELLA AVE	13	2E-01	7E-01	2E-07			No
24736 RAVENNA AVE	6.5	8E-02	5E+00	2E-06	TPHd; TPHmo	Benzene; TBA; TPHd; TPHg	Yes
24737 MARBELLA AVE	18	2E-01	6E+00	1E-06	TPHd; TPHmo	TPHd; TPHg	Yes
24738 NEPTUNE AVE	24	3E-01	1E+01	2E-05	TPHd; TPHmo; TPHg; Benzene; Naphthalene	Benzene; PCE; TPHd; TPHg	Yes
24738 PANAMA AVE	39	5E-01	3E+00	3E-07	TPHd	TPHd	Yes
24739 NEPTUNE AVE	15	2E-01	3E+00	4E-07	no COC-specific HQ >1	TPHd	Yes
24739 PANAMA AVE	12	2E-01	9E+00	3E-06	TPHd; TPHmo; Naphthalene	Benzene; TBA; TPHd; TPHg; TPHmo	Yes
24739 RAVENNA AVE	12	2E-01	2E+01	2E-05	TPHd; TPHmo; TPHg; Benzene; Naphthalene	Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24740 MARBELLA AVE	15	2E-01	2E+00	3E-07	no COC-specific HQ >1	TPHd	Yes
24741 MARBELLA AVE	14	2E-01	1E+00	4E-07			No
24743 RAVENNA AVE	10	1E-01	1E+01	4E-06	TPHd; TPHmo	Benzene; TPHd; TPHg; TPHmo	Yes
24744 MARBELLA AVE	12	1E-01	7E+00	4E-07	TPHd; TPHmo	TPHd	Yes
24748 RAVENNA AVE	8.6	1E-01	6E+00	3E-06	TPHd; TPHmo	Benzene; TBA; TPHd; TPHg	Yes
24749 RAVENNA AVE	24	3E-01	6E+00	8E-07	TPHd; TPHmo	Benzene; TPHd; TPHg	Yes
24752 RAVENNA AVE	48	6E-01	6E+00	2E-06	TPHd; TPHmo; Naphthalene	TBA; TPHd; TPHg	Yes
24802 PANAMA AVE	18	2E-01	3E+00	5E-07	no COC-specific HQ >1	TPHd	Yes
24803 NEPTUNE AVE	14	2E-01	2E+00	3E-07	no COC-specific HQ >1	1,2-DCA; TPHd	Yes
24803 PANAMA AVE	5.2	7E-02	4E+00	6E-06	TPHd; Benzene; Naphthalene	Benzene; TPHd; TPHg	Yes
24808 PANAMA AVE	15	2E-01	2E+00	4E-07	no COC-specific HQ >1	TPHd	Yes
24809 NEPTUNE AVE	17	2E-01	2E+00	4E-07	no COC-specific HQ >1	TPHd	Yes
24809 PANAMA AVE	8.7	1E-01	6E+00	3E-06	TPHd; TPHmo	Benzene; TPHd; TPHg	Yes
24812 PANAMA AVE	14	2E-01	8E-01	2E-07		TPHd	Yes
24813 PANAMA AVE	19	2E-01	6E+00	4E-06	TPHd; TPHmo; Naphthalene	Benzene; TPHd; TPHg	Yes
24815 NEPTUNE AVE	23	3E-01	3E+00	4E-07	TPHd	TPHd	Yes
24818 PANAMA AVE	29	4E-01	1E+01	2E-06	TPHd; TPHmo	TPHd; TPHg; TPHmo	Yes
24819 PANAMA AVE	61	8E-01	5E+00	4E-06	TPHd; Benzene	1,2,3-TCP; Benzene; TPHd; TPHg	Yes
24822 PANAMA AVE	25	3E-01	1E+01	8E-07	TPHd; TPHmo	1,2,3-TCP; TBA; TPHd; TPHmo	Yes
24823 PANAMA AVE	8.0	1E-01	3E+00	3E-07	TPHd	TPHd	Yes
24825 NEPTUNE AVE	15	2E-01	3E-01	2E-07			No

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24828 PANAMA AVE	49	6E-01	2E+01	8E-09	TPHd; TPHmo	TBA; TPHd; TPHmo	Yes
24829 PANAMA AVE	9.3	1E-01	1E+00	7E-07		TPHd	Yes
24832 PANAMA AVE	12	1E-01	1E+00	2E-08		TPHd	Yes
24833 PANAMA AVE	12	1E-01	1E+00	3E-07		TPHd	Yes
24838 PANAMA AVE	21	3E-01	7E+00	4E-07	TPHd; TPHmo	TPHd; TPHmo	Yes
24904 NEPTUNE AVE	12	2E-01	9E-01	3E-07			No
24912 NEPTUNE AVE	21	3E-01	1E-01	2E-07			No
301 244TH ST	13	2E-01	8E-01	3E-07			No
305 244TH ST	37	5E-01	2E+01	5E-07	TPHd; TPHmo	1,2,3-TCP; TPHd; TPHmo	Yes
311 244TH ST	78	1E+00	4E+01	3E-05	TPHd; TPHmo; BaP; BaA; BbF	TPHd; TPHmo	Yes
317 244TH ST	51	6E-01	2E+01	2E-07	TPHd; TPHmo	TPHd; TPHmo	Yes
321 244TH ST	15	2E-01	8E-01	2E-07	Arsenic > bkgd	Arsenic > bkgd	Yes
327 244TH ST	9.7	1E-01	7E-01	6E-07			No
331 244TH ST	9.2	1E-01	7E-01	5E-07	Arsenic > bkgd	Arsenic > bkgd	Yes
337 244TH ST	9.0	1E-01	1E+00	2E-07			No
341 244TH ST	11	1E-01	6E-01	5E-07			No
344 249TH ST	18	2E-01	2E+00	8E-09	no COC-specific HQ >1	TPHd	Yes
345 249TH ST	28	3E-01	1E+00	3E-07		TPHd	Yes
347 244TH ST	14	2E-01	7E-01	4E-07			No
348 248TH ST	12	2E-01	8E+00	4E-06	TPHd; TPHmo; Naphthalene	Benzene; TPHd	Yes
348 249TH ST	36	4E-01	1E+00	6E-07		TPHd	Yes
351 244TH ST	39	5E-01	3E+00	6E-07	no COC-specific HQ >1	TPHd	Yes
352 249TH ST	20	2E-01	8E-01	2E-07			No
353 249TH ST	9.6	1E-01	3E+00	4E-06	TPHd; Benzene	Benzene; TPHd; TPHg	Yes
354 248TH ST	14	2E-01	4E+00	2E-06	TPHd; Naphthalene	TPHd	Yes
357 244TH ST	9.7	1E-01	6E-01	3E-07			No

Table 2-1
Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident
Former Kast Property

Location	Resident (EF = 350 d/y)						
	≤5 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
357 249TH ST	9.7	1E-01	6E-01	3E-08			No
358 249TH ST	10	1E-01	3E+00	9E-07	TPHd	TPHd	Yes
360 248TH ST	8.0	1E-01	2E+00	3E-07	no COC-specific HQ >1	TPHd	Yes
361 244TH ST	11	1E-01	6E-01	6E-07			No
362 249TH ST	19	2E-01	1E+00	4E-08			No
363 249TH ST	33	4E-01	8E-01	3E-08		TPHd	Yes
364 248TH ST	11	1E-01	4E+00	1E-06	TPHd	Benzene; TBA; TPHd	Yes
367 244TH ST	88	1E+00	8E+00	7E-10	TPHd; TPHmo	TPHd; TPHmo	Yes
367 249TH ST	16	2E-01	1E+00	2E-07		TPHd	Yes
368 249TH ST	28	4E-01	6E+00	2E-06	TPHd; TPHmo	Benzene; TPHd; TPHg	Yes
373 249TH ST	19	2E-01	1E+00	2E-07		TPHd	Yes
374 248TH ST	18	2E-01	5E+00	5E-07	TPHd; TPHmo	TBA; TPHd	Yes
374 249TH ST	21	3E-01	4E+00	2E-06	TPHd	Benzene; TPHd; TPHg	Yes
377 244TH ST	13	2E-01	8E-01	3E-07			No
377 249TH ST	8.0	1E-01	4E+00	8E-07	TPHd	TPHd	Yes
378 249TH ST	14	2E-01	3E+00	6E-07	TPHd	TPHd	Yes
383 249TH ST	13	2E-01	2E+00	7E-08	no COC-specific HQ >1	TPHd	Yes
402 249TH ST	11	1E-01	3E+00	6E-07	TPHd	TPHd	Yes
408 249TH ST	46	6E-01	2E-01	3E-07			No
412 249TH ST	49	6E-01	2E+00	3E-07	no COC-specific HQ >1	TPHd	Yes

Notes:

HHRA = human health risk assessment; HQ = noncancer hazard quotient; GW = groundwater

EF = exposure frequency; COC = constituent of concern; 95UCL = 95% upper confidence limit

ft bgs = feet below ground surface; SSCG = Site-specific cleanup goal; bkgd = background

TPHd = Total Petroleum Hydrocarbons- diesel range; TPHg = gasoline range; TPHmo = motor oil range

BaP = benzo(a)pyrene; BaA = Benzo(a)Anthracene; BbF = Benzo(b)Fluoranthene; MN = Methylnaphthalene; DCA = Dichloroethane; DCE = Dichloroethene; DCB = Dichlorobenzene; TBA = tert-Butyl Alcohol; PCE = tetrachloroethene; TCE = trichloroethene; TCP = Trichloropropane; VC = vinyl chloride

Lead Hazard = 95UCL of Lead ÷ SSCG of 80 mg/kg for an onsite resident

The risk assessment was conducted using conservative health-protective assumptions. A risk or hazard exceedance does not indicate that adverse impacts to human health are occurring or will occur, but rather may indicate that actions may be taken to reduce the likelihood of future exposure.

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24401 MARBELLA AVE	10	1E-02	9E-03	8E-11			No
24402 NEPTUNE AVE	7.9	1E-02	1E-01	1E-08		TPHd	Yes
24402 PANAMA AVE	7.2	9E-03	8E-03	5E-10			No
24402 RAVENNA AVE	7.1	9E-03	3E-01	8E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24403 NEPTUNE AVE	9.4	1E-02	2E-01	3E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24403 RAVENNA AVE	12	1E-02	7E-02	1E-08		Benzene; TPHd; TPHg	Yes
24405 MARBELLA AVE	15	2E-02	8E-03	2E-11			No
24406 MARBELLA AVE	4.9	6E-03	2E-01	7E-07		Benzene; TPHd; TPHg	Yes
24406 NEPTUNE AVE	40	5E-02	3E-01	2E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24406 PANAMA AVE	5.6	7E-03	4E-03	6E-10			No
24406 RAVENNA AVE	17	2E-02	5E-02	5E-09		TPHd	Yes
24409 NEPTUNE AVE	10	1E-02	2E-01	4E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24409 RAVENNA AVE	7.1	9E-03	8E-02	1E-08		TPHd; TPHg	Yes
24410 PANAMA AVE	6.2	8E-03	5E-03	7E-11			No
24411 MARBELLA AVE	5.4	7E-03	6E-03	4E-10			No
24411 PANAMA AVE	9.3	1E-02	2E-01	4E-07	Arsenic > bkgd	Benzene; Naphthalene; TPHd; TPHg; TPHmo; Arsenic > bkgd	Yes
24412 MARBELLA AVE	20	2E-02	3E-01	4E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24412 RAVENNA AVE	8.0	1E-02	1E-01	6E-09		TPHd; TPHg	Yes
24413 NEPTUNE AVE	7.7	9E-03	2E-01	8E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24413 RAVENNA AVE	13	2E-02	1E-01	3E-09		TPHd	Yes
24416 MARBELLA AVE	4.9	6E-03	2E-01	1E-07		Benzene; TPHd; TPHg	Yes
24416 NEPTUNE AVE	9.9	1E-02	4E-03	6E-10			No
24416 PANAMA AVE	4.4	5E-03	4E-03	3E-11			No
24416 RAVENNA AVE	11	1E-02	5E-02	5E-09		TPHd; TPHg	Yes
24417 MARBELLA AVE	8.4	1E-02	6E-03	1E-11			No
24417 PANAMA AVE	12	2E-02	2E-01	2E-07		Benzene; TPHd; TPHg	Yes
24419 NEPTUNE AVE	12	2E-02	1E-01	6E-08		Benzene; TPHd; TPHg	Yes
24419 RAVENNA AVE	7.4	9E-03	1E-02	6E-09		TPHd	Yes
24420 PANAMA AVE	5.9	7E-03	5E-03	2E-10			No
24421 PANAMA AVE	8.5	1E-02	2E-01	1E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24422 MARBELLA AVE	8.9	1E-02	2E-01	1E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24422 NEPTUNE AVE	8.1	1E-02	2E-02	2E-09		TBA; TPHd; TPHg	Yes

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24422 RAVENNA AVE	11	1E-02	4E-02	3E-09		TBA; TPHd	Yes
24423 MARBELLA AVE	6.1	7E-03	6E-03	4E-12			No
24423 NEPTUNE AVE	7.3	9E-03	2E-01	8E-08		Benzene; TPHd; TPHg	Yes
24423 RAVENNA AVE	6.6	8E-03	6E-02	2E-08		Benzene; TPHd	Yes
24426 MARBELLA AVE	13	2E-02	2E-01	5E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24426 NEPTUNE AVE	10	1E-02	4E-02	2E-09		TPHd	Yes
24426 PANAMA AVE	4.9	6E-03	5E-03	2E-10			No
24426 RAVENNA AVE	7.6	9E-03	1E-02	8E-09			No
24427 MARBELLA AVE	9.5	1E-02	8E-03	1E-11			No
24427 PANAMA AVE	43	5E-02	6E-02	2E-08		Benzene; TPHd; TPHg	Yes
24429 NEPTUNE AVE	21	3E-02	2E-01	1E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24429 RAVENNA AVE	5.9	7E-03	9E-03	6E-09		TPHg	Yes
24430 PANAMA AVE	5.3	7E-03	3E-05	4E-09			No
24431 PANAMA AVE	5.7	7E-03	4E-02	3E-09		TPHd	Yes
24432 MARBELLA AVE	10	1E-02	1E-01	3E-08		Benzene; c-1,2-DCE; TPHd; TPHg; TCE	Yes
24433 MARBELLA AVE	23	3E-02	1E-02	1E-09			No
24436 PANAMA AVE	2.2	3E-03	7E-05	2E-09			No
24502 MARBELLA AVE	655	8E-01	8E-02	2E-08		TPHd; TPHg	Yes
24502 NEPTUNE AVE	8.8	1E-02	9E-02	4E-09		TPHd	Yes
24502 PANAMA AVE	1.9	2E-03	9E-06	1E-09			No
24502 RAVENNA AVE	13	2E-02	2E-02	7E-09		Benzene; TBA; TPHd; TPHg	Yes
24503 MARBELLA AVE	12	1E-02	1E-02	2E-10			No
24503 NEPTUNE AVE	9.6	1E-02	1E-01	2E-08		Benzene; TBA; TPHd; TPHg	Yes
24503 PANAMA AVE	8.0	1E-02	4E-02	3E-09		TPHd; TPHg	Yes
24503 RAVENNA AVE	7.7	9E-03	3E-02	1E-08		TPHd; TPHg	Yes
24506 MARBELLA AVE	14	2E-02	2E-01	3E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24507 MARBELLA AVE	10	1E-02	9E-03	5E-11			No
24508 NEPTUNE AVE	6.6	8E-03	1E-01	9E-08		Benzene; TPHd; TPHg	Yes
24508 PANAMA AVE	3.2	4E-03	4E-06	6E-10			No
24508 RAVENNA AVE	29	4E-02	2E-01	4E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24509 NEPTUNE AVE	14	2E-02	4E-02	5E-09		TPHd	Yes
24509 PANAMA AVE	7.5	9E-03	1E-01	8E-08		Benzene; TPHd; TPHg	Yes

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24509 RAVENNA AVE	8.1	1E-02	2E-01	4E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24512 MARBELLA AVE	7.7	9E-03	2E-01	9E-08		Benzene; TBA; TPHd; TPHg; TPHmo	Yes
24512 NEPTUNE AVE	6.1	7E-03	9E-02	6E-08		Benzene; TPHd; TPHg	Yes
24512 PANAMA AVE	5.0	6E-03	1E-06	3E-10			No
24512 RAVENNA AVE	24	3E-02	6E-02	5E-08		Benzene; TPHd; TPHg	Yes
24513 NEPTUNE AVE	6.6	8E-03	9E-02	8E-08		Benzene; TPHd; TPHg	Yes
24513 PANAMA AVE	5.5	7E-03	1E-01	1E-07		1,4-DCB; Benzene; TPHd; TPHg	Yes
24513 RAVENNA AVE	5.7	7E-03	2E-01	5E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24516 MARBELLA AVE	9.1	1E-02	4E-01	9E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24517 MARBELLA AVE	19	2E-02	1E-02	3E-09			No
24518 NEPTUNE AVE	6.2	8E-03	2E-01	5E-08		Benzene; TBA; TPHd; TPHg; TPHmo	Yes
24518 PANAMA AVE	3.0	4E-03	2E-04	3E-09			No
24518 RAVENNA AVE	6.6	8E-03	1E-01	7E-08		Benzene; TPHd; TPHg	Yes
24519 NEPTUNE AVE	8.6	1E-02	6E-02	2E-08		Benzene; TBA; TPHd; TPHg	Yes
24519 PANAMA AVE	6.0	7E-03	2E-01	6E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24522 MARBELLA AVE	6.2	8E-03	3E-01	9E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24522 NEPTUNE AVE	11	1E-02	6E-02	3E-08		Benzene; TPHd; TPHg	Yes
24522 PANAMA AVE	2.0	2E-03	1E-04	3E-09			No
24522 RAVENNA AVE	4.2	5E-03	9E-02	3E-08		Benzene; TPHd; TPHg	Yes
24523 MARBELLA AVE	8.3	1E-02	6E-03	5E-09			No
24523 NEPTUNE AVE	7.5	9E-03	2E-01	3E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24523 RAVENNA AVE	6.2	8E-03	1E-01	4E-08		Benzene; TPHd; TPHg	Yes
24526 MARBELLA AVE	5.3	6E-03	2E-01	6E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24528 NEPTUNE AVE	4.8	6E-03	4E-02	2E-08		TPHd; TPHg; TCE	Yes
24528 PANAMA AVE	2.7	3E-03	3E-04	1E-10			No
24529 NEPTUNE AVE	14	2E-02	2E-01	6E-07		Benzene; TPHd; TPHg	Yes
24529 PANAMA AVE	3.3	4E-03	3E-05	6E-09			No
24529 RAVENNA AVE	2.3	3E-03	2E-01	8E-08		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24532 MARBELLA AVE	8.5	1E-02	5E-01	3E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24532 NEPTUNE AVE	3.2	4E-03					No
24532 PANAMA AVE	68	8E-02	7E-02	1E-07		1,2,3-TCP; TPHd	Yes
24532 RAVENNA AVE	2.9	4E-03	5E-05	4E-09			No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24533 MARBELLA AVE	7.8	1E-02	8E-03	3E-10			No
24533 PANAMA AVE	4.3	5E-03	1E-03	4E-09			No
24533 RAVENNA AVE	4.0	5E-03	2E-04	4E-09			No
24602 MARBELLA AVE	8.6	1E-02	1E-01	1E-07		Naphthalene; TPHd; TPHg	Yes
24602 NEPTUNE AVE	3.4	4E-03	1E-04	3E-09			No
24602 PANAMA AVE	46	6E-02	4E-02	3E-09		TPHd	Yes
24602 RAVENNA AVE	13	2E-02	2E-05	2E-09			No
24603 MARBELLA AVE	9.6	1E-02	9E-03	3E-09			No
24603 NEPTUNE AVE	4.1	5E-03	1E-02	9E-09		Benzene; TPHg	Yes
24603 PANAMA AVE	7.9	1E-02	9E-04	4E-09			No
24603 RAVENNA AVE	2.9	4E-03	3E-02	6E-10	Thallium > bkgd	Thallium > bkgd	Yes
24606 MARBELLA AVE	4.8	6E-03	1E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg	Yes
24607 MARBELLA AVE	9.1	1E-02	8E-03	4E-11		1,2-DCA	Yes
24608 NEPTUNE AVE	4.1	5E-03	2E-01	1E-07		Naphthalene; TPHd; TPHg	Yes
24608 PANAMA AVE	9.9	1E-02	5E-02	7E-09	Thallium > bkgd	TPHd; Thallium > bkgd	Yes
24608 RAVENNA AVE	33	4E-02	2E-01	6E-09		TPHd; TPHmo	Yes
24609 NEPTUNE AVE	8.8	1E-02	4E-01	3E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24609 PANAMA AVE	8.5	1E-02	6E-02	5E-08		Benzene; TPHd; TPHg	Yes
24609 RAVENNA AVE	4.6	6E-03	1E-05	2E-09			No
24612 MARBELLA AVE	5.6	7E-03	2E-01	2E-07		Benzene; TPHd; TPHg	Yes
24612 NEPTUNE AVE	5.5	7E-03	1E-01	1E-07		Benzene; TBA; TPHd; TPHg; TPHmo	Yes
24612 PANAMA AVE	36	4E-02	4E-02	4E-09		TPHd	Yes
24612 RAVENNA AVE	5.3	6E-03	8E-03	3E-09			No
24613 MARBELLA AVE	7.7	9E-03	6E-03	3E-09	Arsenic > bkgd	Arsenic > bkgd	Yes
24613 NEPTUNE AVE	5.2	6E-03	3E-01	4E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24613 PANAMA AVE	39	5E-02	5E-02	3E-08		1,2,3-TCP; Benzene; TPHd; TPHg	Yes
24613 RAVENNA AVE	4.7	6E-03	5E-03	9E-09		Benzene; TPHg	Yes
24616 MARBELLA AVE	5.7	7E-03	4E-01	8E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24617 MARBELLA AVE	6.1	7E-03	2E-02	2E-11	Thallium > bkgd	Thallium > bkgd	Yes
24618 NEPTUNE AVE	5.3	6E-03	2E-01	2E-07		Benzene; Naphthalene; TBA; TPHd; TPHg; TPHmo	Yes
24618 PANAMA AVE	37	4E-02	7E-02	2E-08		TPHd	Yes
24618 RAVENNA AVE	3.2	4E-03	8E-05	2E-09			No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24619 NEPTUNE AVE	7.2	9E-03	3E-01	3E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24619 PANAMA AVE	26	3E-02	1E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg	Yes
24619 RAVENNA AVE	5.2	6E-03	1E-01	2E-07		Benzene; TPHd; TPHg	Yes
24622 MARBELLA AVE	5.6	7E-03	2E-01	2E-07	Arsenic > bkgd	Benzene; Naphthalene; TPHd; TPHg; TPHmo; Arsenic > bkgd	Yes
24622 NEPTUNE AVE	4.9	6E-03	2E-01	1E-07		Benzene; TBA; TPHd; TPHg; TPHmo; TCE	Yes
24623 MARBELLA AVE	7.2	9E-03	1E-01	4E-08		TPHd; TPHg	Yes
24623 NEPTUNE AVE	7.5	9E-03	2E-01	4E-07		Benzene; Naphthalene; TBA; TPHd; TPHg; TPHmo	Yes
24627 MARBELLA AVE	7.3	9E-03	4E-01	1E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24628 MARBELLA AVE	6.1	7E-03	3E-01	1E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24628 NEPTUNE AVE	6.2	8E-03	2E-01	6E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24629 NEPTUNE AVE	10	1E-02	2E-01	2E-07		Benzene; TPHd; TPHg; TPHmo	Yes
24632 NEPTUNE AVE	8.0	1E-02	2E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24633 MARBELLA AVE	8.7	1E-02	6E-03	6E-11			No
24700 MARBELLA AVE	9.8	1E-02	3E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24700 RAVENNA AVE	4.7	6E-03	1E-03	3E-09			No
24702 NEPTUNE AVE	6.2	8E-03	2E-01	7E-08		Benzene; Naphthalene; TBA; TPHd; TPHg; TPHmo	Yes
24702 PANAMA AVE	156	2E-01	3E-01	6E-08		Benzene; TPHd; TPHmo	Yes
24703 MARBELLA AVE	6.2	8E-03	5E-03	7E-11			No
24703 NEPTUNE AVE	8.2	1E-02	1E-01	3E-08		1,2,3-TCP; Benzene; TPHd; TPHg; TPHmo	Yes
24703 PANAMA AVE	24	3E-02	3E-02	5E-09		TBA; TPHd	Yes
24703 RAVENNA AVE	5.9	7E-03	2E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24706 MARBELLA AVE	7.3	9E-03	2E-01	1E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24706 RAVENNA AVE	5.6	7E-03	2E-03	2E-10			No
24707 MARBELLA AVE	4.5	5E-03	4E-03	4E-09			No
24708 PANAMA AVE	72	9E-02	7E-02	8E-09		TPHd	Yes
24709 NEPTUNE AVE	9.1	1E-02	2E-01	5E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24709 PANAMA AVE	39	5E-02	3E-01	3E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24709 RAVENNA AVE	5.0	6E-03	2E-01	8E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24710 MARBELLA AVE	5.4	7E-03	2E-01	1E-06		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24712 NEPTUNE AVE	4.6	6E-03	2E-01	1E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24712 PANAMA AVE	65	8E-02	4E-02	4E-09		TPHd	Yes
24712 RAVENNA AVE	7.0	9E-03	3E-03	1E-09			No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24713 MARBELLA AVE	3.5	4E-03	3E-03	2E-09			No
24713 PANAMA AVE	209	3E-01	2E-01	1E-08		Benzene; TPHd; TPHmo	Yes
24713 RAVENNA AVE	4.1	5E-03	1E-01	6E-08		Benzene; TPHd; TPHg	Yes
24715 NEPTUNE AVE	6.0	7E-03	2E-01	3E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24716 MARBELLA AVE	5.2	6E-03	3E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24716 RAVENNA AVE	3.2	4E-03	3E-04	2E-09			No
24717 MARBELLA AVE	3.6	4E-03	8E-03	2E-09			No
24718 NEPTUNE AVE	4.3	5E-03	1E-01	6E-08	Antimony > bkgd	Benzene; c-1,2-DCE; TPHd; TPHg; Antimony > bkdg	Yes
24718 PANAMA AVE	8.9	1E-02	4E-03	4E-09		1,2,3-TCP	Yes
24719 NEPTUNE AVE	7.5	9E-03	4E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24719 PANAMA AVE	82	1E-01	2E-01	5E-09		TPHd; TPHmo	Yes
24719 RAVENNA AVE	4.7	6E-03	2E-01	1E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24722 MARBELLA AVE	5.4	7E-03	5E-03	2E-10			No
24722 NEPTUNE AVE	4.5	6E-03	4E-04	3E-09			No
24722 PANAMA AVE	5.6	7E-03	7E-03	3E-09			No
24722 RAVENNA AVE	6.9	8E-03	5E-03	3E-09			No
24723 MARBELLA AVE	2.8	3E-03	4E-03	4E-10			No
24723 RAVENNA AVE	5.9	7E-03	7E-02	2E-08		TPHd; TPHg	Yes
24725 NEPTUNE AVE	4.6	6E-03	5E-04	4E-09			No
24726 MARBELLA AVE	4.8	6E-03	4E-03	3E-09			No
24726 RAVENNA AVE	3.9	5E-03	6E-04	3E-09			No
24727 MARBELLA AVE	3.2	4E-03	5E-04	3E-09			No
24728 NEPTUNE AVE	4.4	5E-03	2E-02	3E-08		Benzene; TPHd; TPHg	Yes
24728 PANAMA AVE	10	1E-02	2E-02	2E-09		TPHd	Yes
24729 NEPTUNE AVE	5.0	6E-03	1E-03	4E-09			No
24729 PANAMA AVE	7.7	9E-03	6E-04	3E-09			No
24729 RAVENNA AVE	5.5	7E-03	1E-05	5E-10			No
24732 MARBELLA AVE	15	2E-02	2E-05	3E-09			No
24732 NEPTUNE AVE	2.8	3E-03	5E-01	9E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24732 PANAMA AVE	5.3	6E-03	2E-04	3E-09			No
24732 RAVENNA AVE	5.5	7E-03	5E-03	4E-11			No
24733 MARBELLA AVE	3.2	4E-03	2E-03	3E-09			No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24733 PANAMA AVE	12	1E-02	1E-03	3E-09			No
24733 RAVENNA AVE	7.0	9E-03	7E-03	3E-09	Thallium > bkgd	1,2,3-TCP; Thallium > bkgd	Yes
24735 NEPTUNE AVE	5.3	6E-03	2E-04	2E-11			No
24736 MARBELLA AVE	4.7	6E-03	3E-03	3E-09			No
24736 RAVENNA AVE	6.1	7E-03	1E-01	6E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24737 MARBELLA AVE	4.5	5E-03	2E-01	6E-09		TPHd; TPHg; TPHmo	Yes
24738 NEPTUNE AVE	7.0	8E-03	2E-01	5E-07		Benzene; TBA; TPHd; TPHg; TPHmo	Yes
24738 PANAMA AVE	5.5	7E-03	2E-03	3E-09			No
24739 NEPTUNE AVE	6.7	8E-03	2E-04	4E-09			No
24739 PANAMA AVE	5.3	6E-03	2E-01	7E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24739 RAVENNA AVE	6.1	7E-03	2E-01	4E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24740 MARBELLA AVE	4.3	5E-03	1E-02	4E-09			No
24741 MARBELLA AVE	5.3	6E-03	1E-05	2E-09			No
24743 RAVENNA AVE	12	2E-02	2E-01	2E-07		Benzene; TBA; TPHd; TPHg; TPHmo	Yes
24744 MARBELLA AVE	7.7	9E-03	1E-03	3E-09			No
24748 RAVENNA AVE	5.9	7E-03	6E-02	1E-08		Benzene; TBA; TPHd; TPHg	Yes
24749 RAVENNA AVE	8.6	1E-02	2E-01	7E-08		Benzene; TPHd; TPHg; TPHmo	Yes
24752 RAVENNA AVE	9.0	1E-02	6E-02	2E-08		Benzene; TBA; TPHd; TPHg	Yes
24802 PANAMA AVE	5.4	7E-03	2E-03	3E-09			No
24803 NEPTUNE AVE	6.0	7E-03	8E-04	2E-09			No
24803 PANAMA AVE	5.5	7E-03	6E-02	7E-08		Benzene; TPHd; TPHg	Yes
24808 PANAMA AVE	5.3	6E-03	7E-03	8E-09			No
24809 NEPTUNE AVE	8.2	1E-02	9E-02	5E-09		TPHd	Yes
24809 PANAMA AVE	8.1	1E-02	9E-02	2E-07		Benzene; TBA; TPHd; TPHg	Yes
24812 PANAMA AVE	5.5	7E-03	4E-04	2E-09			No
24813 PANAMA AVE	6.9	8E-03	2E-01	9E-08		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
24815 NEPTUNE AVE	7.5	9E-03	9E-03	7E-10		TPHd	Yes
24818 PANAMA AVE	5.7	7E-03	5E-04	4E-09			No
24819 PANAMA AVE	57	7E-02	5E-02	3E-08		Benzene; TBA; TPHd; TPHg	Yes
24822 PANAMA AVE	5.3	6E-03	7E-04	4E-09		1,2,3-TCP	Yes
24823 PANAMA AVE	8.9	1E-02	2E-01	5E-08		Benzene; TBA; TPHd; TPHg; TPHmo	Yes
24825 NEPTUNE AVE	4.7	6E-03	3E-04	3E-09			No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
24828 PANAMA AVE	5.5	7E-03	3E-04	2E-11		TBA	Yes
24829 PANAMA AVE	7.2	9E-03	4E-02	6E-08		Benzene; TBA; TPHd; TPHg	Yes
24832 PANAMA AVE	6.9	8E-03	2E-03	3E-09		VC	Yes
24833 PANAMA AVE	8.9	1E-02	8E-02	5E-08		Benzene; TPHd; TPHg	Yes
24838 PANAMA AVE	8.6	1E-02	3E-03	3E-09			No
24904 NEPTUNE AVE	24	3E-02	3E-02	5E-09		TPHd	Yes
24912 NEPTUNE AVE	11	1E-02	1E-02	4E-09		1,2,3-TCP; TPHd	Yes
301 244TH ST	7.9	1E-02	9E-03	6E-09			No
305 244TH ST	8.6	1E-02	6E-03	3E-09		1,2,3-TCP	Yes
311 244TH ST	7.7	9E-03	6E-02	5E-08		TPHd; TPHg	Yes
317 244TH ST	8.3	1E-02	9E-03	5E-11			No
321 244TH ST	9.0	1E-02	7E-03	3E-11	Arsenic > bkgd	Arsenic > bkgd	Yes
327 244TH ST	8.8	1E-02	8E-03	3E-11			No
331 244TH ST	9.4	1E-02	8E-03	3E-09	Arsenic > bkgd	Arsenic > bkgd	Yes
337 244TH ST	6.5	8E-03	5E-03	2E-10			No
341 244TH ST	5.6	7E-03	5E-03	3E-11			No
344 249TH ST	11	1E-02	7E-03	9E-11			No
345 249TH ST	43	5E-02	9E-02	1E-08		TPHd	Yes
347 244TH ST	5.3	6E-03	5E-03	3E-09			No
348 248TH ST	5.2	6E-03	2E-01	2E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
348 249TH ST	14	2E-02	3E-02	6E-09		TPHd	Yes
351 244TH ST	5.7	7E-03	5E-03	3E-09			No
352 249TH ST	25	3E-02	5E-02	3E-09		TPHd	Yes
353 249TH ST	5.4	7E-03	4E-02	9E-08		Benzene; TPHd; TPHg	Yes
354 248TH ST	23	3E-02	2E-01	8E-08		Benzene; TPHd; TPHg; TPHmo	Yes
357 244TH ST	5.6	7E-03	5E-03	3E-09			No

Table 2-1

Cumulative Risk and Hazard Results for Soil and Potential Leaching to Groundwater, Onsite Resident

Former Kast Property

Location	>5 ft bgs to ≤10 ft bgs						
	HHRA					Soil Leaching to GW	Exceeds HHRA or Soil Leach to GW?
	Lead		Other COCs		Risk and/or Hazard Drivers	Compounds Exceeding SSCG Based on UCL	
	95UCL (mg/kg)	Lead Hazard	Noncancer Hazard	Cancer Risk			
357 249TH ST	6.1	7E-03	2E-01	1E-07		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
358 249TH ST	8.9	1E-02	1E-03	3E-09			No
360 248TH ST	6.6	8E-03	8E-02	3E-08		Benzene; TPHd; TPHg	Yes
361 244TH ST	7.6	9E-03	6E-03	2E-09			No
362 249TH ST	6.9	8E-03	1E-04	4E-09			No
363 249TH ST	82	1E-01	4E-01	8E-08		Benzene; Naphthalene; TPHd; TPHg; TPHmo	Yes
364 248TH ST	52	6E-02	5E-02	1E-08		Benzene; TBA; TPHd; TPHg	Yes
367 244TH ST	5.7	7E-03	1E-03				No
367 249TH ST	22	3E-02	4E-02	1E-08		1,2,3-TCP; TPHd	Yes
368 249TH ST	6.2	8E-03	3E-02	2E-08		Benzene; TPHd; TPHg	Yes
373 249TH ST	18	2E-02	6E-02	2E-08		1,2,3-TCP; Benzene; TPHd	Yes
374 248TH ST	67	8E-02	2E-01	3E-08		Benzene; TBA; TPHd; TPHmo	Yes
374 249TH ST	6.8	8E-03	1E-01	1E-07		Benzene; TPHd; TPHg	Yes
377 244TH ST	7.3	9E-03	6E-03	2E-11			No
377 249TH ST	15	2E-02	1E-01	3E-08		Benzene; TPHd; TPHg	Yes
378 249TH ST	7.8	9E-03	7E-02	3E-08		Benzene; TPHd; TPHg	Yes
383 249TH ST	8.9	1E-02	6E-02	2E-08		Benzene; TPHd; TPHg	Yes
402 249TH ST	4.9	6E-03	3E-04	4E-11			No
408 249TH ST	6.0	7E-03	3E-03	7E-11			No
412 249TH ST	37	5E-02	2E-01	3E-09		TPHd; TPHmo	Yes

Notes:

HHRA = human health risk assessment; GW = groundwater; 95UCL = 95% upper confidence limit

EF = exposure frequency; COC = constituent of concern

ft bgs = feet below ground surface; SSCG = Site-specific cleanup goal; bkgd = background

TPHd = Total Petroleum Hydrocarbons- diesel range; TPHg = gasoline range; TPHmo = motor oil range

BaP = benzo(a)pyrene; BaA = Benzo(a)Anthracene; BbF = Benzo(b)Fluoranthene; DCB = Dichlorobenzene; DCE = Dichloroethene; TBA = tert-Butyl Alcohol; PCE = tetrachloroethene; TCE = trichloroethene; TCP = Trichloropropane; VC = vinyl chloride

Lead Hazard = 95UCL of Lead ÷ SSCG of 820 mg/kg for an infrequent contact onsite resident

The risk assessment was conducted using conservative health-protective assumptions. A risk or hazard exceedance does not indicate that adverse impacts to human health are occurring or will occur, but rather may indicate that actions may be taken to reduce the likelihood of future exposure.

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24401 MARBELLA AVE	1E-02	1E-06		1E-02	1E-06	
24402 NEPTUNE AVE	1E-02	2E-07		1E-02	2E-07	
24402 PANAMA AVE	7E-03	3E-07		7E-03	3E-07	
24402 RAVENNA AVE	6E-03	1E-06		1E-03	3E-08	
24403 NEPTUNE AVE	3E-03	1E-07		3E-03	1E-07	
24403 RAVENNA AVE	4E-03	3E-07		4E-03	3E-07	
24405 MARBELLA AVE	1E-02	9E-07		1E-02	9E-07	
24406 MARBELLA AVE	2E-03	3E-07		2E-03	3E-07	
24406 NEPTUNE AVE	6E-02	6E-06	Carbon Tetrachloride, Naphthalene	6E-02	5E-06	Carbon Tetrachloride, Naphthalene
24406 PANAMA AVE	7E-02	5E-07		7E-02	5E-07	
24406 RAVENNA AVE	8E-04	3E-08		8E-04	3E-08	
24409 NEPTUNE AVE	3E-03	1E-07		3E-03	1E-07	
24409 RAVENNA AVE	1E-03	3E-07		1E-03	3E-07	
24410 PANAMA AVE	3E-03	6E-08		3E-03	4E-08	
24411 MARBELLA AVE	6E-02	1E-06		6E-02	1E-06	
24411 PANAMA AVE	3E-02	1E-06		3E-02	1E-06	
24412 MARBELLA AVE	7E-01	4E-06	TCE	7E-01	4E-06	TCE
24412 RAVENNA AVE	6E-04	2E-07		6E-04	2E-07	
24413 NEPTUNE AVE	5E-03	3E-07		5E-03	3E-07	
24413 RAVENNA AVE	5E-03	3E-07		5E-03	3E-07	
24416 MARBELLA AVE	1E-03	1E-07		1E-03	4E-08	
24416 NEPTUNE AVE	2E-03	1E-07		1E-03	6E-08	
24416 PANAMA AVE	1E-02	9E-07		1E-02	9E-07	
24416 RAVENNA AVE	2E-02	5E-06	Benzene	2E-02	5E-06	Benzene
24417 MARBELLA AVE	3E-03	2E-07		3E-03	2E-07	
24417 PANAMA AVE	2E-03	8E-08		2E-03	8E-08	
24419 NEPTUNE AVE	3E-02	6E-06	Chloroform	6E-04	2E-07	
24419 RAVENNA AVE	2E-03	2E-07		1E-03	1E-07	
24420 PANAMA AVE	2E-03	7E-08		2E-03	7E-08	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24421 PANAMA AVE	4E-03	8E-08		4E-03	8E-08	
24422 MARBELLA AVE	3E-03	3E-07		3E-03	1E-07	
24422 NEPTUNE AVE	2E-02	5E-07		2E-02	3E-07	
24422 RAVENNA AVE	1E-03	6E-08		1E-03	6E-08	
24423 MARBELLA AVE	1E-02	1E-06		1E-02	1E-06	
24423 NEPTUNE AVE	5E-02	7E-06	Chloroform; Vinyl chloride	3E-02	3E-06	Vinyl chloride
24423 RAVENNA AVE	6E-03	7E-07		4E-03	3E-07	
24426 MARBELLA AVE	1E-02	5E-07		1E-02	5E-07	
24426 NEPTUNE AVE	6E-03	7E-07		6E-03	7E-07	
24426 PANAMA AVE	1E-03	6E-08		1E-03	6E-08	
24426 RAVENNA AVE	3E-02	7E-07		3E-02	7E-07	
24427 MARBELLA AVE	2E-03	1E-07		2E-03	1E-07	
24427 PANAMA AVE	2E-03	3E-07		9E-04	2E-07	
24429 NEPTUNE AVE	3E-02	2E-06	PCE	3E-02	2E-06	PCE
24429 RAVENNA AVE	1E-03	1E-07		1E-03	5E-08	
24430 PANAMA AVE	9E-03	6E-07		9E-03	6E-07	
24431 PANAMA AVE	5E-03	1E-07		5E-03	1E-07	
24432 MARBELLA AVE	5E-03	4E-07		5E-03	4E-07	
24433 MARBELLA AVE	1E-01	2E-06	no COC-specific risk >1E-06	1E-01	2E-06	no COC-specific risk >1E-06
24436 PANAMA AVE	3E-03	4E-07		3E-03	3E-07	
24502 MARBELLA AVE	7E-03	9E-07		5E-03	1E-07	
24502 NEPTUNE AVE	2E-02	4E-06	Chloroform	9E-03	3E-07	
24502 PANAMA AVE	1E-02	5E-07		1E-02	5E-07	
24502 RAVENNA AVE	4E-03	4E-07		4E-03	4E-07	
24503 MARBELLA AVE	2E-02	1E-06		2E-02	1E-06	
24503 NEPTUNE AVE	2E-02	5E-06	Chloroform	3E-03	2E-07	
24503 PANAMA AVE	6E-03	6E-07		5E-03	5E-07	
24503 RAVENNA AVE	2E-03	2E-07		1E-03	1E-07	
24506 MARBELLA AVE	6E-02	3E-06	Benzene	6E-02	3E-06	Benzene

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24507 MARBELLA AVE	2E-03	1E-07		2E-03	1E-07	
24508 NEPTUNE AVE	8E-03	1E-07		8E-03	1E-07	
24508 PANAMA AVE	2E+00	5E-06	Naphthalene	2E+00	5E-06	Naphthalene
24508 RAVENNA AVE	1E-03	7E-08		1E-03	6E-08	
24509 NEPTUNE AVE	2E-03	2E-07		2E-03	2E-07	
24509 PANAMA AVE	2E-03	1E-07		2E-03	1E-07	
24509 RAVENNA AVE	4E-03	3E-07		4E-03	2E-07	
24512 MARBELLA AVE	3E-03	1E-07		3E-03	1E-07	
24512 NEPTUNE AVE	3E-03	1E-07		3E-03	1E-07	
24512 PANAMA AVE	3E-03	2E-07		2E-03	8E-08	
24512 RAVENNA AVE	3E-03	1E-07		3E-03	1E-07	
24513 NEPTUNE AVE	6E-03	3E-07		6E-03	3E-07	
24513 PANAMA AVE	8E-03	2E-07		8E-03	2E-07	
24513 RAVENNA AVE	1E-02	2E-06	no COC-specific risk >1E-06	1E-02	2E-06	no COC-specific risk >1E-06
24516 MARBELLA AVE	1E-02	6E-07		1E-02	6E-07	
24517 MARBELLA AVE	1E-02	6E-07		1E-02	6E-07	
24518 NEPTUNE AVE	2E-02	5E-06	Chloroform	4E-03	6E-07	
24518 PANAMA AVE	5E-03	1E-07		5E-03	1E-07	
24518 RAVENNA AVE	7E-03	4E-07		7E-03	4E-07	
24519 NEPTUNE AVE	3E-03	1E-07		3E-03	1E-07	
24519 PANAMA AVE	3E-03	2E-07		3E-03	1E-07	
24522 MARBELLA AVE	7E-03	7E-07		7E-03	7E-07	
24522 NEPTUNE AVE	5E-03	6E-08		5E-03	6E-08	
24522 PANAMA AVE	2E-03	2E-07		1E-03	5E-08	
24522 RAVENNA AVE	2E-03	1E-06		9E-04	4E-08	
24523 MARBELLA AVE	1E-02	1E-06		1E-02	1E-06	
24523 NEPTUNE AVE	3E-03	1E-07		3E-03	1E-07	
24523 RAVENNA AVE	5E-02	4E-06	Chloroform	3E-02	1E-06	
24526 MARBELLA AVE	2E-03	2E-07		2E-03	2E-07	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24528 NEPTUNE AVE	7E-03	4E-07		7E-03	3E-07	
24528 PANAMA AVE	3E-03	1E-07		3E-03	1E-07	
24529 NEPTUNE AVE	1E-02	1E-06		1E-02	8E-07	
24529 PANAMA AVE	1E-03	5E-08		1E-03	5E-08	
24529 RAVENNA AVE	4E-03	2E-07		3E-03	2E-07	
24532 MARBELLA AVE	2E-03	4E-07		2E-03	3E-07	
24532 NEPTUNE AVE	1E-02	8E-07		1E-02	8E-07	
24532 PANAMA AVE	5E-03	4E-07		4E-03	2E-07	
24532 RAVENNA AVE	2E-03	2E-07		2E-03	2E-07	
24533 MARBELLA AVE	2E-03	1E-07		2E-03	1E-07	
24533 NEPTUNE AVE	3E-03	4E-07		9E-04	4E-08	
24533 PANAMA AVE	2E-03	8E-08		2E-03	8E-08	
24533 RAVENNA AVE	5E-03	2E-07		5E-03	2E-07	
24602 MARBELLA AVE	1E-03	2E-07		1E-03	1E-07	
24602 NEPTUNE AVE	2E-03	1E-06		2E-03	1E-06	
24602 PANAMA AVE	4E-03	2E-07		4E-03	2E-07	
24602 RAVENNA AVE	4E-03	2E-07		4E-03	2E-07	
24603 MARBELLA AVE	1E+00	1E-04	Benzene, Ethylbenzene	1E+00	1E-04	Benzene, Ethylbenzene
24603 NEPTUNE AVE	1E-03	6E-08		1E-03	6E-08	
24603 PANAMA AVE	3E-02	4E-07		3E-02	3E-07	
24603 RAVENNA AVE	6E-03	1E-07		6E-03	1E-07	
24606 MARBELLA AVE	5E-03	2E-07		5E-03	2E-07	
24607 MARBELLA AVE	5E-03	6E-07		5E-03	5E-07	
24608 NEPTUNE AVE	7E-03	2E-06	no COC-specific risk >1E-06	6E-03	1E-06	
24608 PANAMA AVE	4E-02	6E-06	Chloroform	2E-02	1E-06	
24608 RAVENNA AVE	4E-03	7E-07		4E-03	7E-07	
24609 NEPTUNE AVE	2E-03	9E-07		2E-03	9E-07	
24609 PANAMA AVE	3E-02	5E-06	Carbon Tetrachloride	3E-02	5E-06	Carbon Tetrachloride
24609 RAVENNA AVE	2E-03	6E-08		2E-03	6E-08	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24612 MARBELLA AVE	1E-03	6E-07		2E-05	--	
24612 NEPTUNE AVE	1E-03	9E-08		1E-03	6E-08	
24612 PANAMA AVE	2E-03	1E-07		1E-03	6E-08	
24612 RAVENNA AVE	4E-03	2E-07		4E-03	2E-07	
24613 MARBELLA AVE	1E-02	7E-07		1E-02	7E-07	
24613 NEPTUNE AVE	2E-03	7E-07		2E-03	7E-07	
24613 PANAMA AVE	2E-02	2E-06	no COC-specific risk >1E-06	2E-02	2E-06	no COC-specific risk >1E-06
24613 RAVENNA AVE	1E-02	4E-07		1E-02	4E-07	
24616 MARBELLA AVE	9E-02	2E-05	BDCM, DBCM	7E-02	8E-07	
24617 MARBELLA AVE	5E-03	3E-07		5E-03	3E-07	
24618 NEPTUNE AVE	3E-03	3E-07		2E-03	2E-07	
24618 PANAMA AVE	2E-03	3E-07		1E-03	6E-08	
24618 RAVENNA AVE	7E-03	1E-06		4E-03	2E-07	
24619 NEPTUNE AVE	5E-04	2E-08		5E-04	2E-08	
24619 PANAMA AVE	1E-02	6E-07		1E-02	6E-07	
24619 RAVENNA AVE	3E-03	2E-07		3E-03	2E-07	
24622 MARBELLA AVE	4E-04	7E-08		2E-04	2E-08	
24622 NEPTUNE AVE	7E-03	6E-07		6E-03	5E-07	
24623 MARBELLA AVE	9E-03	3E-06	Benzene	9E-03	3E-06	Benzene
24623 NEPTUNE AVE	4E-03	2E-07		4E-03	2E-07	
24627 MARBELLA AVE	5E-03	2E-07		5E-03	2E-07	
24628 MARBELLA AVE	1E-03	5E-08		1E-03	5E-08	
24628 NEPTUNE AVE	3E-02	7E-06	BDCM, Chloroform	6E-03	9E-08	
24629 NEPTUNE AVE	2E-02	6E-06	Benzene	2E-02	6E-06	Benzene
24632 NEPTUNE AVE	1E-02	8E-07		1E-02	6E-07	
24633 MARBELLA AVE	5E-03	2E-07		5E-03	2E-07	
24700 MARBELLA AVE	1E-02	9E-07		1E-02	8E-07	
24700 RAVENNA AVE	4E-03	5E-07		3E-03	2E-07	
24702 NEPTUNE AVE	2E-05	--		2E-05	--	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24702 PANAMA AVE	9E-04	1E-07		9E-04	1E-07	
24703 MARBELLA AVE	4E-03	7E-07		4E-03	7E-07	
24703 NEPTUNE AVE	4E-02	5E-07		4E-02	5E-07	
24703 PANAMA AVE	6E-03	2E-07		5E-03	2E-07	
24703 RAVENNA AVE	3E-03	2E-07		3E-03	2E-07	
24706 MARBELLA AVE	4E-02	1E-06		3E-02	5E-07	
24706 RAVENNA AVE	7E-03	1E-06		5E-03	6E-07	
24707 MARBELLA AVE	5E-03	4E-07		5E-03	4E-07	
24708 PANAMA AVE	3E-03	1E-06		3E-03	1E-06	
24709 NEPTUNE AVE	1E-01	5E-06	Naphthalene	1E-01	5E-06	Naphthalene
24709 PANAMA AVE	2E-02	9E-07		2E-02	7E-07	
24709 RAVENNA AVE	3E-02	7E-07		3E-02	7E-07	
24710 MARBELLA AVE	4E-02	5E-07		4E-02	3E-07	
24712 NEPTUNE AVE	9E-02	6E-06	Chloroform, Naphthalene	8E-02	2E-06	Naphthalene
24712 PANAMA AVE	6E-04	2E-08		6E-04	2E-08	
24712 RAVENNA AVE	4E-03	2E-07		4E-03	2E-07	
24713 MARBELLA AVE	1E-03	6E-08		1E-03	6E-08	
24713 PANAMA AVE	2E-02	3E-06	no COC-specific risk >1E-06	2E-02	1E-06	
24713 RAVENNA AVE	9E-03	2E-06	Chloroform	8E-04	4E-08	
24715 NEPTUNE AVE	6E-03	2E-07		6E-03	2E-07	
24716 MARBELLA AVE	4E-02	4E-06	Chloroform	3E-02	5E-07	
24716 RAVENNA AVE	2E-03	3E-07		1E-03	4E-08	
24717 MARBELLA AVE	5E-03	5E-07		4E-03	4E-07	
24718 NEPTUNE AVE	5E-03	4E-07		5E-03	4E-07	
24718 PANAMA AVE	3E-02	3E-06	no COC-specific risk >1E-06	3E-02	1E-06	
24719 NEPTUNE AVE	2E-02	5E-06	Chloroform	5E-03	1E-06	
24719 PANAMA AVE	3E-03	2E-07		2E-03	9E-08	
24719 RAVENNA AVE	3E-03	1E-07		3E-03	1E-07	
24722 MARBELLA AVE	2E-03	3E-07		2E-03	3E-07	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24722 NEPTUNE AVE	2E-02	6E-06	Benzene	2E-02	6E-06	Benzene
24722 PANAMA AVE	2E-02	3E-06	no COC-specific risk >1E-06	1E-02	7E-07	
24722 RAVENNA AVE	2E-03	9E-08		2E-03	6E-08	
24723 MARBELLA AVE	2E-02	3E-06	PCE	2E-02	3E-06	PCE
24723 RAVENNA AVE	3E-03	1E-06		7E-04	3E-08	
24725 NEPTUNE AVE	9E-03	8E-07		7E-03	3E-07	
24726 MARBELLA AVE	4E-03	6E-07		3E-03	3E-07	
24726 RAVENNA AVE	2E-03	1E-07		1E-03	6E-08	
24727 MARBELLA AVE	5E-04	2E-07		5E-04	2E-07	
24728 NEPTUNE AVE	2E-02	1E-06		2E-02	1E-06	
24728 PANAMA AVE	7E-03	1E-07		7E-03	1E-07	
24729 NEPTUNE AVE	8E-03	2E-06	no COC-specific risk >1E-06	6E-03	4E-07	
24729 PANAMA AVE	7E-04	3E-08		7E-04	3E-08	
24729 RAVENNA AVE	1E-03	2E-07		1E-03	2E-07	
24732 MARBELLA AVE	3E-03	1E-07		2E-03	1E-07	
24732 NEPTUNE AVE	3E-03	2E-07		2E-03	1E-07	
24732 PANAMA AVE	2E-02	8E-07		2E-02	8E-07	
24732 RAVENNA AVE	3E-02	1E-06		2E-02	2E-07	
24733 MARBELLA AVE	6E-03	6E-07		6E-03	6E-07	
24733 PANAMA AVE	2E-02	2E-06	no COC-specific risk >1E-06	1E-02	9E-07	
24733 RAVENNA AVE	2E-03	2E-07		2E-03	1E-07	
24735 NEPTUNE AVE	2E-03	1E-07		1E-03	5E-08	
24736 RAVENNA AVE	7E-02	1E-06		6E-02	2E-07	
24737 MARBELLA AVE	9E-03	6E-07		9E-03	6E-07	
24738 NEPTUNE AVE	5E-02	2E-06	no COC-specific risk >1E-06	5E-02	2E-06	no COC-specific risk >1E-06
24738 PANAMA AVE	1E-02	1E-06		1E-02	1E-06	
24739 NEPTUNE AVE	1E-02	3E-07		1E-02	2E-07	
24739 PANAMA AVE	3E-03	5E-08		3E-03	5E-08	
24739 RAVENNA AVE	2E-02	2E-07		2E-02	2E-07	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
24740 MARBELLA AVE	3E-03	5E-07		3E-03	5E-07	
24741 MARBELLA AVE	2E-01	6E-06	PCE	2E-01	6E-06	PCE
24743 RAVENNA AVE	4E-03	2E-07		3E-03	1E-07	
24744 MARBELLA AVE	7E-02	2E-06	no COC-specific risk >1E-06	7E-02	2E-06	no COC-specific risk >1E-06
24748 RAVENNA AVE	8E-03	2E-06	no COC-specific risk >1E-06	4E-03	6E-07	
24749 RAVENNA AVE	2E-01	3E-05	Benzene	1E-01	3E-05	Benzene
24752 RAVENNA AVE	2E-04	3E-08		2E-05	--	
24802 PANAMA AVE	3E-03	5E-07		3E-03	5E-07	
24803 NEPTUNE AVE	3E-03	1E-07		3E-03	1E-07	
24803 PANAMA AVE	4E-03	9E-07		4E-03	8E-07	
24808 PANAMA AVE	2E-03	1E-07		1E-03	6E-08	
24809 NEPTUNE AVE	4E-02	2E-07		4E-02	2E-07	
24809 PANAMA AVE	4E-03	6E-07		3E-03	5E-07	
24812 PANAMA AVE	1E-03	9E-08		1E-03	5E-08	
24813 PANAMA AVE	3E-02	7E-06	BDCM, Chloroform	4E-03	4E-07	
24815 NEPTUNE AVE	4E-03	3E-07		4E-03	3E-07	
24818 PANAMA AVE	3E-03	2E-07		3E-03	1E-07	
24819 PANAMA AVE	1E-02	5E-07		1E-02	5E-07	
24822 PANAMA AVE	3E-03	1E-07		3E-03	1E-07	
24823 PANAMA AVE	5E-04	2E-07		5E-04	2E-07	
24825 NEPTUNE AVE	2E-02	2E-06	no COC-specific risk >1E-06	1E-02	5E-07	
24828 PANAMA AVE	4E-03	2E-07		4E-03	2E-07	
24829 PANAMA AVE	2E-02	2E-06	no COC-specific risk >1E-06	1E-02	1E-06	
24832 PANAMA AVE	2E-03	8E-08		2E-03	8E-08	
24833 PANAMA AVE	6E-02	1E-06		6E-02	1E-06	
24838 PANAMA AVE	1E-02	2E-06	no COC-specific risk >1E-06	1E-02	9E-07	
24904 NEPTUNE AVE	4E-03	4E-07		4E-03	4E-07	
24912 NEPTUNE AVE	6E-02	1E-06		6E-02	1E-06	
301 244TH ST	9E-03	1E-06		9E-03	1E-06	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
305 244TH ST	4E-03	3E-07		4E-03	3E-07	
311 244TH ST	2E-03	2E-07		2E-03	9E-08	
317 244TH ST	2E-01	7E-05	BDCM, Chloroform, Carbon Tetrachloride	1E-02	2E-05	Carbon Tetrachloride
321 244TH ST	5E-03	2E-07		5E-03	2E-07	
327 244TH ST	1E-03	1E-07		7E-04	3E-08	
331 244TH ST	4E-03	6E-07		4E-03	6E-07	
337 244TH ST	1E-03	9E-08		1E-03	6E-08	
341 244TH ST	4E-03	2E-07		4E-03	2E-07	
344 249TH ST	8E-03	1E-06		1E-03	7E-08	
345 249TH ST	1E-02	4E-07		1E-02	4E-07	
347 244TH ST	2E-03	1E-07		1E-03	6E-08	
348 248TH ST	7E-03	3E-06	Carbon Tetrachloride	6E-03	3E-06	Carbon Tetrachloride
348 249TH ST	4E-03	5E-07		4E-03	3E-07	
351 244TH ST	8E-03	1E-06		8E-03	1E-06	
352 249TH ST	5E-02	5E-06	PCE	5E-02	5E-06	PCE
353 249TH ST	1E-03	1E-07		1E-03	1E-07	
354 248TH ST	4E-03	3E-07		3E-03	3E-07	
357 244TH ST	4E-03	3E-07		4E-03	3E-07	
357 249TH ST	3E-03	1E-06		3E-03	1E-06	
358 249TH ST	3E-03	1E-07		3E-03	1E-07	

Table 2-2
Cumulative Risk and Hazard Results, Sub-Slab Soil Vapor
Onsite Resident - Indoor Air Inhalation
Former Kast Property

Location	Resident (EF = 350 d/y)					
	With THMs			Without THMs		
	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers	Noncancer Hazard	Cancer Risk	Risk and/or Hazard Drivers
360 248TH ST	4E-03	9E-07		4E-03	9E-07	
361 244TH ST	2E-02	6E-08		2E-02	6E-08	
362 249TH ST	2E-02	9E-07		2E-02	9E-07	
363 249TH ST	4E-03	4E-07		3E-03	1E-07	
364 248TH ST	4E-03	9E-07		4E-03	9E-07	
367 244TH ST	1E-03	5E-07		1E-03	5E-07	
367 249TH ST	1E-02	5E-07		1E-02	3E-07	
368 249TH ST	5E-03	4E-07		5E-03	3E-07	
373 249TH ST	1E-03	5E-08		1E-03	5E-08	
374 248TH ST	2E-02	7E-07		2E-02	5E-07	
374 249TH ST	6E-03	1E-06		1E-03	5E-08	
377 244TH ST	7E-04	2E-07		7E-04	2E-07	
377 249TH ST	1E-02	1E-06		1E-02	3E-07	
378 249TH ST	5E+00	2E-03	Benzene, Ethylbenzene, Methylene Chloride, Naphthalene	5E+00	2E-03	Benzene, Ethylbenzene, Methylene Chloride, Naphthalene
383 249TH ST	3E-01	3E-06	Naphthalene	3E-01	3E-06	Naphthalene
402 249TH ST	4E-03	4E-07		2E-03	9E-08	
408 249TH ST	3E-05	2E-07		3E-05	2E-07	
412 249TH ST	7E-03	4E-07		7E-03	4E-07	
Soil Vapor, Non-Subslab[a]	1E-02	1E-06		1E-02	1E-06	
Streets[b]	3E+01	4E-03	1,1,2,2-Tetrachloroethane; 1,4-DCB; 1,2,4-TMB; 1,3,5-TMB; Benzene; BDCM; Ethylbenzene; HCB; Naphthalene	2E+01	4E-03	1,1,2,2-Tetrachloroethane; 1,4-DCB; 1,2,4-TMB; 1,3,5-TMB; Benzene; Ethylbenzene; HCB; Naphthalene

Notes:

EF = exposure frequency; THM = trihalomethanes; COC = constituent of concern

[a] Results based on the maximum detected concentration Site-wide as the exposure point concentration (EPC).

[b] Results based on 95 percent upper confidence limit (95UCL) of the average concentration as the EPC; however, if not available, the maximum detect was used as the EPC.

BDCM = bromodichloromethane; DBCM = dibromochloromethane; DCB = dichlorobenzene; HCB = Hexachloro-1,3-butadiene; PCE = tetrachloroethene; TCE = trichloroethene; TMB = trimethylbenzene

The risk assessment was conducted using conservative health-protective assumptions. A risk or hazard exceedance does not indicate that adverse impacts to human health are occurring or will occur, but rather may indicate that actions may be taken to reduce the likelihood of future exposure.

Table 3-1

Site-Specific Cleanup Goals for Sub-Slab and Soil Vapor

Former Kast Property

CAS Number		Odor-Based SSCG[1] (µg/m³)	Sub-Slab and Soil Vapor		Soil Vapor	
			Onsite Resident		Construction and Utility Maintenance Worker	
			SSCG (µg/m³)	Basis	SSCG (µg/m³)	Basis
79-34-5	1,1,2,2-Tetrachloroethane	5.2E+06	2.1E+01	c	1.2E+05	c
79-00-5	1,1,2-Trichloroethane	--	7.5E+01	c	1.0E+05	nc
75-34-3	1,1-Dichloroethane	6.3E+07	7.6E+02	c	2.5E+07	c
120-82-1	1,2,4-Trichlorobenzene	1.1E+07	1.0E+03	nc	3.9E+05	nc
95-63-6	1,2,4-Trimethylbenzene	--	3.7E+03	nc	2.3E+06	nc
107-06-2	1,2-Dichloroethane	1.2E+06	5.9E+01	c	8.5E+05	c
78-87-5	1,2-Dichloropropane	6.0E+05	1.2E+02	c	2.5E+06	c
108-67-8	1,3,5-Trimethylbenzene	--	3.7E+03	nc	2.3E+06	nc
106-99-0	1,3-Butadiene	--	7.2E+00	c	3.0E+05	c
106-46-7	1,4-Dichlorobenzene	5.5E+05	1.1E+02	c	7.2E+05	c
123-91-1	1,4-Dioxane	3.1E+08	1.6E+02	c	1.6E+05	c
540-84-1	2,2,4-Trimethylpentane	--	5.2E+05	nc	6.5E+08	nc
591-78-6	2-Hexanone	--	1.6E+04	nc	7.9E+06	nc
622-96-8	4-Ethyltoluene	--	5.2E+04	nc	2.5E+07	nc
71-43-2	Benzene	2.4E+06	4.2E+01	c	1.0E+06	c
75-27-4	Bromodichloromethane	5.5E+09	3.3E+01	c	7.8E+05	c
74-83-9	Bromomethane	4.0E+07	2.6E+03	nc	9.5E+06	nc
75-15-0	Carbon disulfide	--	3.7E+05	nc	1.4E+09	nc
56-23-5	Carbon tetrachloride	3.2E+07	2.9E+01	c	1.1E+06	c
67-66-3	Chloroform	2.1E+08	2.3E+02	c	4.9E+06	c
110-82-7	Cyclohexane	--	3.1E+06	nc	1.8E+10	nc
124-48-1	Dibromochloromethane	--	4.5E+01	c	8.8E+05	c
156-59-2	Dichloroethene, cis-1,2-	3.4E+07	3.7E+03	nc	8.3E+06	nc
156-60-5	Dichloroethene, trans-1,2-	3.4E+07	3.1E+04	nc	9.3E+07	nc
10061-02-6	Dichloropropene, trans-1,3-	2.1E+06	7.6E+01	c	3.9E+06	c
64-17-5	Ethanol	--	2.1E+06	nc	1.9E+08	nc
100-41-4	Ethylbenzene	1.0E+06	4.9E+02	c	7.0E+06	c
142-82-5	Heptane	--	3.7E+05	nc	2.3E+09	nc
87-68-3	Hexachloro-1,3-butadiene	6.0E+06	5.5E+01	c	8.0E+04	c
110-54-3	Hexane	--	3.7E+05	nc	1.7E+09	nc
67-63-0	Isopropanol	--	3.7E+06	nc	5.7E+08	nc
98-82-8	Isopropylbenzene (cumene)	--	2.1E+05	nc	1.5E+09	nc
78-93-3	Methyl ethyl ketone (2-butanone)	1.6E+07	2.6E+06	nc	1.1E+09	nc
75-09-2	Methylene chloride	2.8E+08	1.2E+03	c	2.8E+07	c
1634-04-4	Methyl-tert-butyl ether	2.7E+05	4.7E+03	c	6.5E+07	c
91-20-3	Naphthalene	2.2E+05	3.6E+01	c	6.3E+04	c
103-65-1	Propylbenzene	--	5.2E+05	nc	6.6E+08	nc
75-65-0	tert-Butyl Alcohol (TBA)	--	5.5E+05	nc	2.6E+08	nc

Table 3-1

Site-Specific Cleanup Goals for Sub-Slab and Soil Vapor

Former Kast Property

CAS Number		Odor-Based SSCG[1] (µg/m³)	Sub-Slab and Soil Vapor		Soil Vapor	
			Onsite Resident		Construction and Utility Maintenance Worker	
			SSCG (µg/m³)	Basis	SSCG (µg/m³)	Basis
127-18-4	Tetrachloroethene	1.6E+07	2.1E+02	c	6.6E+06	c
109-99-9	Tetrahydrofuran	--	1.0E+06	nc	4.9E+08	nc
108-88-3	Toluene	1.5E+07	2.6E+06	nc	3.7E+09	nc
79-01-6	Trichloroethene	6.8E+08	2.2E+02	c	2.0E+06	nc
75-01-4	Vinyl chloride	3.9E+08	1.6E+01	c	8.3E+05	c
1330-20-7	Xylene, total	2.2E+05	5.2E+04	nc	5.9E+07	nc
	TPH					
	Aliphatic: C5-C8	--	3.7E+05	nc	1.2E+09	nc
	Aliphatic: C9-C18	--	1.6E+05	nc	1.2E+08	nc
	Aliphatic: C19-C32	--	--	--	--	--
	Aromatic: C6-C8	--	--	--	--	--
	Aromatic: C9-C16	--	2.6E+04	nc	6.7E+06	nc
	Aromatic: C17-C32	--	--	--	--	--
	TPHg	5.0E+04	7.2E+04	nc	2.2E+07	nc
	TPHd	5.0E+05	8.1E+04	nc	2.3E+07	nc
	TPHmo	--	--	--	--	--

Notes:

" -- " not applicable or not available

[1] Odor-based SSCGs for soil vapor based on SFRWCQB ESLs (SFRWCQB, 2013) as directed by RWQCB (RWQCB, 2014b,e).

nc = SSCG based on noncancer effects

c = SSCG based on cancer effects

Table 3-2

Site-Specific Cleanup Goals for Soil

Former Kast Property

CAS Number	Constituents of Concern	$SSCG_{soil\text{-}GW}$[1] (mg/kg)	(BTV)[2] (mg/kg)	Soil Site-Specific Cleanup Goals (mg/kg)					
				Onsite Resident				Construction and Utility Maintenance Worker	
				EF = 350 d/y		EF = 4 d/y			
				SSCG (mg/kg)	Basis	SSCG (mg/kg)	Basis	SSCG (mg/kg)	Basis
	Inorganics								
7440-36-0	Antimony	2.7E-01	7.4E-01	3.1E+01	nc	2.7E+03	nc	3.1E+03	nc
7440-38-2	Arsenic	--	1.2E+01	6.1E-02	c	5.4E+00	c	1.5E+01	c
7440-43-9	Cadmium	--	3.8E+00	7.0E+01	nc	6.2E+03	nc	2.4E+02	c
18540-29-9	Chromium VI	--	--	1.3E+00	c	1.1E+02	c	6.7E+00	c
7440-48-4	Cobalt	--	1.1E+01	2.3E+01	nc	2.1E+03	nc	1.1E+02	c
7440-50-8	Copper	--	5.9E+01	3.1E+03	nc	2.7E+05	nc*	3.1E+05	nc*
7439-92-1	Lead	--	6.1E+01	8.0E+01[3]	--	8.2E+02[4]	--	8.2E+02[5]	--
7440-28-0	Thallium	1.4E-01	2.3E-01	7.8E-01	nc	6.8E+01	nc	7.7E+01	nc
7440-62-2	Vanadium	--	4.6E+01	3.9E+02	nc	3.4E+04	nc	3.3E+03	nc
7440-66-6	Zinc	--	2.9E+02	2.3E+04	nc	2.1E+06	nc*	2.3E+06	nc*
	PAHs								
56-55-3	Benz[a]anthracene	--	--	1.6E+00	c	1.4E+02	c	2.6E+02	c
50-32-8	Benzo[a]pyrene	--	9.0E-01	1.6E-01	c	1.4E+01	c	2.6E+01	c
205-99-2	Benzo[b]fluoranthene	--	--	1.6E+00	c	1.4E+02	c	2.6E+02	c
207-08-9	Benzo[k]fluoranthene	--	--	1.6E+00	c	1.4E+02	c	2.6E+02	c
218-01-9	Chrysene	--	--	1.6E+01	c	1.4E+03	c	2.6E+03	c
53-70-3	Dibenz[a,h]anthracene	--	--	1.1E-01	c	9.7E+00	c	1.9E+01	c
193-39-5	Indeno[1,2,3-cd]pyrene	--	--	1.6E+00	c	1.4E+02	c	2.6E+02	c
90-12-0	Methylnaphthalene, 1-	--	--	1.6E+01	c	1.4E+03	c	2.7E+03	c
91-57-6	Methylnaphthalene, 2-	--	--	2.3E+02	nc	2.0E+04	nc	1.1E+04	nc
91-20-3	Naphthalene	1.4E+01	--	4.0E+00	c	3.5E+02	c	3.9E+01	c
129-00-0	Pyrene	--	--	1.7E+03	nc	1.5E+05	nc*	6.7E+04	nc
	TPH								
	TPHg	117	--	7.6E+02	nc	6.6E+04	nc*	8.6E+02	nc
	TPHd	625	--	1.3E+03	nc	1.1E+05	nc*	1.9E+03	nc
	TPHmo	10000	--	3.3E+03	nc	2.9E+05	nc*	1.6E+05	nc*
	SVOCs								
121-14-2	2,4-Dinitrotoluene	--	--	1.6E+00	c	1.4E+02	c	2.8E+02	c
117-81-7	Bis(2-Ethylhexyl) Phthalate	--	--	3.5E+01	c	3.0E+03	c	6.4E+03	c
	VOCs								
79-34-5	1,1,2,2-Tetrachloroethane	--	--	4.7E-01	c	4.1E+01	c	5.7E+00	c
96-18-4	1,2,3-Trichloropropane	4.2E-06	--	2.1E-02	c	1.9E+00	c	2.0E+00	nc
95-63-6	1,2,4-Trimethylbenzene	--	--	8.3E+01	nc	7.2E+03	nc	7.5E+01	nc
107-06-2	1,2-Dichloroethane	3.2E-04	--	--		--		--	
156-59-2	cis-1,2-Dichloroethene	3.9E-03	--	--		--		--	
78-87-5	1,2-Dichloropropane	--	--	8.3E-01	c	7.2E+01	c	8.5E+00	c
108-67-8	1,3,5-Trimethylbenzene	--	--	8.5E+01	nc	7.4E+03	nc	7.7E+01	nc

Table 3-2

Site-Specific Cleanup Goals for Soil

Former Kast Property

CAS Number	Constituents of Concern	$SSCG_{soil-GW}$[1] (mg/kg)	(BTV)[2] (mg/kg)	Soil Site-Specific Cleanup Goals (mg/kg)					
				Onsite Resident				Construction and Utility Maintenance Worker	
				EF = 350 d/y		EF = 4 d/y			
				SSCG (mg/kg)	Basis	SSCG (mg/kg)	Basis	SSCG (mg/kg)	Basis
106-46-7	1,4-Dichlorobenzene	1.2E-02	--	2.8E+00	c	2.4E+02	c	2.8E+01	c
71-43-2	Benzene	2.1E-02	--	2.2E-01	c	1.9E+01	c	2.2E+00	c
75-27-4	Bromodichloromethane	--	--	4.9E-01	c	4.2E+01	c	5.3E+00	c
74-83-9	Bromomethane	--	--	8.8E+00	nc	7.7E+02	nc	7.8E+00	nc
100-41-4	Ethylbenzene	--	--	4.8E+00	c	4.2E+02	c	5.1E+01	c
75-09-2	Methylene chloride	--	--	5.3E+00	c	4.7E+02	c	5.9E+01	c
75-65-0	tert-Butyl Alcohol	7.9E-03	--	--		--		--	
127-18-4	Tetrachloroethene	5.8E-03	--	5.5E-01	c	4.9E+01	c	1.0E+01	c
108-88-3	Toluene	--	--	4.8E+03	nc	4.2E+05	nc*	1.6E+04	nc
79-01-6	Trichloroethene	3.2E-03	--	1.2E+00	c	1.0E+02	c	5.5E+00	nc
75-01-4	Vinyl chloride	3.2E-04	--	3.2E-02	c	2.8E+00	c	3.1E-01	c
1330-20-7	Xylene, total	--	--	5.6E+02	nc	4.9E+04	nc	4.7E+02	nc

Notes:

" -- " not applicable or not available

EF = exposure frequency; d/y = days per year

TPHg = Total Petroleum Hydrocarbons- gasoline range

TPHd = Total Petroleum Hydrocarbons- diesel range

TPHmo = Total Petroleum Hydrocarbons- motor oil range

nc = SSCG based on noncancer effects; c = SSCG based on cancer effects

* Values are above Csat, 1E+05 or Cres

[1] A $SSCG_{soil-GW}$ value was only listed for those COCs identified for potential soil leaching to groundwater. These $SSCG_{soil-GW}$ are from the January 23, 2014 letter from the Regional Board on the Revised SSCG Report (RWQCB, 2014b) as corrected in the May 29, 2014 letter from the Regional Board for benzene and TPH-mo (RWQCB, 2014e).

[2] To evaluate potential human health exposures, the higher value between the health-based SSCG and Background Threshold Value (BTV) will be selected as the cleanup goal. To evaluate potential leaching to groundwater, the higher between $SSCG_{soil-GW}$ and BTV will be will be selected as the cleanup goal.

[3] Cal-EPA DTSC, 2009b. Revised California Human Health Screening Levels for Lead. September 2009.

[4] Based on USEPA adult lead model (USEPA, 2003), similar parameters used for the residential CHHSL, and a lower exposure frequency.

[5] Based on USEPA adult lead model (USEPA, 2003), similar parameters used for the industrial worker CHHSL, and a lower exposure frequency.

Table 3-3
Site-Specific Cleanup Goals for Groundwater
Former Kast Property

CAS Number	Constituents of Concern	Primary MCL (µg/L)	Secondary MCL, NL or ESL (µg/L)	Selected Groundwater $SSCG_{GW}$
	Inorganics			
7440-36-0	Antimony	6.0E+00	--	Bkgd
7440-38-2	Arsenic	1.0E+01	--	Bkgd
7440-28-0	Thallium	2.0E+00	--	Bkgd
	PAHs			
91-20-3	Naphthalene	--	1.7E+01	1.7E+01
	TPH			
	TPHg	--	4.1E+02	1.0E+02*
	TPHd	--	2.0E+02	1.0E+02*
	TPHmo	--	6.2E+03	1.0E+02*
	VOCs			
75-34-3	1,1-Dichloroethane	5.0E+00	--	5.0E+00
75-35-4	1,1-Dichloroethene	6.0E+00	--	6.0E+00
96-18-4	1,2,3-Trichloropropane	--	5.0E-03	5.0E-03
107-06-2	1,2-Dichloroethane	5.0E-01	--	5.0E-01
156-59-2	cis-1,2-Dichloroethene	6.0E+00	--	6.0E+00
71-43-2	Benzene	1.0E+00	--	1.0E+00
75-65-0	tert-Butyl Alcohol (TBA)	--	1.2E+01	1.2E+01
127-18-4	Tetrachloroethene	5.0E+00	--	5.0E+00
156-60-5	trans-1,2-Dichloroethene	1.0E+01	--	1.0E+01
79-01-6	Trichloroethene	5.0E+00	--	5.0E+00
75-01-4	Vinyl Chloride	5.0E-01	--	5.0E-01
106-46-7	1,4-Dichlorobenzene	5.0E+00	--	5.0E+00

Notes:

" -- " not available

µg/L: micrograms per liter

Bkgd = background

MCL = State of Maximum Contaminant Level for drinking water

NL = Notification Level

ESL = Environmental Screening Levels, San Francisco RWQCB, Region 2 (SFRWCQB, 2013)

GW = groundwater; SSCG = Site-Specific Cleanup Goal

* Secondary taste and odor threshold for TPH from a Compilation of Water Quality Goals, 16th Edition, April 2011 (SWRCB, 2011)

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
348	248TH	R	1	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, sub-slab depressurization system, SVE/biovent wells.
354	248TH	R	1	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
360	248TH	R	1	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
364	248TH	R	1	Shallow excavation 0-5 feet, SVE/biovent wells.
345	249TH	R	1	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
353	249TH	R	1	Shallow excavation 0-5 feet, SVE/biovent wells.
357	249TH	R	1	No excavation, SVE/biovent wells.
363	249TH	R	1	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
367	249TH	R	1	Shallow excavation 0-5 feet, SVE/biovent wells.
370	248TH	NR	2	No data, to be determined.
374	248TH	R	2	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
373	249TH	R	2	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
377	249TH	R	2	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
383	249TH	R	2	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24819	PANAMA	R	2	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24823	PANAMA	NR	2	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24829	PANAMA	R	2	Shallow excavation 0-5 feet, SVE/biovent wells.
24833	PANAMA	R	2	Shallow excavation 0-5 feet, SVE/biovent wells.
24752	RAVENNA	NR	2	Shallow excavation 0-5 feet, SVE/biovent wells.
24729	PANAMA	NR	3	No remediation
24733	PANAMA	R	3	Shallow excavation 0-5 feet, SVE/biovent wells.
24739	PANAMA	R	3	Shallow excavation 0-5 feet, SVE/biovent wells.
24803	PANAMA	R	3	Shallow excavation 0-5 feet, SVE/biovent wells.
24809	PANAMA	R	3	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24813	PANAMA	R	3	Shallow excavation 0-5 feet, SVE/biovent wells.
24726	RAVENNA	R	3	Shallow excavation 0-5 feet, SVE/biovent wells.
24732	RAVENNA	R	3	Shallow excavation 0-5 feet, SVE/biovent wells.
24736	RAVENNA	R	3	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24742	RAVENNA	NR	3	No data, to be determined.
24748	RAVENNA	R	3	Shallow excavation 0-5 feet, SVE/biovent wells.
24703	PANAMA	NR	4	Shallow excavation 0-5 feet, SVE/biovent wells.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24709	PANAMA	R	4	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24713	PANAMA	R	4	Shallow excavation 0-5 feet, SVE/biovent wells.
24719	PANAMA	R	4	Shallow excavation 0-5 feet, SVE/biovent wells.
24723	PANAMA	NR	4	No data, to be determined.
24700	RAVENNA	NR	4	No remediation
24706	RAVENNA	R	4	Shallow excavation 0-5 feet, SVE/biovent wells.
24712	RAVENNA	NR	4	Shallow excavation 0-5 feet, SVE/biovent wells.
24716	RAVENNA	NR	4	Shallow excavation 0-5 feet, SVE/biovent wells.
24722	RAVENNA	R	4	Shallow excavation 0-5 feet, SVE/biovent wells.
24533	PANAMA	R	5	Shallow excavation 0-5 feet, SVE/biovent wells.
24603	PANAMA	NR	5	Shallow excavation 0-5 feet, SVE/biovent wells.
24609	PANAMA	R	5	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24613	PANAMA	R	5	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24619	PANAMA	R	5	Shallow excavation 0-5 feet, SVE/biovent wells.
24532	RAVENNA	R	5	No remediation
24602	RAVENNA	R	5	No remediation
24608	RAVENNA	R	5	Shallow excavation 0-5 feet, SVE/biovent wells.
24612	RAVENNA	R	5	Shallow excavation 0-5 feet, SVE/biovent wells.
24618	RAVENNA	R	5	Shallow excavation 0-5 feet, SVE/biovent wells.
24513	PANAMA	NR	6	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24519	PANAMA	R	6	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24523	PANAMA	NR	6	No data, to be determined.
24529	PANAMA	R	6	No remediation
24512	RAVENNA	NR	6	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24518	RAVENNA	R	6	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24522	RAVENNA	R	6	Shallow excavation 0-5 feet, SVE/biovent wells.
24528	RAVENNA	NR	6	No data, to be determined.
24427	PANAMA	R	7	No excavation, SVE/biovent wells.
24431	PANAMA	R	7	Shallow excavation 0-5 feet, SVE/biovent wells.
24437	PANAMA	NR	7	No data, to be determined.
24503	PANAMA	R	7	Shallow excavation 0-5 feet, SVE/biovent wells.
24509	PANAMA	R	7	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24416	RAVENNA	R	7	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24422	RAVENNA	R	7	Shallow excavation 0-5 feet, SVE/biovent wells.
24426	RAVENNA	R	7	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24502	RAVENNA	R	7	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24508	RAVENNA	R	7	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24411	PANAMA	R	8	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24417	PANAMA	NR	8	No excavation, SVE/biovent wells.
24421	PANAMA	R	8	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24402	RAVENNA	R	8	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24406	RAVENNA	NR	8	Shallow excavation 0-5 feet, SVE/biovent wells.
24412	RAVENNA	R	8	Shallow excavation 0-5 feet, SVE/biovent wells.
331	244TH ST	R	9	Shallow excavation 0-5 feet.
337	244TH ST	R	9	Shallow excavation 0-5 feet.
341	244TH ST	R	9	No remediation
347	244TH ST	R	9	No remediation
351	244TH ST	R	9	Shallow excavation 0-5 feet, SVE/biovent wells.
357	244TH ST	R	9	Shallow excavation 0-5 feet, SVE/biovent wells.
361	244TH ST	R	9	No remediation
367	244TH	NR	9	Shallow excavation 0-5 feet, SVE/biovent wells.
373	244TH	NR	9	No data, to be determined.
301	244TH ST	R	10	No remediation
305	244TH ST	R	10	Shallow excavation 0-5 feet, SVE/biovent wells.
311	244TH ST	NR	10	Shallow excavation 0-5 feet, SVE/biovent wells.
317	244TH ST	R	10	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
321	244TH ST	R	10	Shallow excavation 0-5 feet.
327	244TH ST	R	10	No remediation
24401	MARBELLA	R	10	No remediation
24405	MARBELLA	R	10	No remediation
24411	MARBELLA	R	10	Shallow excavation 0-5 feet, SVE/biovent wells.
24417	MARBELLA	NR	10	Shallow excavation 0-5 feet.
24423	MARBELLA	R	10	Shallow excavation 0-5 feet.
24427	MARBELLA	R	10	No remediation
24433	MARBELLA	R	10	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
344	249TH	R	11	Shallow excavation 0-5 feet, SVE/biovent wells.
348	249TH	R	11	Shallow excavation 0-5 feet, SVE/biovent wells.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
352	249TH	R	11	No excavation, sub-slab depressurization system, SVE/biovent wells.
358	249TH	R	11	Shallow excavation 0-5 feet, SVE/biovent wells.
362	249TH	R	11	No remediation
368	249TH	R	11	Shallow excavation 0-5 feet, SVE/biovent wells.
374	249TH	NR	11	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
378	249TH	R	11	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24904	NEPTUNE	R	11	No excavation, SVE/biovent wells.
24912	NEPTUNE	R	11	No excavation, SVE/biovent wells.
402	249TH	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
408	249TH	R	12	No remediation
412	249TH	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
24812	PANAMA	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
24818	PANAMA	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
24822	PANAMA	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
24828	PANAMA	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
24832	PANAMA	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
24838	PANAMA	R	12	Shallow excavation 0-5 feet, SVE/biovent wells.
24708	PANAMA	R	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24712	PANAMA	R	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24718	PANAMA	R	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24722	PANAMA	R	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24728	PANAMA	R	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24732	PANAMA	NR	13	No remediation
24738	PANAMA	R	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24802	PANAMA	R	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24808	PANAMA	NR	13	Shallow excavation 0-5 feet, SVE/biovent wells.
24528	PANAMA	NR	14A	No remediation
24532	PANAMA	R	14A	Shallow excavation 0-5 feet, SVE/biovent wells.
24602	PANAMA	NR	14A	No excavation, SVE/biovent wells.
24608	PANAMA	R	14A	Shallow excavation 0-5 feet, SVE/biovent wells.
24612	PANAMA	R	14A	Shallow excavation 0-5 feet, SVE/biovent wells.
24618	PANAMA	R	14A	Shallow excavation 0-5 feet, SVE/biovent wells.
24622	PANAMA	NR	14A	No data, to be determined.
24702	PANAMA	R	14A	Shallow excavation 0-5 feet, SVE/biovent wells.
377	244TH	R	14B	No remediation

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24402	PANAMA	R	14B	Shallow excavation 0-5 feet, SVE/biovent wells.
24406	PANAMA	R	14B	Shallow excavation 0-5 feet, SVE/biovent wells.
24410	PANAMA	R	14B	No remediation
24416	PANAMA	R	14B	No remediation
24420	PANAMA	R	14B	Shallow excavation 0-5 feet, SVE/biovent wells.
24426	PANAMA	R	14B	Shallow excavation 0-5 feet, SVE/biovent wells.
24430	PANAMA	R	14B	No remediation
24436	PANAMA	R	14B	Shallow excavation 0-5 feet, SVE/biovent wells.
24502	PANAMA	R	14B	No remediation
24508	PANAMA	R	14B	No excavation, sub-slab depressurization system.
24512	PANAMA	R	14B	No remediation
24518	PANAMA	NR	14B	No remediation
24522	PANAMA	R	14B	No remediation
24718	NEPTUNE	R	15	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24722	NEPTUNE	R	15	No excavation, sub-slab depressurization system.
24728	NEPTUNE	R	15	Shallow excavation 0-5 feet, SVE/biovent wells.
24732	NEPTUNE	R	15	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24738	NEPTUNE	R	15	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.
24729	RAVENNA	R	15	No remediation
24733	RAVENNA	R	15	Shallow excavation 0-5 feet, SVE/biovent wells.
24739	RAVENNA	R	15	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24743	RAVENNA	R	15	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24749	RAVENNA	R	15	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.
24628	NEPTUNE	R	16	No excavation, SVE/biovent wells.
24632	NEPTUNE	R	16	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.
24702	NEPTUNE	NR	16	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24708	NEPTUNE	NR	16	No data, to be determined.
24712	NEPTUNE	R	16	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24703	RAVENNA	R	16	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24709	RAVENNA	R	16	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24713	RAVENNA	NR	16	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24719	RAVENNA	R	16	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24723	RAVENNA	R	16	Shallow excavation 0-5 feet, SVE/biovent wells.
24532	NEPTUNE	R	17	No remediation
24602	NEPTUNE	R	17	No remediation
24608	NEPTUNE	R	17	Shallow excavation 0-5 feet, SVE/biovent wells.
24612	NEPTUNE	R	17	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24618	NEPTUNE	R	17	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24622	NEPTUNE	R	17	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24533	RAVENNA	NR	17	No remediation
24603	RAVENNA	R	17	Shallow excavation 0-5 feet, SVE/biovent wells.
24609	RAVENNA	R	17	Shallow excavation 0-5 feet, SVE/biovent wells.
24613	RAVENNA	NR	17	Shallow excavation 0-5 feet, SVE/biovent wells.
24619	RAVENNA	R	17	No excavation, SVE/biovent wells.
24623	RAVENNA	NR	17	No data, to be determined.
24502	NEPTUNE	R	18	No excavation, SVE/biovent wells.
24508	NEPTUNE	R	18	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24512	NEPTUNE	NR	18	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24518	NEPTUNE	R	18	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24522	NEPTUNE	R	18	Shallow excavation 0-5 feet, SVE/biovent wells.
24528	NEPTUNE	R	18	Shallow excavation 0-5 feet, SVE/biovent wells.
24503	RAVENNA	NR	18	No excavation, SVE/biovent wells.
24509	RAVENNA	R	18	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24513	RAVENNA	R	18	No excavation, sub-slab depressurization system, SVE/biovent wells.
24519	RAVENNA	NR	18	Shallow excavation 0-5 feet, SVE/biovent wells.
24523	RAVENNA	NR	18	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24529	RAVENNA	NR	18	Shallow excavation 0-5 feet, SVE/biovent wells.
24402	NEPTUNE	R	19	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24406	NEPTUNE	R	19	No excavation, sub-slab depressurization system, SVE/biovent wells.
24412	NEPTUNE	NR	19	No data, to be determined.
24416	NEPTUNE	R	19	Shallow excavation 0-5 feet, SVE/biovent wells.
24422	NEPTUNE	R	19	No excavation, SVE/biovent wells.
24426	NEPTUNE	R	19	No excavation, SVE/biovent wells.
24403	RAVENNA	R	19	No excavation, SVE/biovent wells.
24409	RAVENNA	R	19	No excavation, SVE/biovent wells.
24413	RAVENNA	R	19	No excavation, SVE/biovent wells.
24419	RAVENNA	R	19	No excavation, SVE/biovent wells.
24423	RAVENNA	R	19	Shallow excavation 0-5 feet, SVE/biovent wells.
24429	RAVENNA	R	19	Shallow excavation 0-5 feet, SVE/biovent wells.
24726	MARBELLA	R	20	No remediation
24732	MARBELLA	R	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24736	MARBELLA	NR	20	No remediation
24740	MARBELLA	NR	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24744	MARBELLA	R	20	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24729	NEPTUNE	R	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24735	NEPTUNE	R	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24739	NEPTUNE	R	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24803	NEPTUNE	R	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24809	NEPTUNE	R	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24815	NEPTUNE	R	20	Shallow excavation 0-5 feet, SVE/biovent wells.
24825	NEPTUNE	NR	20	No remediation
24700	MARBELLA	R	21	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24706	MARBELLA	R	21	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24710	MARBELLA	R	21	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24716	MARBELLA	R	21	Shallow excavation 0-5 feet, SVE/biovent wells.
24722	MARBELLA	R	21	Shallow excavation 0-5 feet, SVE/biovent wells.
24703	NEPTUNE	R	21	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24709	NEPTUNE	R	21	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, sub-slab depressurization system, SVE/biovent wells.
24715	NEPTUNE	R	21	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24719	NEPTUNE	R	21	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24725	NEPTUNE	R	21	No remediation
24612	MARBELLA	NR	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24616	MARBELLA	R	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24622	MARBELLA	R	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24628	MARBELLA	NR	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24613	NEPTUNE	R	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24619	NEPTUNE	R	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24623	NEPTUNE	R	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24629	NEPTUNE	R	22	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.
24522	MARBELLA	R	23	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24526	MARBELLA	R	23	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24532	MARBELLA	R	23	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24602	MARBELLA	R	23	No excavation, SVE/biovent wells.
24606	MARBELLA	R	23	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24523	NEPTUNE	R	23	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24529	NEPTUNE	R	23	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24533	NEPTUNE	R	23	Shallow excavation 0-5 feet, SVE/biovent wells.
24603	NEPTUNE	R	23	Shallow excavation 0-5 feet, SVE/biovent wells.
24609	NEPTUNE	R	23	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24432	MARBELLA	R	24	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24502	MARBELLA	R	24	Shallow excavation 0-5 feet, SVE/biovent wells.
24506	MARBELLA	R	24	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, sub-slab depressurization system, SVE/biovent wells.
24512	MARBELLA	R	24	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24516	MARBELLA	R	24	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24429	NEPTUNE	R	24	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.
24503	NEPTUNE	R	24	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24509	NEPTUNE	R	24	Shallow excavation 0-5 feet, SVE/biovent wells.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24513	NEPTUNE	R	24	No excavation, SVE/biovent wells.
24519	NEPTUNE	R	24	Shallow excavation 0-5 feet, SVE/biovent wells.
24406	MARBELLA	R	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft back yard, SVE/biovent wells.
24412	MARBELLA	NR	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.
24416	MARBELLA	NR	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24422	MARBELLA	R	25	Shallow excavation 0-5 feet, SVE/biovent wells.
24426	MARBELLA	R	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24403	NEPTUNE	R	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24409	NEPTUNE	R	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24413	NEPTUNE	R	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24419	NEPTUNE	R	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, SVE/biovent wells.
24423	NEPTUNE	R	25	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front and back yards, sub-slab depressurization system, SVE/biovent wells.
24627	MARBELLA	R	26	Shallow excavation 0-5 feet, targeted excavation 5-10 ft front yard, SVE/biovent wells.
24633	MARBELLA	NR	26	Shallow excavation 0-5 feet, SVE/biovent wells.
24703	MARBELLA	R	26	Shallow excavation 0-5 feet, SVE/biovent wells.
24707	MARBELLA	R	26	No remediation
24713	MARBELLA	R	26	No remediation
24717	MARBELLA	R	26	Shallow excavation 0-5 feet, SVE/biovent wells.
24723	MARBELLA	R	26	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24727	MARBELLA	NR	26	Shallow excavation 0-5 feet, SVE/biovent wells.
24733	MARBELLA	R	26	Shallow excavation 0-5 feet, SVE/biovent wells.
24737	MARBELLA	R	26	Shallow excavation 0-5 feet, SVE/biovent wells.
24741	MARBELLA	R	26	No excavation, sub-slab depressurization system.
24503	MARBELLA	R	27	No excavation, sub-slab depressurization system.
24507	MARBELLA	NR	27	No remediation
24513	MARBELLA	NR	27	No data, to be determined.
24517	MARBELLA	R	27	Shallow excavation 0-5 feet, SVE/biovent wells.
24523	MARBELLA	R	27	No remediation
24527	MARBELLA	NR	27	No remediation
24533	MARBELLA	NR	27	No remediation
24603	MARBELLA	NR	27	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells
24607	MARBELLA	NR	27	No excavation, SVE/biovent wells.
24613	MARBELLA	R	27	Shallow excavation 0-5 feet.

TABLE 9-1
Remediation Clusters and Planned Remediation Activities

Address Number	Street Name	Non-Rep (NR) or Rep (R)	Cluster Number	Planned Remediation Activities
24617	MARBELLA	R	27	Shallow excavation 0-5 feet, SVE/biovent wells.
24623	MARBELLA	R	27	Shallow excavation 0-5 feet, sub-slab depressurization system, SVE/biovent wells

Table 9-2
Typical Laboratory Reporting Limits for Non-Impacted Soil for Backfill Testing

Analysis	Unit	Analyte	Laboratory Reporting Limits
VOCs by EPA Method 8260B	µg/kg	Acetone	50
	µg/kg	Benzene	1.0
	µg/kg	Bromobenzene	1.0
	µg/kg	Bromochloromethane	2.0
	µg/kg	Bromodichloromethane	1.0
	µg/kg	Bromoform	5.0
	µg/kg	Bromomethane	20
	µg/kg	2-Butanone	20
	µg/kg	n-Butylbenzene	1.0
	µg/kg	sec-Butylbenzene	1.0
	µg/kg	tert-Butylbenzene	1.0
	µg/kg	Carbon Disulfide	10
	µg/kg	Carbon Tetrachloride	1.0
	µg/kg	Chlorobenzene	1.0
	µg/kg	Chloroethane	2.0
	µg/kg	Chloroform	1.0
	µg/kg	Chloromethane	20
	µg/kg	2-Chlorotoluene	1.0
	µg/kg	4-Chlorotoluene	1.0
	µg/kg	Dibromochloromethane	2.0
	µg/kg	1,2-Dibromo-3-Chloropropane	5.0
	µg/kg	1,2-Dibromoethane	1.0
	µg/kg	Dibromomethane	1.0
	µg/kg	1,2-Dichlorobenzene	1.0
	µg/kg	1,3-Dichlorobenzene	1.0
	µg/kg	1,4-Dichlorobenzene	1.0
	µg/kg	Dichlorodifluoromethane	2.0
	µg/kg	1,1-Dichloroethane	1.0
	µg/kg	1,2-Dichloroethane	1.0
	µg/kg	1,1-Dichloroethene	1.0
	µg/kg	c-1,2-Dichloroethene	1.0
	µg/kg	t-1,2-Dichloroethene	1.0
	µg/kg	1,2-Dichloropropane	1.0
	µg/kg	1,3-Dichloropropane	1.0
	µg/kg	2,2-Dichloropropane	5.0
	µg/kg	1,1-Dichloropropene	2.0
	µg/kg	c-1,3-Dichloropropene	1.0
	µg/kg	t-1,3-Dichloropropene	2.0
	µg/kg	Ethylbenzene	1.0
	µg/kg	2-Hexanone	20
	µg/kg	Isopropylbenzene	1.0
	µg/kg	p-Isopropyltoluene	1.0
	µg/kg	Methylene Chloride	10
	µg/kg	4-Methyl-2-Pentanone	20
	µg/kg	Naphthalene	10
	µg/kg	n-Propylbenzene	2.0
	µg/kg	Styrene	1.0
	µg/kg	1,1,1,2-Tetrachloroethane	1.0
	µg/kg	1,1,2,2-Tetrachloroethane	2.0
	µg/kg	Tetrachloroethene	1.0
	µg/kg	Toluene	1.0

Table 9-2
Typical Laboratory Reporting Limits for Non-Impacted Soil for Backfill Testing

Analysis	Unit	Analyte	Laboratory Reporting Limits
VOCs by EPA Method 8260B	µg/kg	1,2,3-Trichlorobenzene	2.0
	µg/kg	1,2,4-Trichlorobenzene	2.0
	µg/kg	1,1,1-Trichloroethane	1.0
	µg/kg	1,1,2-Trichloro-1,2,2-Trifluoroethane	10
	µg/kg	1,1,2-Trichloroethane	1.0
	µg/kg	Trichloroethene	2.0
	µg/kg	Trichlorofluoromethane	10
	µg/kg	1,2,3-Trichloropropane	2.0
	µg/kg	1,2,4-Trimethylbenzene	2.0
	µg/kg	1,3,5-Trimethylbenzene	2.0
	µg/kg	Vinyl Acetate	10
	µg/kg	Vinyl Chloride	1.0
	µg/kg	p/m-Xylene	2.0
	µg/kg	o-Xylene	1.0
	µg/kg	Xylenes (total)	1.0
	µg/kg	Methyl-t-Butyl Ether (MTBE)	2.0
	µg/kg	Tert-Butyl Alcohol (TBA)	20
	µg/kg	Diisopropyl Ether (DIPE)	1.0
	µg/kg	Ethyl-t-Butyl Ether (ETBE)	1.0
	µg/kg	Tert-Amyl-Methyl Ether (TAME)	1.0
	µg/kg	Ethanol	500
SVOCs by EPA Method 8270C	mg/kg	Acenaphthene	0.50
	mg/kg	Acenaphthylene	0.50
	mg/kg	Aniline	0.50
	mg/kg	Anthracene	0.50
	mg/kg	Azobenzene	0.50
	mg/kg	Benzidine	10
	mg/kg	Benzo (a) Anthracene	0.50
	mg/kg	Benzo (a) Pyrene	0.50
	mg/kg	Benzo (b) Fluoranthene	0.50
	mg/kg	Benzo (g,h,i) Perylene	0.50
	mg/kg	Benzo (k) Fluoranthene	0.50
	mg/kg	Benzoic Acid	2.5
	mg/kg	Benzyl Alcohol	0.50
	mg/kg	Bis(2-Chloroethoxy) Methane	0.50
	mg/kg	Bis(2-Chloroethyl) Ether	2.5
	mg/kg	Bis(2-Chloroisopropyl) Ether	0.50
	mg/kg	Bis(2-Ethylhexyl) Phthalate	0.50
	mg/kg	4-Bromophenyl-Phenyl Ether	0.50
	mg/kg	Butyl Benzyl Phthalate	0.50
	mg/kg	4-Chloro-3-Methylphenol	0.50
	mg/kg	4-Chloroaniline	0.50
	mg/kg	2-Chloronaphthalene	0.50
	mg/kg	2-Chlorophenol	0.50
	mg/kg	4-Chlorophenyl-Phenyl Ether	0.50
	mg/kg	Chrysene	0.50
	mg/kg	Di-n-Butyl Phthalate	0.50
	mg/kg	Di-n-Octyl Phthalate	0.50
	mg/kg	Dibenz (a,h) Anthracene	0.50

Table 9-2
Typical Laboratory Reporting Limits for Non-Impacted Soil for Backfill Testing

Analysis	Unit	Analyte	Laboratory Reporting Limits
SVOCs by EPA Method 8270C	mg/kg	Dibenzofuran	0.50
	mg/kg	1,2-Dichlorobenzene	0.50
	mg/kg	1,3-Dichlorobenzene	0.50
	mg/kg	1,4-Dichlorobenzene	0.50
	mg/kg	3,3-Dichlorobenzidine	10
	mg/kg	2,4-Dichlorophenol	0.50
	mg/kg	Diethyl Phthalate	0.50
	mg/kg	Dimethyl Phthalate	0.50
	mg/kg	2,4-Dimethylphenol	0.50
	mg/kg	4,6-Dinitro-2-Methylphenol	2.5
	mg/kg	2,4-Dinitrophenol	2.5
	mg/kg	2,4-Dinitrotoluene	0.50
	mg/kg	2,6-Dinitrotoluene	0.50
	mg/kg	Fluoranthene	0.50
	mg/kg	Fluorene	0.50
	mg/kg	Hexachloro-1,3-Butadiene	0.50
	mg/kg	Hexachlorobenzene	0.50
	mg/kg	Hexachlorocyclopentadiene	2.5
	mg/kg	Hexachloroethane	0.50
	mg/kg	Indeno (1,2,3-c,d) Pyrene	0.50
	mg/kg	Isophorone	0.50
	mg/kg	2-Methylnaphthalene	0.50
	mg/kg	1-Methylnaphthalene	0.50
	mg/kg	2-Methylphenol	0.50
	mg/kg	3/4-Methylphenol	0.50
	mg/kg	N-Nitroso-di-n-propylamine	0.50
	mg/kg	N-Nitrosodimethylamine	0.50
	mg/kg	N-Nitrosodiphenylamine	0.50
	mg/kg	Naphthalene	0.50
	mg/kg	4-Nitroaniline	0.50
	mg/kg	3-Nitroaniline	0.50
	mg/kg	2-Nitroaniline	0.50
	mg/kg	Nitrobenzene	2.5
	mg/kg	4-Nitrophenol	0.50
	mg/kg	2-Nitrophenol	0.50
	mg/kg	Pentachlorophenol	2.5
	mg/kg	Phenanthrene	0.50
	mg/kg	Phenol	0.50
	mg/kg	Pyrene	0.50
	mg/kg	Pyridine	0.50
	mg/kg	1,2,4-Trichlorobenzene	0.50
	mg/kg	2,4,6-Trichlorophenol	0.50
	mg/kg	2,4,5-Trichlorophenol	0.50
PCBs by EPA Method 8082	µg/kg	Aroclor-1016	50
	µg/kg	Aroclor-1221	50
	µg/kg	Aroclor-1232	50
	µg/kg	Aroclor-1242	50
	µg/kg	Aroclor-1248	50
	µg/kg	Aroclor-1254	50
	µg/kg	Aroclor-1260	50

Table 9-2
Typical Laboratory Reporting Limits for Non-Impacted Soil for Backfill Testing

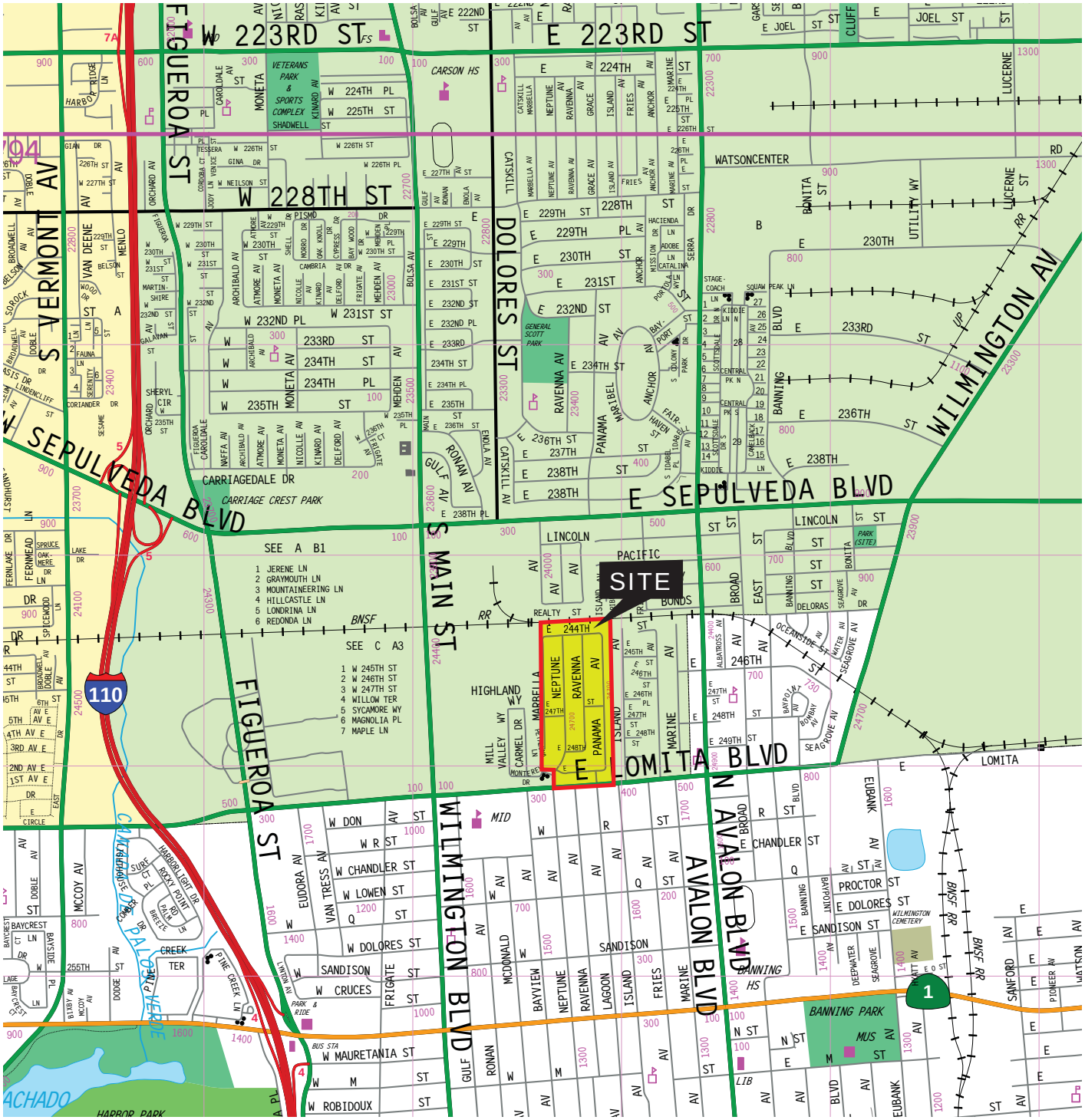
Analysis	Unit	Analyte	Laboratory Reporting Limits
PCBs by EPA Method 8082	µg/kg	Aroclor-1262	50
	µg/kg	Aroclor-1268	50
	µg/kg	Total PCB Aroclors	50
Title 22 Metals by EPA Method 6010B	mg/kg	Antimony	0.75
	mg/kg	Arsenic	0.75
	mg/kg	Barium	0.50
	mg/kg	Beryllium	0.25
	mg/kg	Cadmium	0.50
	mg/kg	Chromium	0.25
	mg/kg	Cobalt	0.25
	mg/kg	Copper	0.50
	mg/kg	Lead	0.50
	mg/kg	Molybdenum	0.25
	mg/kg	Nickel	0.25
	mg/kg	Selenium	0.75
	mg/kg	Silver	0.25
	mg/kg	Thallium	0.75
	mg/kg	Vanadium	0.25
	mg/kg	Zinc	1.0
EPA Method 7471A	mg/kg	Mercury	0.0833
EPA Method 7196A	mg/kg	Chromium, Hexavalent	0.80
TPH by EPA Method 8015B(M)	mg/kg	TPH as Gasoline	0.25
	mg/kg	TPH as Motor Oil	25
EPA Method 8015B	mg/kg	Diesel Range Organics	5.0
PAHs by EPA Method 8270C SIM	mg/kg	Acenaphthene	0.005
	mg/kg	Acenaphthylene	0.005
	mg/kg	Anthracene	0.005
	mg/kg	Benzo (a) Anthracene	0.005
	mg/kg	Benzo (a) Pyrene	0.005
	mg/kg	Benzo (b) Fluoranthene	0.005
	mg/kg	Benzo (g,h,i) Perylene	0.005
	mg/kg	Benzo (k) Fluoranthene	0.005
	mg/kg	Chrysene	0.005
	mg/kg	Dibenz (a,h) Anthracene	0.005
	mg/kg	Fluoranthene	0.005
	mg/kg	Fluorene	0.005
	mg/kg	Indeno (1,2,3-cd) Pyrene	0.005
	mg/kg	2-Methylnaphthalene	0.005
	mg/kg	1-Methylnaphthalene	0.005
	mg/kg	Naphthalene	0.005
	mg/kg	Phenanthrene	0.005
	mg/kg	Pyrene	0.005

TABLE 14-1
GROUNDWATER MONITORING WELL GAUGING AND SAMPLING LIST
FORMER KAST PROPERTY
CARSON, CA

Well Name	Date Completed	LNAPL Recovery	Location	Casing Diameter (inches)	TOC Elevation (ft MSL)	Ground Surface Elevation (ft MSL)	Top of Screen Elevation (ft MSL)	Screened Interval (ft bgs)	Bottom of Casing (ft bgs)	Top of Filter Pack Elevation (ft MSL)	Top Of Filter Pack (ft bgs)	Bottom Of Filter Pack (ft bgs)	Total Depth (ft)	Aquifer
MW-01	7/23/2009	No	On-site	4	39.58	39.98	-10	50-80	80	-8	48	83	83	Water Table
MW-02	7/24/2009	No	On-site	4	43.03	43.49	-3.5	47-77	77	-0.5	44	77.5	77.5	Water Table
MW-03	7/22/2009	Yes	On-site	4	33.14	33.64	-9.4	43-73	73	-7.4	41	75	75	Water Table
MW-04	7/28/2009	No	On-site	4	40.85	41.32	-11.7	53-83	83	-9.7	51	85	85	Water Table
MW-05	7/21/2009	No	On-site	4	32.31	32.79	-10.2	43-73	73	-8.2	41	75	75	Water Table
MW-06	7/27/2009	No	On-site	4	35.59	36.01	-17	53-83	83	-15	51	85	85	Water Table
MW-07	6/3/2010	No	Off-site	4	38.69	39.21	-10.8	50-80	80	-8.8	48	82	82	Water Table
MW-08	6/17/2010	No	On-site	4	38.82	39.31	-10.7	50-80	80	-8.7	48	81	81	Water Table
MW-09	6/15/2010	No	Off-site	4	42.44	42.98	-13	56-86	86	-11	54	87	87	Water Table
MW-10	6/10/2010	No	Off-site	4	45.2	45.83	-11.2	57-87	87	-9.2	55	88	88	Water Table
MW-11	6/8/2010	No	Off-site	4	36.07	36.59	-22.4	59-74	74	-21.4	58	80.5	80.5	Water Table
MW-12	2/15/2011	Yes	On-site	4	33.33	33.82	-16.2	50-70	72.5	-14.2	48	74	74	Water Table
MW-13	2/17/2011	No	On-site	4	33.64	34.25	-11.8	46-71	73.5	-9.8	44	75	75	Water Table
MW-14	4/8/2011	No	On-site	4	41.66	42.22	-9.8	52-77	79	-6.8	49	80	80	Water Table
MW-15	4/1/2011	No	On-site	4	32.52	33.2	-14.8	48-73	75	-11.8	45	76	76	Water Table
MW-16	4/6/2011	No	On-site	4	34.61	35.18	-14.8	50-80	82	-11.8	47	83	83	Water Table
MW-17	4/7/2011	No	On-site	4	31.97	32.5	-15.5	48-78	80	-12.5	45	80.5	80.5	Water Table
MW-18	9/4/2008	Yes	On-site	2	35.49	NA	-14.51	50-70	70	-12.51	48	71	71.5	Water Table
MW-G01D	5/20/2011	No	On-site	4	41.61	42.04	-92	134-154	156.8	-92	134	158.5	158.5	Gage
MW-G01S	5/20/2011	No	On-site	4	41.59	42.04	-58	100-120	122.8	-56	98	124	158.5	Gage
MW-G02D	6/9/2011	No	On-site	4	32.58	33.07	-100.9	134-154	156.8	-98.9	132	158.5	158.5	Gage
MW-G02S	6/9/2011	No	On-site	4	32.55	33.07	-56.9	90-110	112.8	-54.9	88	113.8	158.5	Gage
MW-G03D	5/26/2011	No	On-site	4	34.6	35.19	-106.8	142-162	165	-104.8	140	167	167	Gage
MW-G03S	5/26/2011	No	On-site	4	34.57	35.19	-64.3	99.5-119.5	122.5	-62.8	98	122.5	167	Gage
MW-G04D	6/1/2011	No	On-site	4	32.09	32.59	-101.4	134-154	157	-99.4	132	158.5	158.15	Gage
MW-G04S	6/1/2011	No	On-site	4	32.09	32.59	-59.4	92-112	115	-57.4	90	117	158.5	Gage

Notes
Wells MW-01 through MW-06 surveyed on September 14, 2009
Wells MW-07 through MW-11 surveyed on July 14, 2010
Wells MW-12 and MW-13 surveyed on March 4, 2011
Wells MW-14 through MW-17 and MW-G01 through MW-G04 surveyed on July 18, 2011
MW-18 (formerly Turco MW-16) well construction was obtained from Leymaster Environmental Consulting, LLC. and was surveyed on May 22, 2014
LNAPL - Light Non-Aqueous Phase Liquid. If LNAPL is present within monitor well sampling is not conducted.
NA - Not Available
ft - feet
MSL - Mean Sea Level
bgs - below ground surface

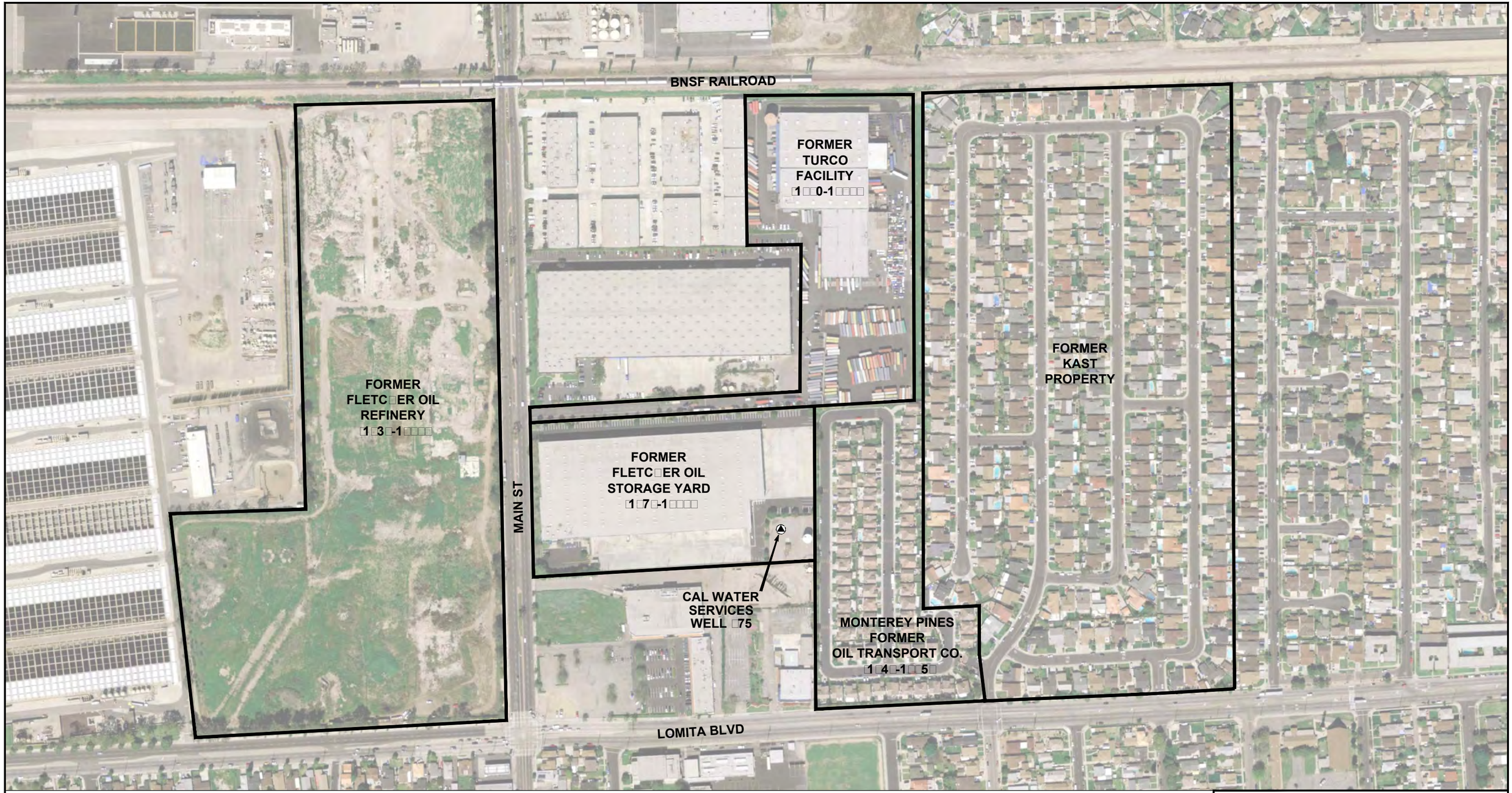
FIGURES



SITE VICINITY MAP

Project No.: 49194119	Date: June 2014	Project: Former KAST Property	Figure 2-1

K:/2008/KAST/fiugure 1 Vic Map.ai



0 150 300

SCALE IN FEET

N

AECOM

LOCATION MAP
SHOWING SITE AND SURROUNDING
PROPERTIES AND FEATURES

Proj. No.: 49194119	Date: JUNE 2014
Project: FORMER KAST PROPERTY	Figure: 2-2

G:\1 Shell Products - Former Kast Property\RAP\SVE\Figure 2-2 Location Map Site And Surrounding Props And Features.dwg , File date: 6/30/2014 9:57 AM , Print date: 6/30/2014 10:03 AM by: Volk, Jessica

≤ 2 FT. BGS

> 2 - ≤ 5 FT. BGS

> 5 - ≤ 10 FT. BGS

N

E 244TH ST
E 247TH ST
E 248TH ST
E 249TH ST
NEPTUNE AVE
RAVENNA AVE
PANAMA AVE
ISLAND AVE
MARBELLA AVE
CARMEL DR
PETALUMA LN
TEREY DR

Legend
- Non-Detect (ND)
- <= 117 mg/kg
- > 117 to 1170 mg/kg
- > 1170 mg/kg

Notes:
117 mg/kg is the soil leaching to groundwater SSCG for TPHg

250 125 0 250 Feet

Geosyntec consultants

Santa Barbara, CA | June 2014

Distribution of TPH-Gasoline in Site Soils

Former Kast Property

Figure **2-3**

Legend

- Non-Detect (ND)
- <= 625 mg/kg
- > 625 to 6250 mg/kg
- > 6250 mg/kg

Notes:
625 mg/kg is the soil leaching to groundwater SSCG for TPHd

250 125 0 250 Feet

Geosyntec consultants

Santa Barbara, CA | June 2014

Distribution of TPH-Diesel in Site Soils

Former Kast Property

Figure **2-4**

≤ 2 FT. BGS

> 2 - ≤ 5 FT. BGS

> 5 - ≤ 10 FT. BGS

N

E 244TH ST
E 247TH ST
E 248TH ST
E 249TH ST
NEPTUNE AVE
RAVENNA AVE
PANAMA AVE
ISLAND AVE
MARBELLA AVE
CARMEL DR
PETALUMA LN
TEREY DR

Legend

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

Notes:
10000 mg/kg is the soil leaching to groundwater SSCG for TPHmo

250 125 0 250 Feet

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Distribution of TPH-Motor Oil in Site Soils

Former Kast Property

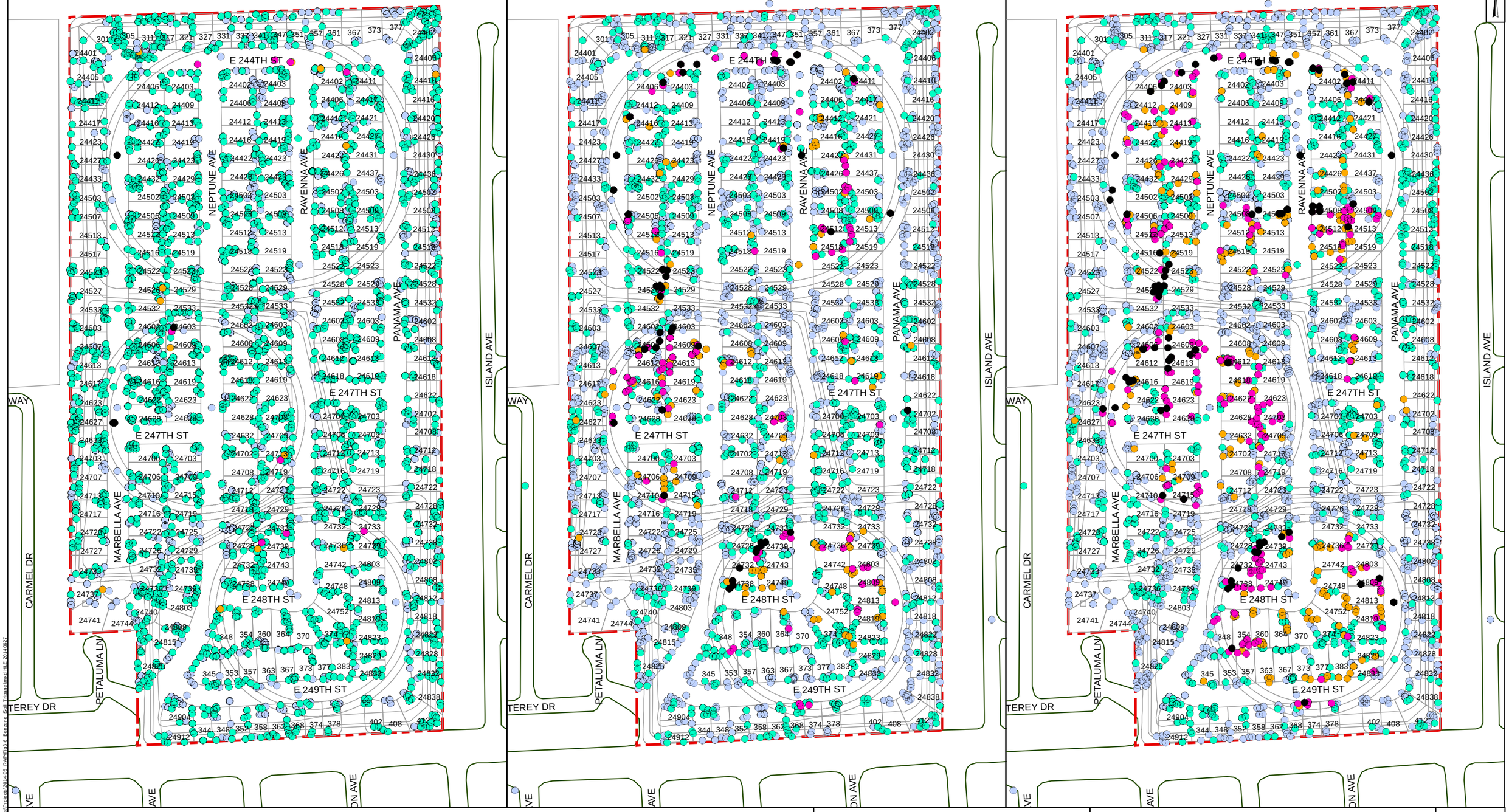
Figure **2-5**

S:\Santa Barbara\Active Projects\Kast\Drawings\2014-06 - RAP\Fig2-5_TPH-mo_Soil_Exceedmnd_HLE 20140627

≤ 2 FT. BGS

> 2 - ≤ 5 FT. BGS

> 5 - ≤ 10 FT. BGS



Legend

- Non-Detect (ND)
- <= 0.021 mg/kg
- > 0.021 to 0.21 mg/kg
- > 0.21 to 2.1 mg/kg
- > 2.1 mg/kg

250 125 0 250 Feet

Notes:
0.021 mg/kg is the soil leaching to groundwater SSCG for Benzene

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Distribution of Benzene in Site Soils

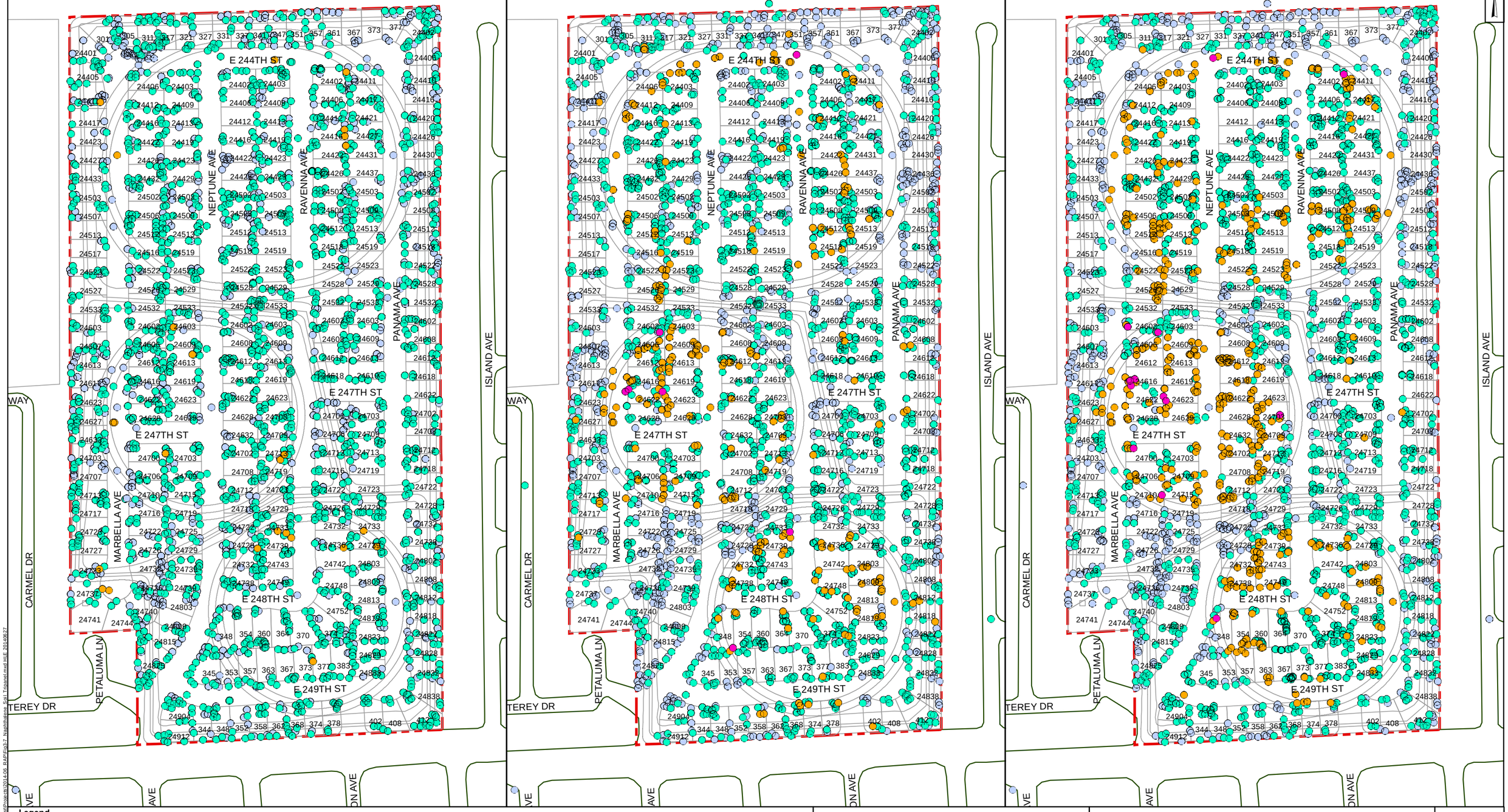
Former Kast Property

Figure **2-6**

≤ 2 FT. BGS

> 2 - ≤ 5 FT. BGS

> 5 - ≤ 10 FT. BGS



Legend

- Non-Detect (ND)
- <= 4.0 mg/kg
- > 4.0 to 40 mg/kg
- > 40 to 400 mg/kg
- > 400 mg/kg

250 125 0 250 Feet

Notes:
4.0 mg/kg is the human health based SSCG for naphthalene

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Distribution of Naphthalene in Site Soils

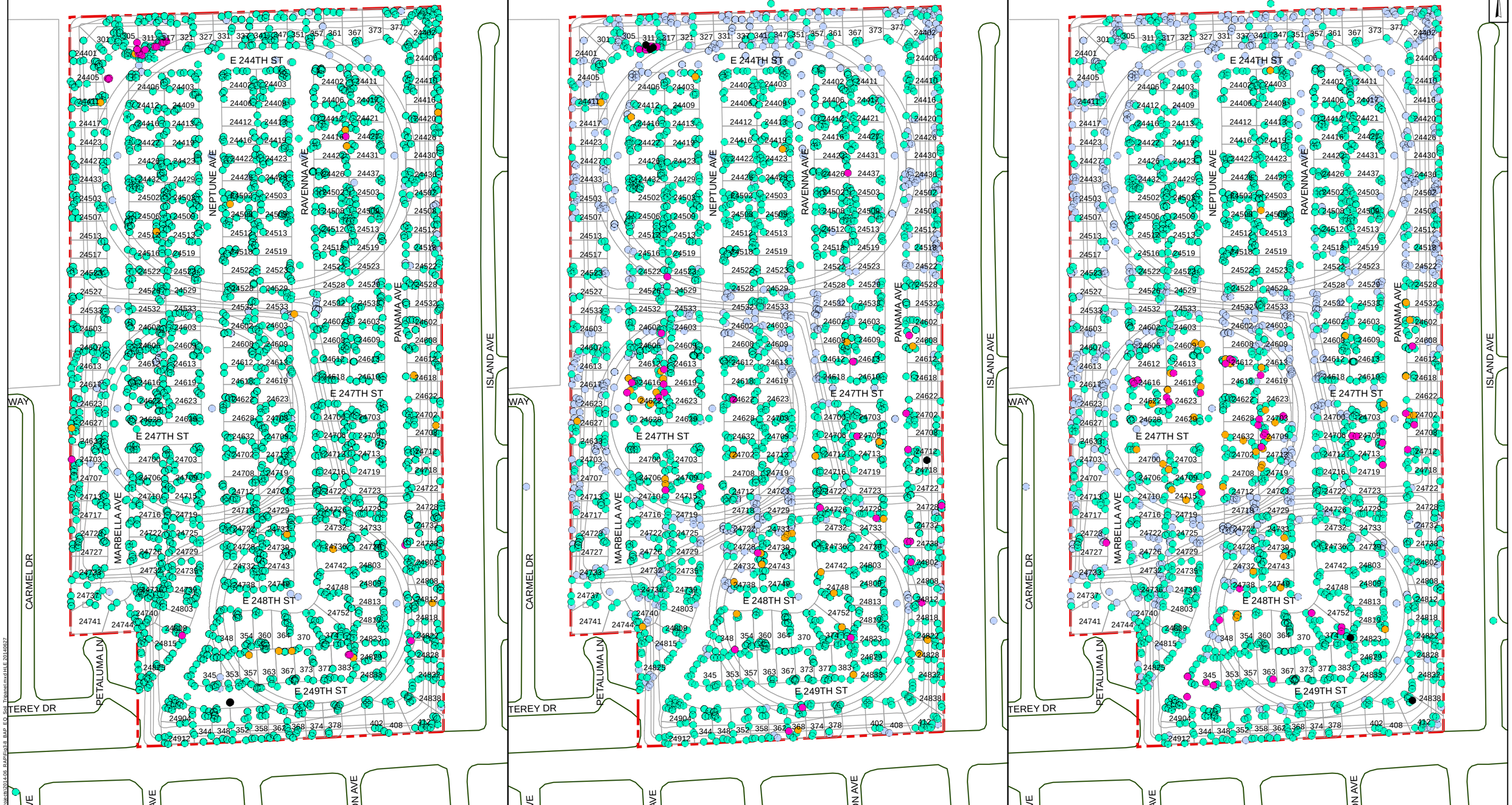
Former Kast Property

Figure **2-7**

≤ 2 FT. BGS

> 2 - ≤ 5 FT. BGS

> 5 - ≤ 10 FT. BGS



Legend

- Non-Detect (ND)
- <= 0.9 mg/kg
- > 0.9 to 1.6 mg/kg
- > 1.6 to 16 mg/kg
- > 16 mg/kg

Notes:
0.9 mg/kg is the background SSCG for benzo(a)pyrene-equivalents

250 125 0 250 Feet

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Santa Barbara, CA | June 2014

Distribution of Benzo(a)pyrene-Equivalents in Site Soils

Former Kast Property

Figure **2-8**

APPENDIX A

SURFACE CONTAINMENT AND SOIL MANAGEMENT PLAN

APPENDIX B

HEALTH AND SAFETY PLAN

APPENDIX C

STORMWATER POLLUTION PREVENTION PLAN

APPENDIX D

RELOCATION PLAN AND OPTIONAL REAL ESTATE PROGRAM

APPENDIX E

CONSTRUCTION TRAFFIC MANAGEMENT PLAN AND HAUL ROUTE PLAN

APPENDIX F

EMERGENCY RESPONSE PLAN

APPENDIX G

POST-EXCAVATION DOCUMENTARY SAMPLING AND POST-CONSTRUCTION LONG-TERM

APPENDIX H

SCAQMD SITE-SPECIFIC RULE 1166 MITIGATION PLAN AND PERMIT

APPENDIX I

AIS OSHA TRENCHING PERMIT

APPENDIX J

LAYDOWN YARD PLANNING SUBMITTAL

APPENDIX K

GEOTECHNICAL INVESTIGATION REPORT

APPENDIX L

SVE SYSTEM CONSTRUCTION DRAWINGS

APPENDIX M

SVE SYSTEM O&M PLAN

APPENDIX N

VAPOR MITIGATION SYSTEM CONCEPTUAL DESIGN

APPENDIX O

MITIGATION MONITORING AND REPORTING PROGRAM CROSS-REFERENCE TABLE

APPENDIX P

PROCEDURES FOR PAINT FILTER TEST