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Revised Site-Specific Cleanup Goal Report

Former Kast Property
Carson, California

Prepared by:

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Project Number: SB0484-04-2

October 21, 2013

Geosyntec consultants

REVISED SITE-SPECIFIC CLEANUP GOAL REPORT

Former Kast Property
Carson, California

Prepared for:

Shell Oil Products US

Prepared by:

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CERTIFICATION

REVISED SITE-SPECIFIC CLEANUP GOAL REPORT

FORMER KAST PROPERTY

CARSON, CALIFORNIA

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

_____

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

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Geosyntec consultants

APPENDIX C

MONITORING AND REMEDIATION OPTIMIZATION SYSTEM (MAROS) AND BIOSCREEN MODEL RESULTS

APPENDIX C-1

MAROS - Benzene Plume Stability Analysis

MAROS Software

To characterize the stability of the benzene groundwater plume at the Former Kast property (Site), a public-domain software package (Monitoring and Remediation Optimization System [MAROS], AFCEE, 2004) was employed to analyze the temporal trends of the plume. The statistical plume analysis module of MAROS evaluates the trend in historical groundwater monitoring data and characterizes the stability of contaminant plumes. The United States Environmental Protection Agency (USEPA, 1999) and the American Society for Testing and Materials (ASTM, 2004) have classified the trend in historical groundwater monitoring data as a first or primary line of evidence to evaluate whether natural attenuation is occurring at a site.

As part of the MAROS analyses the nonparametric Mann-Kendall test was used to evaluate benzene concentration trends. Because the Mann-Kendall test assumes no distribution and permits irregularly spaced measurement periods, it minimizes biases caused by data outliers. The Mann-Kendall analysis determines a sign of the trend (positive as increasing and negative as decreasing) and a statistical confidence level in the trend. A third parameter, the coefficient of variation (COV), describes how an individual data point varies about the mean. MAROS classifies concentration trends as follows:

- Trends with greater than 95% statistical confidence - Increasing or Decreasing
- Trends with 90-95% statistical confidence - Probably Increasing or Probably Decreasing
- Trends with less than 90% statistical confidence and COV>1 – No Trend
- Negative trends with less than 90% statistical confidence and COV<1 - Stable.

In addition to the trend analysis, a moment analysis can be conducted using the MAROS software. The moment analysis calculates the total mass as well as the distance between source and the center of the mass of a contaminant plume as a function of time. The representativeness of each monitoring well is determined by a spatial interpolation method, Delaunay Triangulation, so that the overall mass and the center of mass can be estimated based on site monitoring data. The time-resolved total mass and center of mass data are then analyzed using the Mann-Kendall test to determine temporal trends.

Method description

Both the Shallow zone monitoring network wells (15 wells in total) and the Gage aquifer wells (8 collocated well locations in total, each with a shallow and deep Gage well) were included in the MAROS analysis. MAROS differentiates “source” wells (located in areas with light non-aqueous phase liquid (LNAPL) and/or contaminated vadose zone soils, and areas where aqueous-phase contaminant releases to groundwater occur) from “tail” wells (located downgradient of the contaminant source zone). Monitoring wells located on the Site were assumed as source wells (MW-1, 2, 4 to 6, 8, 12 to 17, and the four Gage aquifer well pairs), whereas the three off-Site wells (MW-9, 10, 11) that are downgradient of the Site (near the Site

boundary) were assumed as tail wells. MW-03 was not included because it contains LNAPL and is not monitored for groundwater quality. Off-Site monitoring well MW-07 was excluded from the analysis because it is located upgradient of the Site (assumed to not be impacted by former Site operations).

Groundwater data collected from August 2009 to August 2013 were used in the trend analysis. Non-detect results were substituted with half of the associated detection limit. J flagged results were analyzed based on the estimated values. Duplicates were averaged. Seepage velocity (a required input to the software) was estimated based on soil types reported on boring logs and hydraulic gradient measured during the quarterly monitoring. Because the moment analysis relies on the spatial distribution of monitoring wells, an inconsistent well count may introduce bias. Therefore, only data collected from August 2011 to August 2013 (after all monitoring wells have been installed) were used in the moment analysis. For the moment analysis, the "source" was assumed to be located at the center point of the Site (the absolute location of this source point does not affect the moment analysis result, since it only serves as a reference point to track the movement of the center of the contaminant mass).

Trend analysis result – Individual Wells

The MAROS Mann-Kendall trend results for benzene are listed below. MAROS reports for individual wells are presented in Attachment A.

MAROS Mann-Kendall trend analysis result for individual wells

Well	Benzene
MW-01	S
MW-02	S
MW-04	D
MW-05	I
MW-06	I
MW-08	D
MW-09	ND
MW-10	NT
MW-11	ND
MW-12	D
MW-13	NT
MW-14	NT
MW-15	D
MW-16	NT
MW-17	I
MW-G01S	ND
MW-G02S	D
MW-G03S	D
MW-G04S	PI
MW-G01D	ND
MW-G02D	ND
MW-G03D	S
MW-G04D	ND

Notes:
Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not detected (ND)

Site Mann-Kendall (benzene results summarized by number of wells)

	Total Wells	Non-detect	Decreasing or Probably Decreasing	Stable	Increasing or Probably Increasing	No Trend
Benzene	23	6 (26%)	6 (26%)	3 (13%)	4 (17%)	4 (17%)

Six wells had no detection (ND) throughout the monitoring period. Based on the Mann-Kendall analyses, benzene concentrations in the majority of the wells were either decreasing, probably decreasing, stable, showed no trend (NT) or ND. Benzene concentrations in seven wells showed NT or a stable trend, and benzene concentrations in six wells were decreasing or probably decreasing. Only four wells (MW-05, MW-06, MW-17, and MW-G04S) had increasing or probably increasing benzene concentrations. Wells MW-05, MW-17, and MW-G04S are located in the northwestern portion of the Site, and MW-06 is located in the northeastern portion of the Site. Benzene was detected at three of the four Shallow Gage aquifer wells and showed decreasing trends, except for MW-G04S. Only one Deep Gage aquifer well (MW-G03D) had a detection of benzene, and stable was indicated by the Mann-Kendall analyses.

Trend analysis – Total Plume

MAROS weighs trends of individual wells to obtain the overall trend of the source and the tail zones. First a number is assigned to each trend. "I" (Increasing) = 1, "PI" (Probably Increasing) = 2, "NT" (No Trend) = 3, "S" (Stable) = 4, "PD" (Probably Decreasing) = 5, "D" (Decreasing) = 6, and "ND" (Not Detected) = 7. Then the overall trend of the source or tail zone is evaluated by averaging the trends of all the wells within the zone. Based on the benzene concentration trends of individual wells, MAROS characterized the overall stability of the source zone as Probably Decreasing, and the tail area as Decreasing.

Moment analysis

The estimated total mass of benzene decreased from 13 kg during the August 2011 sampling event to 7.0 kg during the August 2013 sampling event, and the Mann-Kendall analysis indicates a Probably Decreasing trend for the total benzene mass. The estimated center of the benzene mass fluctuates between 319 to 383 ft, and the Mann-Kendall analysis shows a "No Trend" for the mass center.

Summary

Based on the data collected to date from 23 Site wells, benzene concentrations show statistically increasing or probably increasing trends in only four Site wells (MW-5, MW-6, MW-17, and MW-G04S) located in the northwest and northeast portion of the Site. All other locations have No Trend, Stable trend, or Decreasing/Probably Decreasing trends, or have non-detected levels of the benzene.

Overall the MAROS analysis indicates the plume is Probably Decreasing on the Site and Decreasing off-Site; the total mass is Probably Decreasing; and the center of the mass has no trend. These results are consistent with a benzene plume that is being attenuated through natural biodegradation processes.

References

AFCEE, 2004. Monitoring and Remediation Optimization System Software and User's Guide. http://www.gsinet.com/en/software/free-software/maros.html

ASTM. 2004. Standard guide for remediation of ground water by natural attenuation at petroleum release sites. E 1943-98.

USEPA, 1999. Use of monitored natural attenuation at Superfund, RCRA corrective action, and underground storage tank sites. 9200.4-17P.

ATTACHMENT A

MAROS Site Results

Project: Kast

User Name: dzhou

Location: Carson

State: California

User Defined Site and Data Assumptions:

Hydrogeology and Plume Information:

Groundwater Seepage Velocity: 26 ft/yr

Current Plume Length: 605 ft

Current Plume Width 605 ft

Number of Tail Wells: 3

Number of Source Wells: 20

Down-gradient Information:

Distance from Edge of Tail to Nearest:

Down-gradient receptor: 100 ft

Down-gradient property: 100 ft

Distance from Source to Nearest:

Down-gradient receptor: 100 ft

Down-gradient property: 100 ft

Source Information:

Source Treatment: No Current Site Treatment

NAPL is observed at this site.

Data Consolidation Assumptions:

Time Period: 8/13/2009 **to** 8/20/2013

Consolidation Period: No Time Consolidation

Consolidation Type: Median

Duplicate Consolidation: Average

ND Values: 1/2 Detection Limit

J Flag Values : Actual Value

Plume Information Weighting Assumptions:

Consolidation Step 1. Weight Plume Information by Chemical

Summary Weighting: Weighting Applied to All Chemicals Equally

Consolidation Step 2. Weight Well Information by Chemical

Well Weighting: No Weighting of Wells was Applied.

Chemical Weighting: No Weighting of Chemicals was Applied.

Note: These assumptions were made when consolidating the historical montoring data and lumping the Wells and COCs.

1. Compliance Monitoring/Remediation Optimization Results:

Preliminary Monitoring System Optimization Results: Based on site classification, source treatment and Monitoring System Category the following suggestions are made for site Sampling Frequency, Duration of Sampling before reassessment, and Well Density. These criteria take into consideration: Plume Stability, Type of Plume, and Groundwater Velocity.

COC	Tail Stability	Source Stability	Level of Effort	Sampling Duration	Sampling Frequency	Sampling Density
BENZENE	D	PD	L	Sample 2 more years	Annually	34

Note:

Plume Status: (I) Increasing; (PI)Probably Increasing; (S) Stable; (NT) No Trend; (PD) Probably Decreasing; (D) Decreasing

Design Categories: (E) Extensive; (M) Moderate; (L) Limited (N/A) Not Applicable, Insufficient Data Available

Level of Monitoring Effort Indicated by Analysi Limited

2. Spatial Moment Analysis Results:

Moment Type	Constituent	Coefficient of Variation	Mann-Kendall S Statistic	Confidence in Trend	Moment Trend
Zeroth Moment: Mass					
	BENZENE	0.22	-16	94.0%	PD
1st Moment: Distance to Source					
	BENZENE	0.06	6	69.4%	NT
2nd Moment: Sigma XX					
	BENZENE	0.20	14	91.0%	PI
2nd Moment: Sigma YY					
	BENZENE	0.14	22	98.8%	I

Note: The following assumptions were applied for the calculation of the Zeroth Moment:

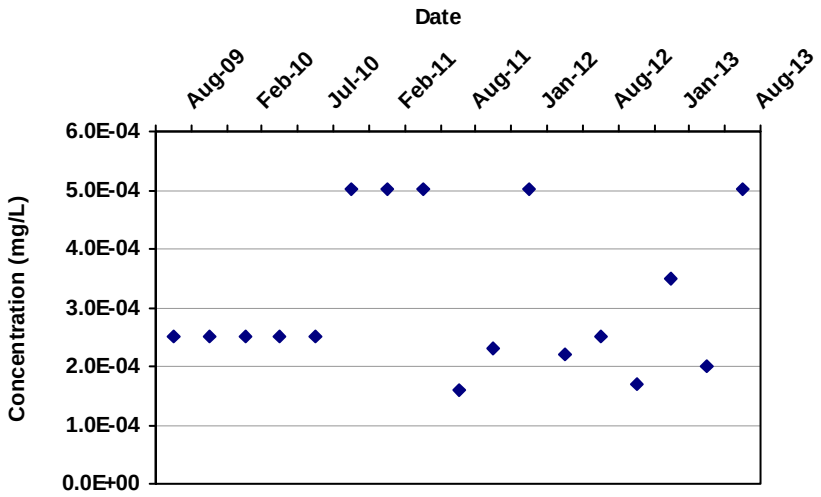
Porosity: 0.45 **Saturated Thickness:** Uniform: 20 ft

Mann-Kendall Trend test performed on all sample events for each constituent. Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A)-Due to insufficient Data (< 4 sampling events).

MAROS Mann-Kendall Statistics Summary

Well: MW-01
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-7

Confidence in Trend:

59.6%

Coefficient of Variation:

0.42

Mann Kendall Concentration Trend: (See Note)

S

Data Table:

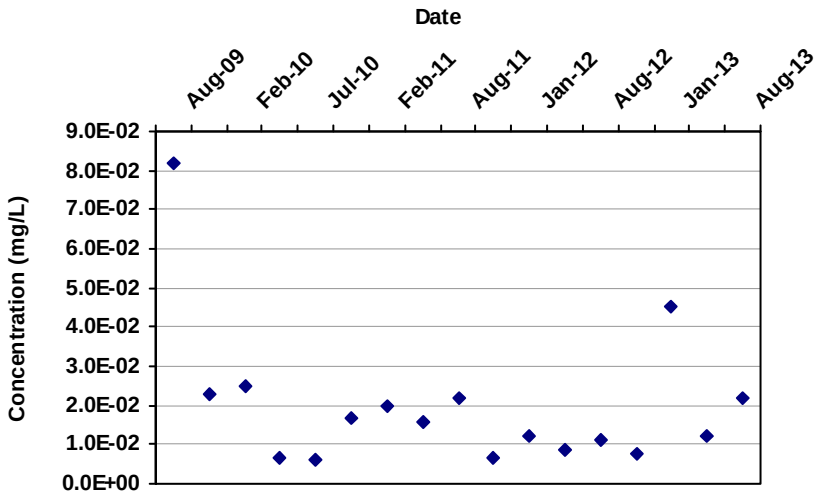
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-01	S	8/13/2009	BENZENE	2.5E-04	ND	1	0
MW-01	S	11/13/2009	BENZENE	2.5E-04	ND	1	0
MW-01	S	2/4/2010	BENZENE	2.5E-04	ND	1	0
MW-01	S	5/27/2010	BENZENE	2.5E-04	ND	1	0
MW-01	S	7/6/2010	BENZENE	2.5E-04	ND	1	0
MW-01	S	10/20/2010	BENZENE	5.0E-04	ND	1	0
MW-01	S	2/3/2011	BENZENE	5.0E-04	ND	1	0
MW-01	S	4/20/2011	BENZENE	5.0E-04	ND	2	0
MW-01	S	8/16/2011	BENZENE	1.6E-04		1	1
MW-01	S	10/18/2011	BENZENE	2.3E-04		1	1
MW-01	S	1/24/2012	BENZENE	5.0E-04	ND	1	0
MW-01	S	4/17/2012	BENZENE	2.2E-04		1	1
MW-01	S	8/13/2012	BENZENE	2.5E-04	ND	1	0
MW-01	S	10/22/2012	BENZENE	1.7E-04		1	1
MW-01	S	1/22/2013	BENZENE	3.5E-04		1	1
MW-01	S	4/16/2013	BENZENE	2.0E-04		1	1
MW-01	S	8/20/2013	BENZENE	5.0E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-02
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-20

Confidence in Trend:

78.0%

Coefficient of Variation:

0.93

Mann Kendall Concentration Trend: (See Note)

S

Data Table:

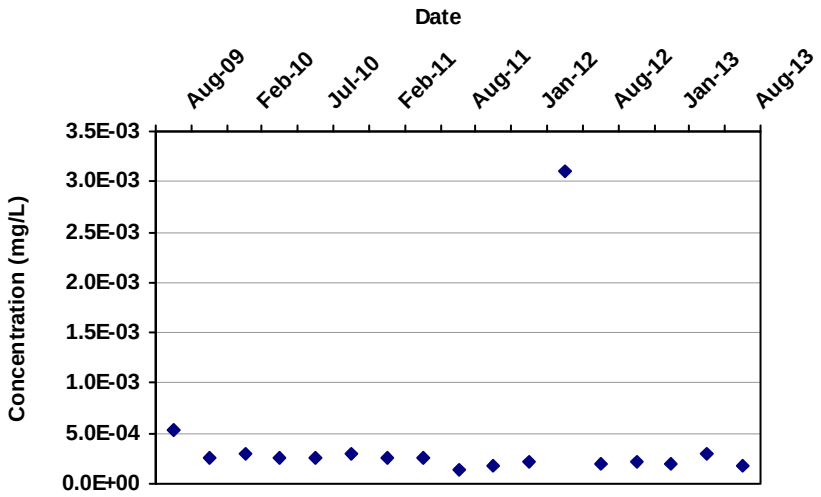
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-02	S	8/13/2009	BENZENE	8.2E-02		1	1
MW-02	S	11/13/2009	BENZENE	2.3E-02		1	1
MW-02	S	2/4/2010	BENZENE	2.5E-02		2	2
MW-02	S	5/27/2010	BENZENE	6.8E-03		2	2
MW-02	S	7/6/2010	BENZENE	6.3E-03		1	1
MW-02	S	10/20/2010	BENZENE	1.7E-02		1	1
MW-02	S	2/3/2011	BENZENE	2.0E-02		1	1
MW-02	S	4/20/2011	BENZENE	1.6E-02		1	1
MW-02	S	8/16/2011	BENZENE	2.2E-02		1	1
MW-02	S	10/18/2011	BENZENE	6.7E-03		1	1
MW-02	S	1/24/2012	BENZENE	1.2E-02		1	1
MW-02	S	4/17/2012	BENZENE	8.5E-03		1	1
MW-02	S	8/13/2012	BENZENE	1.1E-02		1	1
MW-02	S	10/22/2012	BENZENE	7.5E-03		1	1
MW-02	S	1/22/2013	BENZENE	4.5E-02		1	1
MW-02	S	4/16/2013	BENZENE	1.2E-02		1	1
MW-02	S	8/20/2013	BENZENE	2.2E-02		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-04
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-44

Confidence in Trend:

96.2%

Coefficient of Variation:

1.68

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

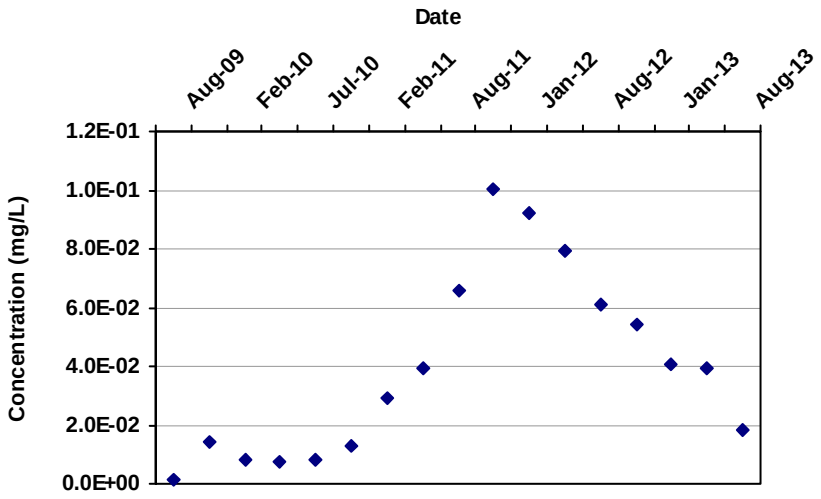
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-04	S	8/13/2009	BENZENE	5.3E-04		1	1
MW-04	S	11/13/2009	BENZENE	2.5E-04	ND	2	0
MW-04	S	2/4/2010	BENZENE	2.9E-04		1	1
MW-04	S	5/27/2010	BENZENE	2.5E-04	ND	1	0
MW-04	S	7/6/2010	BENZENE	2.5E-04	ND	1	0
MW-04	S	10/20/2010	BENZENE	2.9E-04		1	1
MW-04	S	2/3/2011	BENZENE	2.5E-04	ND	2	0
MW-04	S	4/20/2011	BENZENE	2.5E-04	ND	1	0
MW-04	S	8/16/2011	BENZENE	1.4E-04		1	1
MW-04	S	10/18/2011	BENZENE	1.7E-04		1	1
MW-04	S	1/24/2012	BENZENE	2.2E-04		1	1
MW-04	S	4/17/2012	BENZENE	3.1E-03		1	1
MW-04	S	8/13/2012	BENZENE	1.9E-04		1	1
MW-04	S	10/22/2012	BENZENE	2.1E-04		1	1
MW-04	S	1/22/2013	BENZENE	2.0E-04		1	1
MW-04	S	4/16/2013	BENZENE	2.9E-04		2	2
MW-04	S	8/20/2013	BENZENE	1.7E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-05
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

53

Confidence in Trend:

98.5%

Coefficient of Variation:

0.79

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

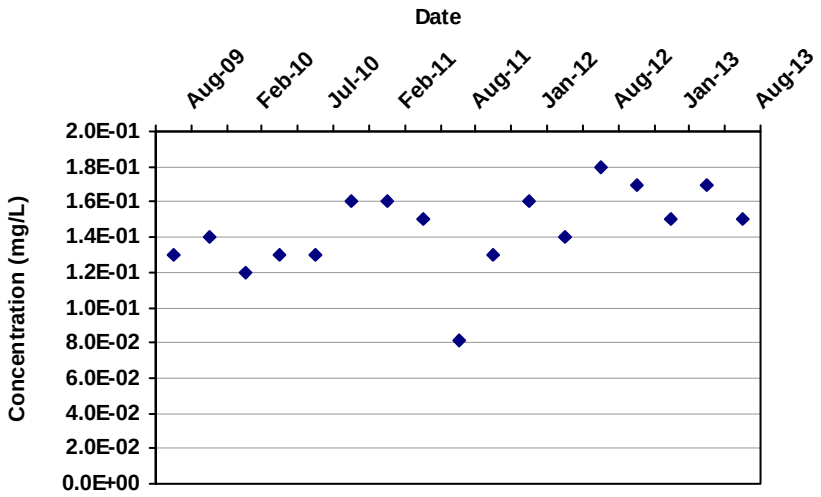
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-05	S	8/13/2009	BENZENE	1.4E-03		2	2
MW-05	S	11/13/2009	BENZENE	1.4E-02		1	1
MW-05	S	2/4/2010	BENZENE	8.3E-03		1	1
MW-05	S	5/27/2010	BENZENE	7.6E-03		1	1
MW-05	S	7/6/2010	BENZENE	8.0E-03		2	2
MW-05	S	10/20/2010	BENZENE	1.3E-02		1	1
MW-05	S	2/3/2011	BENZENE	2.9E-02		1	1
MW-05	S	4/20/2011	BENZENE	3.9E-02		1	1
MW-05	S	8/16/2011	BENZENE	6.6E-02		1	1
MW-05	S	10/18/2011	BENZENE	1.0E-01		1	1
MW-05	S	1/24/2012	BENZENE	9.2E-02		1	1
MW-05	S	4/17/2012	BENZENE	7.9E-02		1	1
MW-05	S	8/13/2012	BENZENE	6.1E-02		1	1
MW-05	S	10/22/2012	BENZENE	5.4E-02		1	1
MW-05	S	1/22/2013	BENZENE	4.1E-02		1	1
MW-05	S	4/16/2013	BENZENE	3.9E-02		1	1
MW-05	S	8/20/2013	BENZENE	1.8E-02		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-06
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

52

Confidence in Trend:

98.3%

Coefficient of Variation:

0.16

Mann Kendall Concentration Trend: (See Note)

I

Data Table:

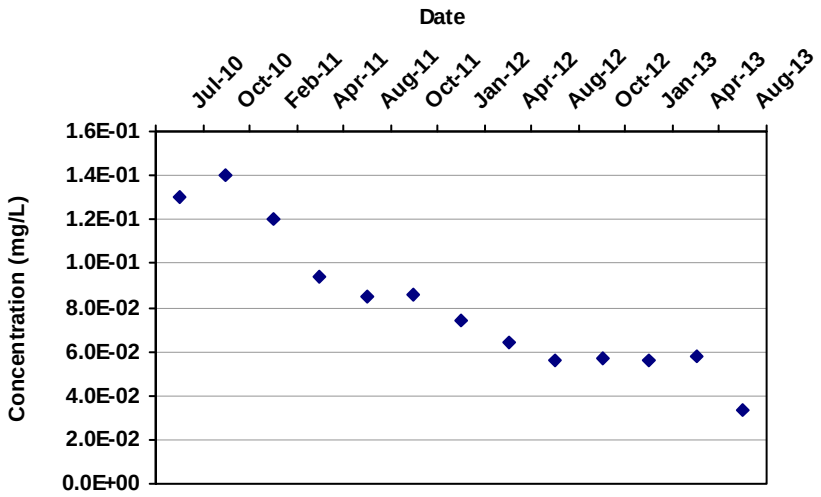
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-06	S	8/13/2009	BENZENE	1.3E-01		2	2
MW-06	S	11/13/2009	BENZENE	1.4E-01		1	1
MW-06	S	2/4/2010	BENZENE	1.2E-01		1	1
MW-06	S	5/27/2010	BENZENE	1.3E-01		1	1
MW-06	S	7/6/2010	BENZENE	1.3E-01		1	1
MW-06	S	10/20/2010	BENZENE	1.6E-01		1	1
MW-06	S	2/3/2011	BENZENE	1.6E-01		1	1
MW-06	S	4/20/2011	BENZENE	1.5E-01		1	1
MW-06	S	8/16/2011	BENZENE	8.1E-02		1	1
MW-06	S	10/18/2011	BENZENE	1.3E-01		1	1
MW-06	S	1/24/2012	BENZENE	1.6E-01		1	1
MW-06	S	4/17/2012	BENZENE	1.4E-01		1	1
MW-06	S	8/13/2012	BENZENE	1.8E-01		1	1
MW-06	S	10/22/2012	BENZENE	1.7E-01		1	1
MW-06	S	1/22/2013	BENZENE	1.5E-01		1	1
MW-06	S	4/16/2013	BENZENE	1.7E-01		1	1
MW-06	S	8/20/2013	BENZENE	1.5E-01		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-08
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-65

Confidence in Trend:

100.0%

Coefficient of Variation:

0.40

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

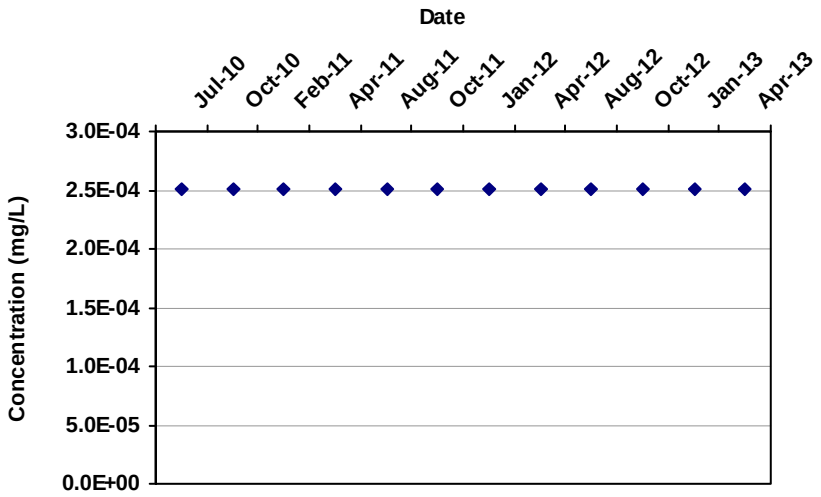
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-08	S	7/6/2010	BENZENE	1.3E-01		1	1
MW-08	S	10/20/2010	BENZENE	1.4E-01		1	1
MW-08	S	2/3/2011	BENZENE	1.2E-01		1	1
MW-08	S	4/20/2011	BENZENE	9.4E-02		1	1
MW-08	S	8/16/2011	BENZENE	8.5E-02		1	1
MW-08	S	10/18/2011	BENZENE	8.6E-02		1	1
MW-08	S	1/24/2012	BENZENE	7.4E-02		1	1
MW-08	S	4/17/2012	BENZENE	6.4E-02		1	1
MW-08	S	8/13/2012	BENZENE	5.6E-02		1	1
MW-08	S	10/22/2012	BENZENE	5.7E-02		1	1
MW-08	S	1/22/2013	BENZENE	5.6E-02		1	1
MW-08	S	4/16/2013	BENZENE	5.8E-02		1	1
MW-08	S	8/20/2013	BENZENE	3.3E-02		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-09
Well Type: T
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
0

Confidence in Trend:
47.3%

Coefficient of Variation:
0.00

Mann Kendall Concentration Trend: (See Note)
ND

Data Table:

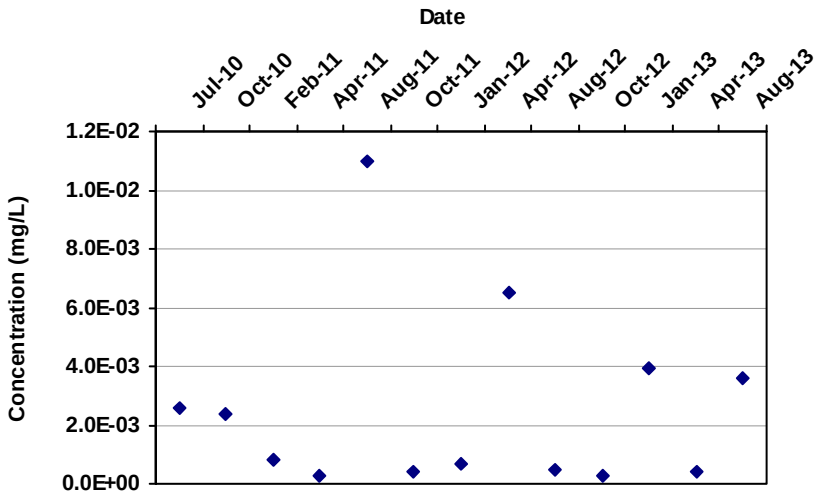
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-09	T	7/6/2010	BENZENE	2.5E-04	ND	1	0
MW-09	T	10/20/2010	BENZENE	2.5E-04	ND	1	0
MW-09	T	2/3/2011	BENZENE	2.5E-04	ND	1	0
MW-09	T	4/20/2011	BENZENE	2.5E-04	ND	1	0
MW-09	T	8/16/2011	BENZENE	2.5E-04	ND	1	0
MW-09	T	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-09	T	1/24/2012	BENZENE	2.5E-04	ND	1	0
MW-09	T	4/17/2012	BENZENE	2.5E-04	ND	1	0
MW-09	T	8/13/2012	BENZENE	2.5E-04	ND	1	0
MW-09	T	10/22/2012	BENZENE	2.5E-04	ND	1	0
MW-09	T	1/22/2013	BENZENE	2.5E-04	ND	1	0
MW-09	T	4/16/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-10
Well Type: T
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-7

Confidence in Trend:

64.0%

Coefficient of Variation:

1.24

Mann Kendall Concentration Trend: (See Note)

NT

Data Table:

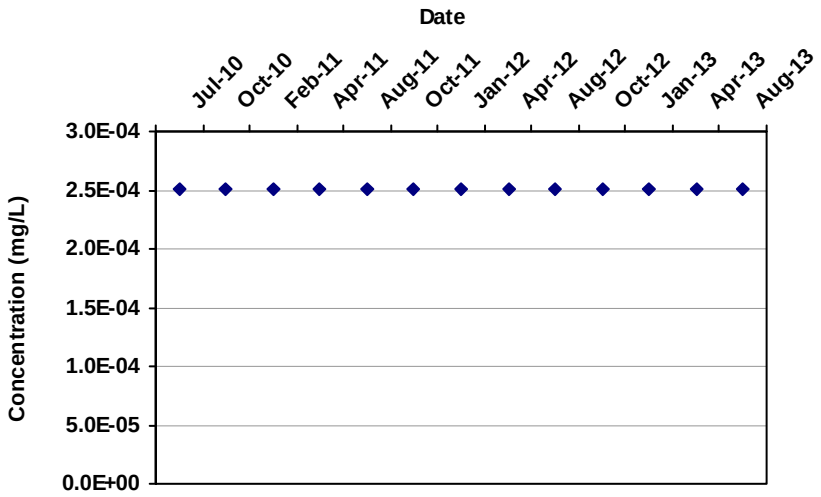
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-10	T	7/6/2010	BENZENE	2.6E-03		1	1
MW-10	T	10/20/2010	BENZENE	2.4E-03		2	2
MW-10	T	2/3/2011	BENZENE	8.1E-04		1	1
MW-10	T	4/20/2011	BENZENE	2.5E-04	ND	1	0
MW-10	T	8/16/2011	BENZENE	1.1E-02		1	1
MW-10	T	10/18/2011	BENZENE	4.0E-04		1	1
MW-10	T	1/24/2012	BENZENE	7.1E-04		1	1
MW-10	T	4/17/2012	BENZENE	6.5E-03		1	1
MW-10	T	8/13/2012	BENZENE	4.9E-04		1	1
MW-10	T	10/22/2012	BENZENE	2.5E-04	ND	1	0
MW-10	T	1/22/2013	BENZENE	3.9E-03		1	1
MW-10	T	4/16/2013	BENZENE	4.4E-04		1	1
MW-10	T	8/20/2013	BENZENE	3.6E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-11
Well Type: T
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
0

Confidence in Trend:
47.6%

Coefficient of Variation:
0.00

Mann Kendall Concentration Trend: (See Note)
ND

Data Table:

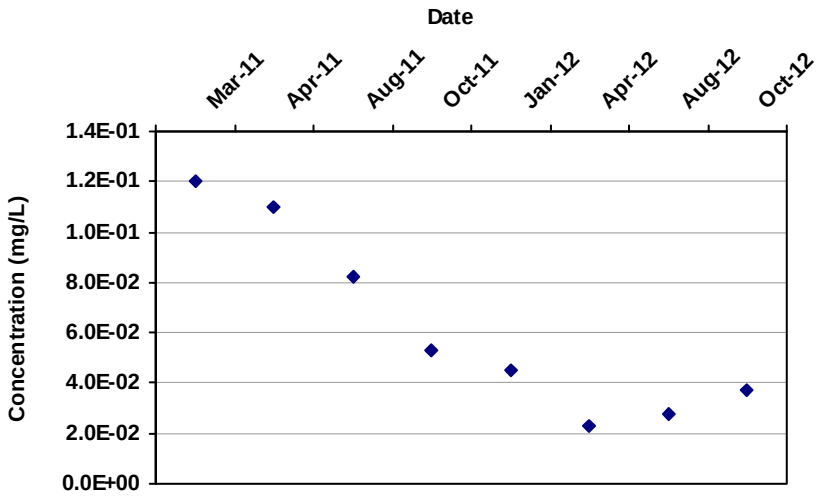
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-11	T	7/6/2010	BENZENE	2.5E-04	ND	1	0
MW-11	T	10/20/2010	BENZENE	2.5E-04	ND	1	0
MW-11	T	2/3/2011	BENZENE	2.5E-04	ND	1	0
MW-11	T	4/20/2011	BENZENE	2.5E-04	ND	1	0
MW-11	T	8/16/2011	BENZENE	2.5E-04	ND	1	0
MW-11	T	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-11	T	1/24/2012	BENZENE	2.5E-04	ND	1	0
MW-11	T	4/17/2012	BENZENE	2.5E-04	ND	1	0
MW-11	T	8/13/2012	BENZENE	2.5E-04	ND	1	0
MW-11	T	10/22/2012	BENZENE	2.5E-04	ND	1	0
MW-11	T	1/22/2013	BENZENE	2.5E-04	ND	1	0
MW-11	T	4/16/2013	BENZENE	2.5E-04	ND	1	0
MW-11	T	8/20/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-12
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-22

Confidence in Trend:

99.8%

Coefficient of Variation:

0.60

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

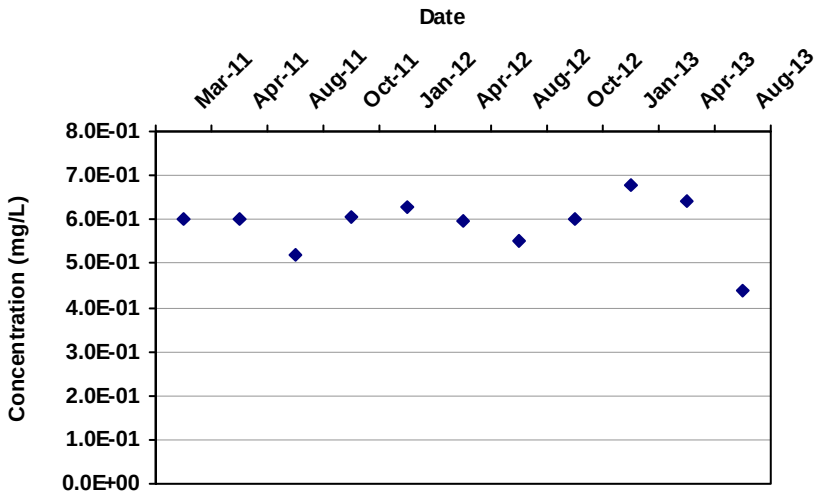
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-12	S	3/4/2011	BENZENE	1.2E-01		2	2
MW-12	S	4/20/2011	BENZENE	1.1E-01		1	1
MW-12	S	8/16/2011	BENZENE	8.2E-02		1	1
MW-12	S	10/18/2011	BENZENE	5.3E-02		1	1
MW-12	S	1/24/2012	BENZENE	4.5E-02		1	1
MW-12	S	4/17/2012	BENZENE	2.3E-02		1	1
MW-12	S	8/13/2012	BENZENE	2.8E-02		1	1
MW-12	S	10/22/2012	BENZENE	3.7E-02		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-13
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
4

Confidence in Trend:
59.0%

Coefficient of Variation:
0.11

Mann Kendall Concentration Trend: (See Note)
NT

Data Table:

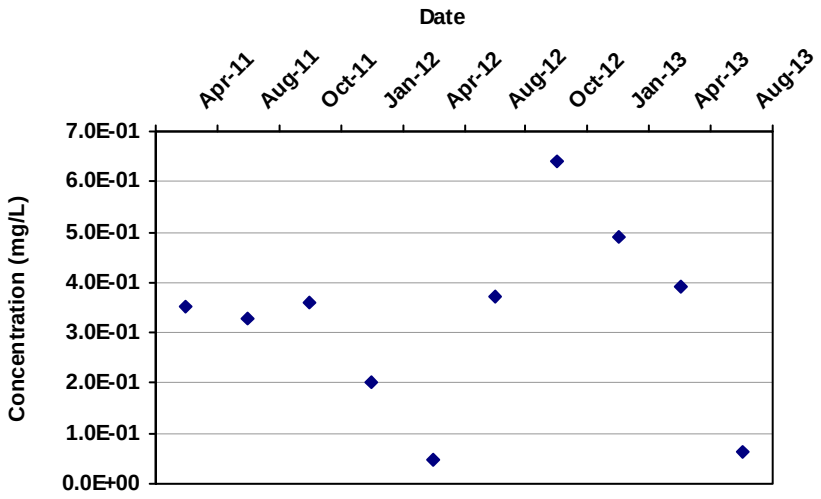
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-13	S	3/4/2011	BENZENE	6.0E-01		1	1
MW-13	S	4/20/2011	BENZENE	6.0E-01		1	1
MW-13	S	8/16/2011	BENZENE	5.2E-01		2	2
MW-13	S	10/18/2011	BENZENE	6.1E-01		2	2
MW-13	S	1/24/2012	BENZENE	6.3E-01		2	2
MW-13	S	4/17/2012	BENZENE	6.0E-01		2	2
MW-13	S	8/13/2012	BENZENE	5.5E-01		2	2
MW-13	S	10/22/2012	BENZENE	6.0E-01		1	1
MW-13	S	1/22/2013	BENZENE	6.8E-01		1	1
MW-13	S	4/16/2013	BENZENE	6.4E-01		1	1
MW-13	S	8/20/2013	BENZENE	4.4E-01		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-14
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic: 7

Confidence in Trend: 70.0%

Coefficient of Variation: 0.56

Mann Kendall Concentration Trend: (See Note) NT

Data Table:

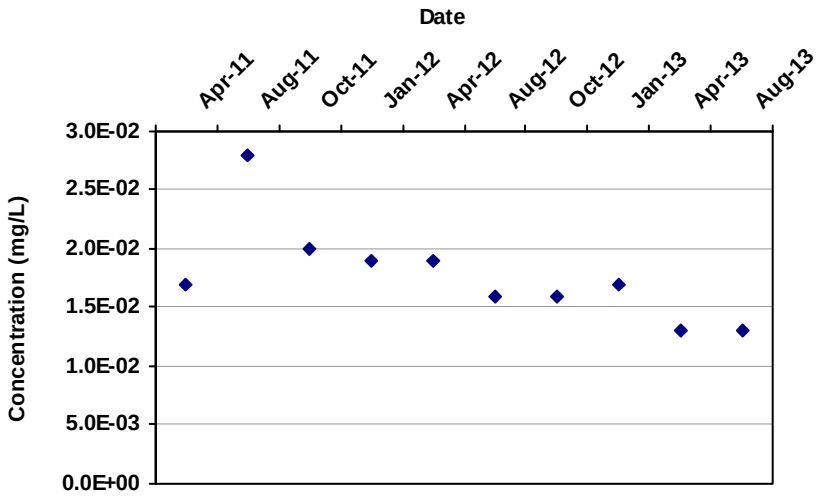
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-14	S	4/20/2011	BENZENE	3.5E-01		1	1
MW-14	S	8/16/2011	BENZENE	3.3E-01		1	1
MW-14	S	10/18/2011	BENZENE	3.6E-01		1	1
MW-14	S	1/24/2012	BENZENE	2.0E-01		1	1
MW-14	S	4/17/2012	BENZENE	4.9E-02		1	1
MW-14	S	8/13/2012	BENZENE	3.7E-01		1	1
MW-14	S	10/22/2012	BENZENE	6.4E-01		1	1
MW-14	S	1/22/2013	BENZENE	4.9E-01		1	1
MW-14	S	4/16/2013	BENZENE	3.9E-01		1	1
MW-14	S	8/20/2013	BENZENE	6.4E-02		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-15
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-29

Confidence in Trend:

99.5%

Coefficient of Variation:

0.24

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

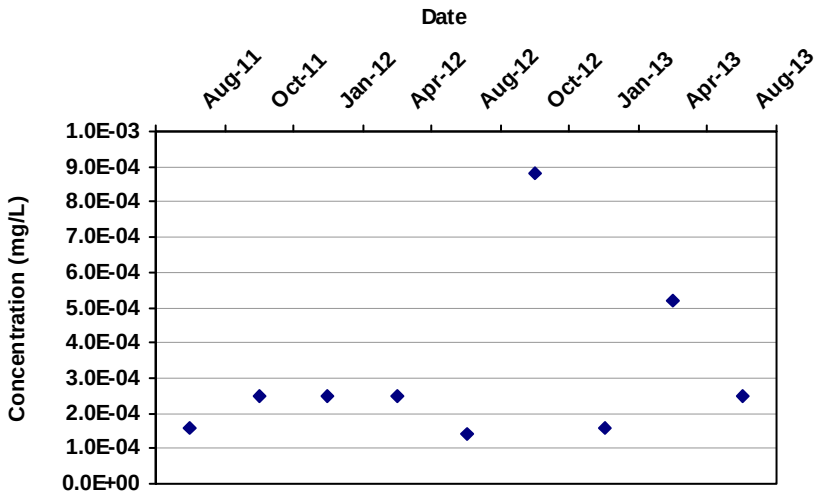
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-15	S	4/20/2011	BENZENE	1.7E-02		1	1
MW-15	S	8/16/2011	BENZENE	2.8E-02		1	1
MW-15	S	10/18/2011	BENZENE	2.0E-02		1	1
MW-15	S	1/24/2012	BENZENE	1.9E-02		1	1
MW-15	S	4/17/2012	BENZENE	1.9E-02		1	1
MW-15	S	8/13/2012	BENZENE	1.6E-02		1	1
MW-15	S	10/22/2012	BENZENE	1.6E-02		1	1
MW-15	S	1/22/2013	BENZENE	1.7E-02		1	1
MW-15	S	4/16/2013	BENZENE	1.3E-02		1	1
MW-15	S	8/20/2013	BENZENE	1.3E-02		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-16
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
7

Confidence in Trend:
72.8%

Coefficient of Variation:
0.75

Mann Kendall Concentration Trend: (See Note)
NT

Data Table:

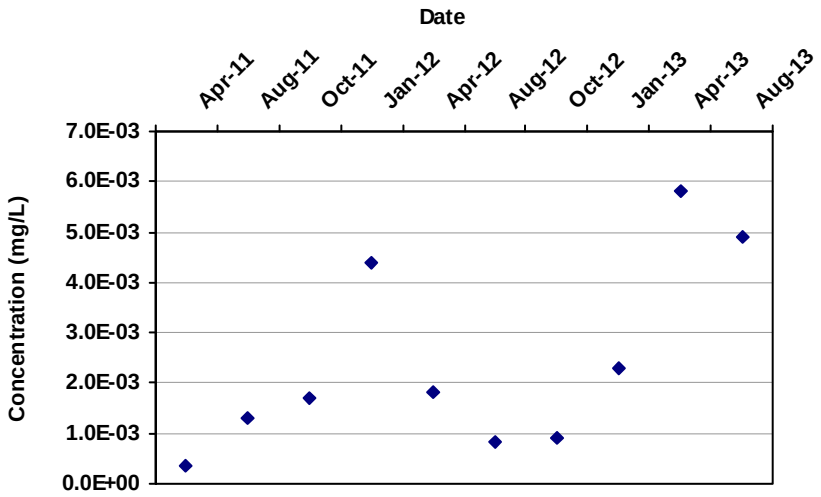
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-16	S	8/16/2011	BENZENE	1.6E-04		1	1
MW-16	S	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-16	S	1/24/2012	BENZENE	2.5E-04	ND	1	0
MW-16	S	4/17/2012	BENZENE	2.5E-04	ND	1	0
MW-16	S	8/13/2012	BENZENE	1.4E-04		1	1
MW-16	S	10/22/2012	BENZENE	8.8E-04		1	1
MW-16	S	1/22/2013	BENZENE	1.6E-04		1	1
MW-16	S	4/16/2013	BENZENE	5.2E-04		1	1
MW-16	S	8/20/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-17
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
23

Confidence in Trend:
97.7%

Coefficient of Variation:
0.79

Mann Kendall Concentration Trend: (See Note)
I

Data Table:

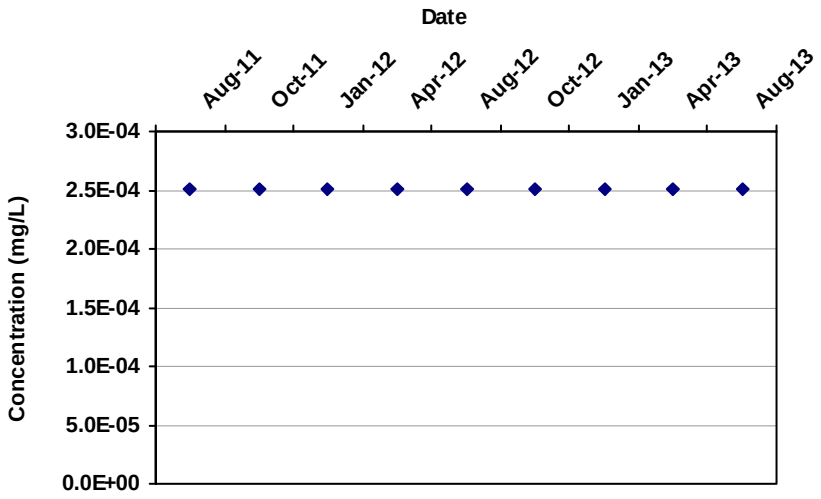
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-17	S	4/20/2011	BENZENE	3.6E-04		1	1
MW-17	S	8/16/2011	BENZENE	1.3E-03		1	1
MW-17	S	10/18/2011	BENZENE	1.7E-03		1	1
MW-17	S	1/24/2012	BENZENE	4.4E-03		1	1
MW-17	S	4/17/2012	BENZENE	1.8E-03		1	1
MW-17	S	8/13/2012	BENZENE	8.2E-04		1	1
MW-17	S	10/22/2012	BENZENE	9.1E-04		1	1
MW-17	S	1/22/2013	BENZENE	2.3E-03		1	1
MW-17	S	4/16/2013	BENZENE	5.8E-03		1	1
MW-17	S	8/20/2013	BENZENE	4.9E-03		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G01S
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
0

Confidence in Trend:
46.0%

Coefficient of Variation:
0.00

Mann Kendall Concentration Trend: (See Note)
ND

Data Table:

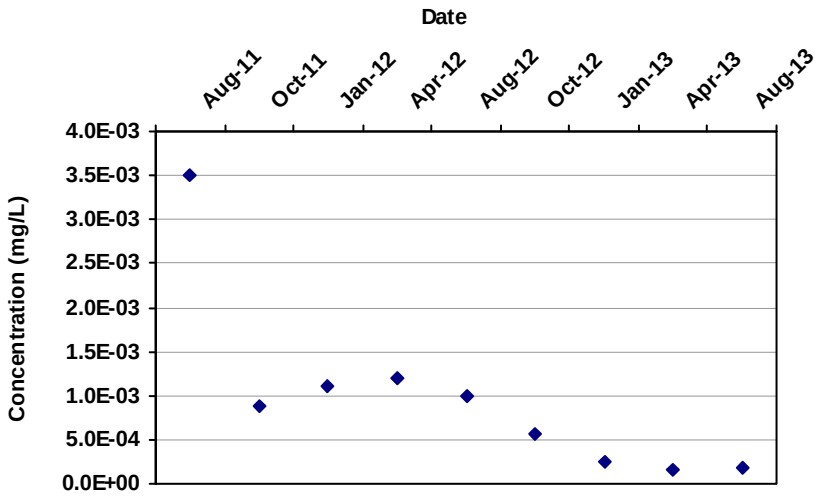
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G01S	S	8/16/2011	BENZENE	2.5E-04	ND	1	0
MW-G01S	S	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-G01S	S	1/24/2012	BENZENE	2.5E-04	ND	1	0
MW-G01S	S	4/17/2012	BENZENE	2.5E-04	ND	1	0
MW-G01S	S	8/13/2012	BENZENE	2.5E-04	ND	1	0
MW-G01S	S	10/22/2012	BENZENE	2.5E-04	ND	1	0
MW-G01S	S	1/22/2013	BENZENE	2.5E-04	ND	2	0
MW-G01S	S	4/16/2013	BENZENE	2.5E-04	ND	1	0
MW-G01S	S	8/20/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G02S
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-26

Confidence in Trend:

99.7%

Coefficient of Variation:

1.04

Mann Kendall Concentration Trend: (See Note)

D

Data Table:

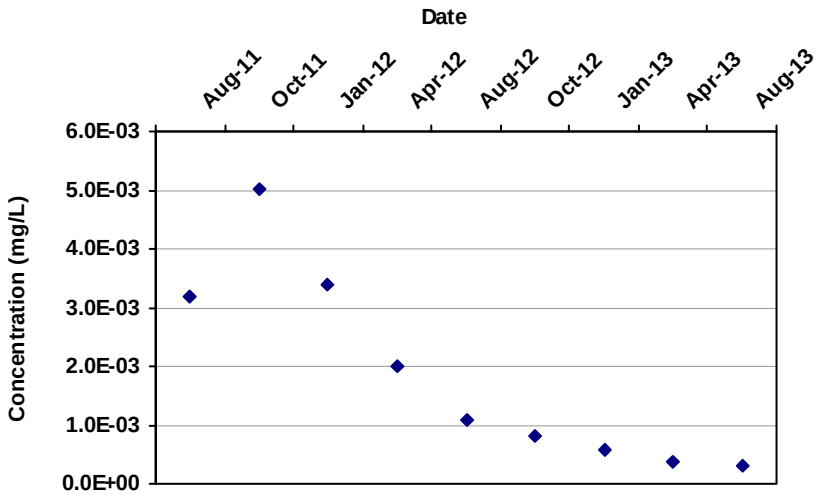
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G02S	S	8/16/2011	BENZENE	3.5E-03		1	1
MW-G02S	S	10/18/2011	BENZENE	8.9E-04		1	1
MW-G02S	S	1/24/2012	BENZENE	1.1E-03		1	1
MW-G02S	S	4/17/2012	BENZENE	1.2E-03		1	1
MW-G02S	S	8/13/2012	BENZENE	1.0E-03		1	1
MW-G02S	S	10/22/2012	BENZENE	5.7E-04		1	1
MW-G02S	S	1/22/2013	BENZENE	2.5E-04	ND	1	0
MW-G02S	S	4/16/2013	BENZENE	1.5E-04		1	1
MW-G02S	S	8/20/2013	BENZENE	1.9E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G03S
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
-32

Confidence in Trend:
100.0%

Coefficient of Variation:
0.89

Mann Kendall Concentration Trend: (See Note)
D

Data Table:

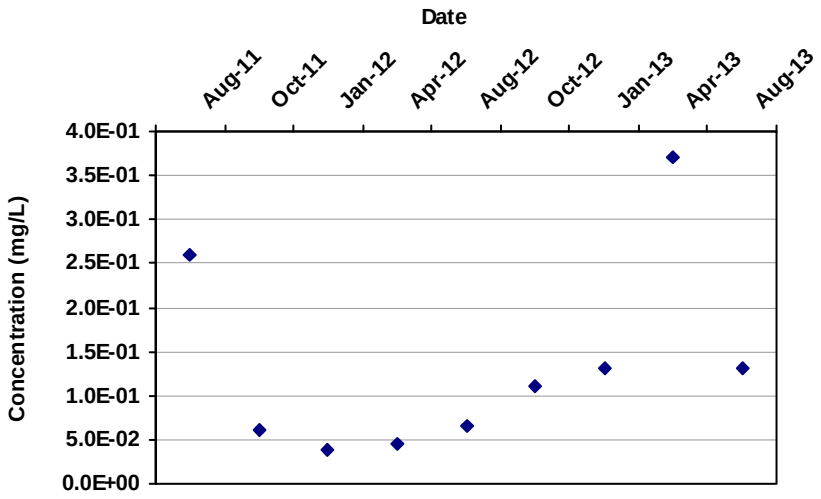
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G03S	S	8/16/2011	BENZENE	3.2E-03		1	1
MW-G03S	S	10/18/2011	BENZENE	5.0E-03		1	1
MW-G03S	S	1/24/2012	BENZENE	3.4E-03		1	1
MW-G03S	S	4/17/2012	BENZENE	2.0E-03		1	1
MW-G03S	S	8/13/2012	BENZENE	1.1E-03		1	1
MW-G03S	S	10/22/2012	BENZENE	8.1E-04		1	1
MW-G03S	S	1/22/2013	BENZENE	5.8E-04		1	1
MW-G03S	S	4/16/2013	BENZENE	3.8E-04		1	1
MW-G03S	S	8/20/2013	BENZENE	3.1E-04		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G04S
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

15

Confidence in Trend:

92.5%

Coefficient of Variation:

0.83

Mann Kendall Concentration Trend: (See Note)

PI

Data Table:

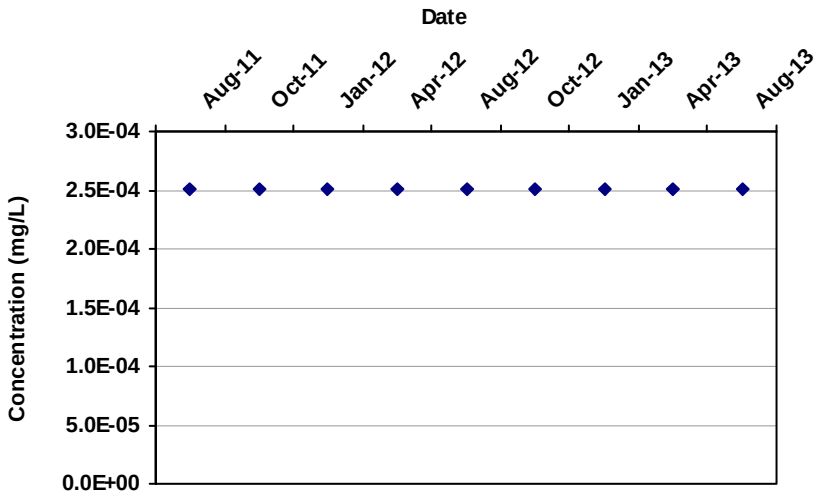
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G04S	S	8/16/2011	BENZENE	2.6E-01		1	1
MW-G04S	S	10/18/2011	BENZENE	6.2E-02		1	1
MW-G04S	S	1/24/2012	BENZENE	3.9E-02		1	1
MW-G04S	S	4/17/2012	BENZENE	4.6E-02		1	1
MW-G04S	S	8/13/2012	BENZENE	6.5E-02		1	1
MW-G04S	S	10/22/2012	BENZENE	1.1E-01		1	1
MW-G04S	S	1/22/2013	BENZENE	1.3E-01		1	1
MW-G04S	S	4/16/2013	BENZENE	3.7E-01		1	1
MW-G04S	S	8/20/2013	BENZENE	1.3E-01		1	1

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G01D
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
0

Confidence in Trend:
46.0%

Coefficient of Variation:
0.00

Mann Kendall Concentration Trend: (See Note)
ND

Data Table:

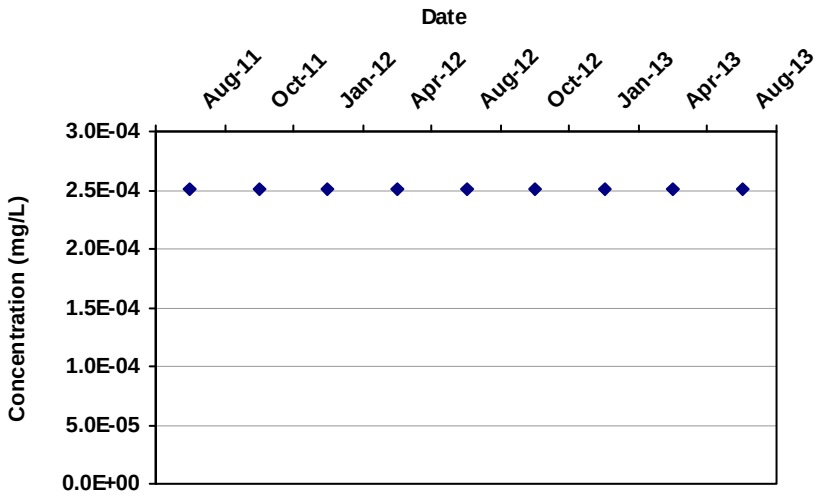
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G01D	S	8/16/2011	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	1/24/2012	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	4/17/2012	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	8/13/2012	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	10/22/2012	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	1/22/2013	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	4/16/2013	BENZENE	2.5E-04	ND	1	0
MW-G01D	S	8/20/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G02D
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
0

Confidence in Trend:
46.0%

Coefficient of Variation:
0.00

Mann Kendall Concentration Trend: (See Note)
ND

Data Table:

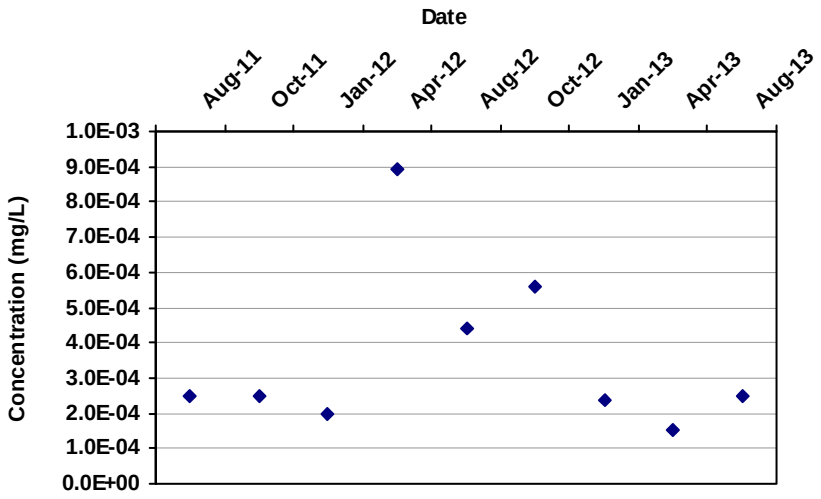
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G02D	S	8/16/2011	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	1/24/2012	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	4/17/2012	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	8/13/2012	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	10/22/2012	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	1/22/2013	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	4/16/2013	BENZENE	2.5E-04	ND	1	0
MW-G02D	S	8/20/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G03D
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:

-5

Confidence in Trend:

65.7%

Coefficient of Variation:

0.66

Mann Kendall Concentration Trend: (See Note)

S

Data Table:

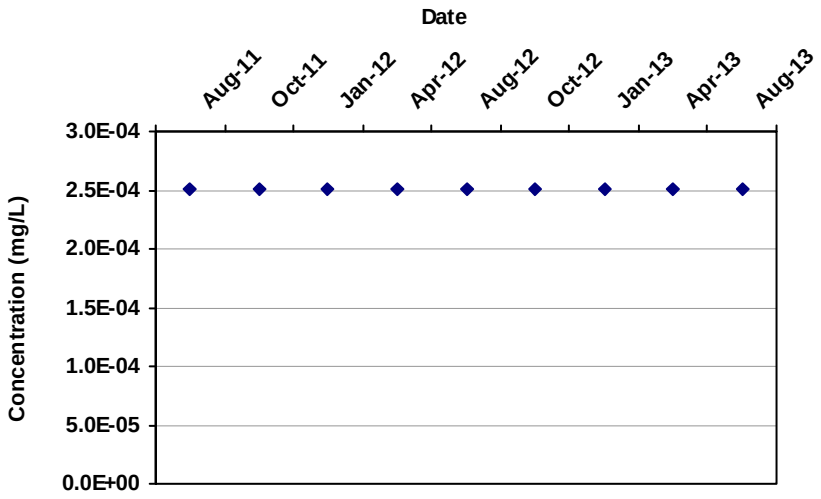
Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G03D	S	8/16/2011	BENZENE	2.5E-04	ND	1	0
MW-G03D	S	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-G03D	S	1/24/2012	BENZENE	2.0E-04		1	1
MW-G03D	S	4/17/2012	BENZENE	8.9E-04		1	1
MW-G03D	S	8/13/2012	BENZENE	4.4E-04		1	1
MW-G03D	S	10/22/2012	BENZENE	5.6E-04		2	2
MW-G03D	S	1/22/2013	BENZENE	2.4E-04		1	1
MW-G03D	S	4/16/2013	BENZENE	1.5E-04		1	1
MW-G03D	S	8/20/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Mann-Kendall Statistics Summary

Well: MW-G04D
Well Type: S
COC: BENZENE

Time Period: 8/13/2009 **to** 8/20/2013
Consolidation Period: No Time Consolidation
Consolidation Type: Median
Duplicate Consolidation: Average
ND Values: 1/2 Detection Limit
J Flag Values : Actual Value



Mann Kendall S Statistic:
0

Confidence in Trend:
46.0%

Coefficient of Variation:
0.00

Mann Kendall Concentration Trend: (See Note)
ND

Data Table:

Well	Well Type	Effective Date	Constituent	Result (mg/L)	Flag	Number of Samples	Number of Detects
MW-G04D	S	8/16/2011	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	10/18/2011	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	1/24/2012	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	4/17/2012	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	8/13/2012	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	10/22/2012	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	1/22/2013	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	4/16/2013	BENZENE	2.5E-04	ND	1	0
MW-G04D	S	8/20/2013	BENZENE	2.5E-04	ND	1	0

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect

MAROS Zeroth Moment Analysis

Project: Kast

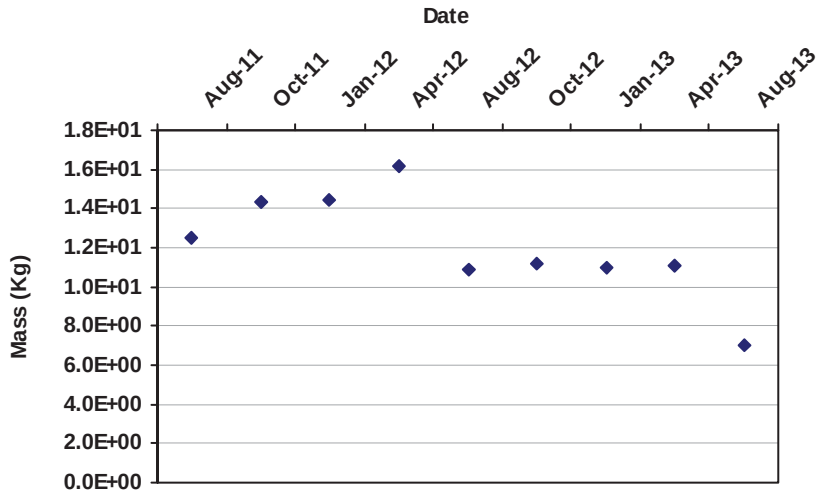
User Name: dzhou

Location: Carson

State: California

COC: BENZENE

Change in Dissolved Mass Over Time



Porosity: 0.43

Saturated Thickness:

Uniform: 20 ft

Mann Kendall S Statistic:

-16

Confidence in Trend:

94.0%

Coefficient of Variation:

0.22

Zeroth Moment Trend:

PD

Data Table:

Effective Date	Constituent	Estimated Mass (Kg)	Number of Wells
8/16/2011	BENZENE	1.3E+01	15
10/18/2011	BENZENE	1.4E+01	15
1/24/2012	BENZENE	1.4E+01	15
4/17/2012	BENZENE	1.6E+01	15
8/13/2012	BENZENE	1.1E+01	15
10/22/2012	BENZENE	1.1E+01	15
1/22/2013	BENZENE	1.1E+01	14
4/16/2013	BENZENE	1.1E+01	14
8/20/2013	BENZENE	7.0E+00	13

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events); ND = Non-detect. Moments are not calculated for sample events with less than 6 wells.

MAROS First Moment Analysis

Project: Kast

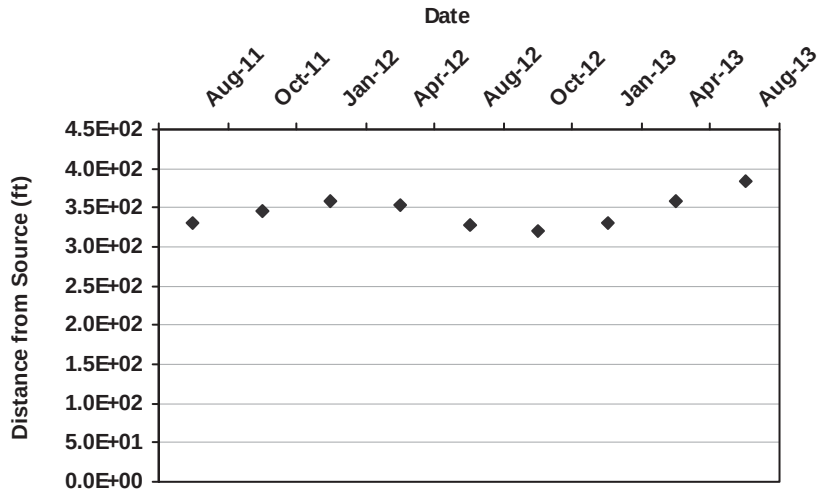
User Name: dzhou

Location: Carson

State: California

COC: BENZENE

Distance from Source to Center of Mass



Mann Kendall S Statistic:

6

Confidence in Trend:

69.4%

Coefficient of Variation:

0.06

First Moment Trend:

NT

Data Table:

Effective Date	Constituent	Xc (ft)	Yc (ft)	Distance from Source (ft)	Number of Wells
8/16/2011	BENZENE	702	1,211	331	15
10/18/2011	BENZENE	682	1,220	344	15
1/24/2012	BENZENE	691	1,238	359	15
4/17/2012	BENZENE	793	1,243	354	15
8/13/2012	BENZENE	713	1,210	327	15
10/22/2012	BENZENE	716	1,202	319	15
1/22/2013	BENZENE	751	1,218	330	14
4/16/2013	BENZENE	742	1,245	358	14
8/20/2013	BENZENE	775	1,272	383	13

Note: Increasing (I); Probably Increasing (PI); Stable (S); Probably Decreasing (PD); Decreasing (D); No Trend (NT); Not Applicable (N/A) - Due to insufficient Data (< 4 sampling events). Moments are not calculated for sample events with less than 6 wells.

APPENDIX C-2

Fate and Transport Modeling of Benzene Plume

Bioscreen Software

To characterize the migration and biodegradation of the benzene groundwater plume at the Former Kast property (Site), an Excel-based Domenico analytical solute transport model, Bioscreen, was used to simulate the subsurface processes of benzene (USEPA, 1996). Bioscreen simulates key fate and transport processes of hydrocarbons, such as advection, dispersion, sorption, and biodegradation, of dissolved hydrocarbons at petroleum fuel impacted sites. Bioscreen is designed to answer two questions for a contaminated site: (1) How far will the dissolved contaminant plume extend with/without engineered controls? (2) How long will the plume persist before being attenuated by natural degradation? Attenuation can be simulated by either first-order decay or instantaneous reaction with soluble electron acceptors.

Model Description

The Site groundwater data indicate that benzene accounts for an average of 89% mole fraction of the total BTEX (benzene, toluene, ethylbenzene, and xylenes), thus this modeling is focused on benzene in groundwater at the Site.

Parameters used in the Bioscreen simulation and the rationale of the selection of each parameter are summarized in **Table C-1**. When available, site-specific parameters are used in the model. Otherwise literature-reported values are used as input.

The observed hydraulic head during the 2013 second quarter sampling event was used to characterize the hydraulic gradient. The benzene contour map generated based on the 2011 second quarter sampling event was used to delineate initial benzene distribution. The soil/water partitioning coefficient (K_d) was calculated based on the literature value of the organic carbon/water partitioning coefficient (K_{oc}) and the minimum fraction of organic carbon (f_{oc}) reported in the California Regional Water Quality Control Board "Interim Site Assessment & Cleanup Guidebook" (CRWQCB, 1996), as a conservative estimation. The biodegradation was modeled as a first-order reaction. The source zone soluble benzene mass was estimated based on the measured benzene soil concentration in the saturated zone at MW-13 (1 mg/kg) and the assumption that this benzene concentration is distributed uniformly throughout a 100 ft (length) × 100 ft (width) ×25 ft (depth) source zone.

The soil boring logs show that the saturated zone consists of a mixture of sand, sand with silt, silty sand, and silt, with the two dominating soil types as fine sand and silty sand. As a conservative measure, the soil type was assumed as fine sand and its corresponding hydraulic conductivity and effective porosity were used. A benzene plume length of 605 ft along the

direction of groundwater flow was estimated based on the 2011 second quarter monitoring data. The longitudinal dispersivity was estimated as 1/10 of the plume length, the transverse dispersivity was estimated as 1/10 of the longitudinal dispersivity, and the vertical dispersivity was set as 0.

The Bioscreen simulation for the Site was conducted in three steps:

1) Calibrate the model to obtain a site-specific biodegradation rate. Based on the groundwater monitoring data and the Site history, benzene has not migrated to the down-gradient well MW-11 in over 50 years. This suggests that the benzene plume front has traveled less than 800 ft (the distance between the plume center, MW-13, and MW-11) in this period of time. Therefore, the model was run multiple times and the first-order solute half-life was manually adjusted to find a decay rate with which the benzene concentration at 800 ft down-gradient from the source equals to 0.14 µg/L (the detection limit of benzene at MW-11) at year 50.

2) Run the baseline scenario assuming no engineered control or source zone benzene reduction to determine a timeframe for source zone benzene to decrease below the MCL.

3) Run a second scenario where an 80% source zone benzene is removed to determine a timeframe for source zone benzene to decrease below the MCL.

Simulation Results

A solute half-life of 3.57 years was estimated. The simulation results show that:

1) Without source zone reduction, the benzene concentration at the source zone will decrease to below the MCL (1 µg/L) in approximately 320 years, and no noticeable down-gradient migration of the benzene plume is predicted by the model;

2) With 80% benzene source zone mass removal, the model predicts that the source zone benzene concentration is biodegraded to below the MCL in 70 years, with no discernible down-gradient migration of the benzene plume.

References

California Regional Water Quality Control Board (CRWQCB), Los Angeles and Ventura Counties. Interim Site Assessment & Cleanup Guidebook. May 1996.

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

Table C-1. Bioscreen Modeling Parameters

Former Kast Property

Carson, CA

Parameter		Unit	Value	Rationale
Chemical Properties				
Koc		(µg/g) / (µg/mL)	65	CRWQCB, 1996
foc		unitless	0.00247	Mean of 55 soil samples, CRWQCB, 1996
Kd		(µg/g) / (µg/mL)	0.161	Kd = Koc × foc
Stratum Property				
Hydraulic conductivity		cm/sec	2.89E-03	Todd, 1980
Effective Porosity		unitless	0.23	Todd, 1980
Hydraulic gradient		ft/ft	0.002	Site groundwater monitoring data
Bulk Density		g/cm^3	1.54	Site soil physical data
Longitudinal dispersivity		ft	60.5	1/10 of the plume length
Transverse/longitudinal dispersivity ratio		ft	6.05	1/10 of the longitudinal dispersivity
Vertical Dispersivity		ft	0	USEPA, 1996
Simulation Parameters				
Modeled Area Length		ft	2000	Professional Judgment
Modeled Area Width		ft	200	Professional Judgment
Source Thickness in Sat Zone		ft	10	USEPA, 1996
Source Zone Parameters				
Zone 1	Width	ft	112.5	Site groundwater monitoring data
	Concentration	mg/L	0.35	
Zone 2	Width	ft	50	
	Concentration	mg/L	0.4	
Zone 3	Width	ft	14	
	Concentration	mg/L	0.52	
Soluble Mass at the source zone		kg	11	Estimated based on MW-13 saturated zone soil data.

References

Todd, D.K., and Mays, L.W. Groundwater Hydrogeology, Wiley, 1980

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

Geosyntec consultants

APPENDIX D

RESPONSES TO REGIONAL BOARD, OEHHA, AND EXPERT PANEL COMMENTS

Geosyntec consultants

APPENDIX D

RESPONSES TO REGIONAL BOARD, OEHHA, AND EXPERT PANEL COMMENTS

Response to Comments
Review of Site-Specific Cleanup Goal Report
Former Kast Property, Carson, California

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
Samuel Unger, LARWQCB, Memorandum dated August 21, 2013				
RWQCB–1	Page 3 First Paragraph	*In their comments on the Report, OEHHA and the UCLA Expert Panel generally agree with the methodology used to calculate the HHSREs, but noted that some areas of the HHSREs require greater clarity. Although the proposed SSCGs are generally consistent with applicable practices regarding calculation of HHSREs, the proposed SSCGs require revision for the reasons described in this letter. The proposed SSCGs also do not appear to take into account Resolution 92-49, the Basin Plan, and other federal and state policies and guidance as required by the CAO, and may not be fully protective of unrestricted residential land use.*	The Revised SSCG Report presents Site-specific Clean-up Goals (SSCGs) that are based on technological and economic feasibility and include all Constituents of Concern (COCs) identified for the Site. Soil SSCGs are based on human health considerations, potential leaching to groundwater considering the groundwater as a potable water source. For soil vapor, SSCGs have been developed for the vapor intrusion pathway and methane. Groundwater SSCGs were developed considering the Basin Plan, State Board Resolution No. 68-16 and State Board Resolution No. 92-49. Additionally, the SSCGs consider nuisance. In order to meet the RWQCB requirement to have SSCGs that are technologically and economically feasible, a Screening Feasibility Study (Screening FS) was conducted which evaluated a number of factors related to potential remedial options at the Site, including options that result in unrestricted land use. These factors included implementability, environmental considerations, reduction of toxicity, mobility and volume, social and economic impacts on the surrounding community, the cost of each remedial option, and other factors. Based on the outcome of this evaluation, the SSCGs associated with applicable potential remedies for the Site were	Section 6.0, Section 7.0, Section 8.0, Section 9.0 and Appendices A and B

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
			selected. It should be noted that the remedial options evaluated in the Screening FS were selected to be representative of potential remedies that could be implemented at the Site. They include options that would result in restricted and unrestricted land use. A more detailed Feasibility Study may be conducted and selection of the final remedy will be submitted as part of the forthcoming Remedial Action Plan (RAP).	
RWQCB–2	Page 7 Comments and Directive on Shell's Proposed RAOs -First Bullet	*The Regional Board disagrees that the proposed COCs are limited to TPH-related compounds. During the Site investigation, chlorinated VOCs were detected on Site. Shell is required to include all compounds detected on site as COCs and develop RAOs and SSCGs to address all COCs. Also, as indicated by the UCLA Expert Panel's Interim Report, "It is possible that cleaning of machinery and other operations on-site resulted in release of these CVOCs on-site. This cannot be ruled out." (See UCLA Expert Panel Interim Report at p.13.)*	In response to the Regional Board's directive, RAOs and SSCGs have been modified to address both Site-related and non-Site-Related COCs. Notwithstanding the contention by the Expert Panel that the use of CVOCs onsite "cannot be ruled out" there is substantial evidence that the presence of CVOCs that were used for cleaning such as PCE and TCE in groundwater beneath the Site is due to off-Site sources. This evidence includes: • The lack of detections of PCE and TCE in Site soils between 10 feet below ground surface and groundwater (>400 samples) • The presence and/or former presence of high concentrations (>6 mg/L) of PCE and TCE in adjacent upgradient groundwater • The presence and/or former presence of PCE and TCE in soils beneath upgradient sites. • The distribution of PCE and TCE in shallow Site soil and Site groundwater	RAOs - Section 4; CVOC discussion: Section 2.1.2 Section 8.3.1 Appendix E.

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
			(higher toward upgradient potential sources, lower down gradient/away from these sources.	
RWQCB–3	Page 7 Comments and Directive on Shell's Proposed RAOs -Second Bullet	*The Regional Board agrees with the RAO of preventing human exposure and also agrees that the NCP sets forth a risk management range of 10^{-6} to 10^{-4}. The Regional Board agrees that such a range is appropriate for construction and utility maintenance workers. However, the Regional Board notes that the Report properly proposes to use a target incremental cancer risk of 10^{-6} and a non-cancer hazard quotient of 1 as the point of departure. The Department of Toxic Substances Control's (DTSC) Vapor Intrusion Mitigation Advisory (October 2011) sets forth the point of departure for risk management decisions for cancer risk at 10^{-6}. A target cancer risk of 10^{-6} or less is considered protective of on-site residents by Cal/EPA and should be used to support an unrestricted land use scenario.*	Comment noted. We understand that the Regional Board considers a target incremental cancer risk of 10^{-6} for residential receptors and considered the risk range of 10^{-6} to 10^{-4} for construction and utility workers. No change has been made in response to this comment.	No Change; See Section 4.0
RWQCB–4	Page 7 Comments and Directive on Shell's	*The Regional Board agrees that an RAO for methane should be to prevent fire and explosions. The RAO should also focus on eliminating methane to the*	The RAO for methane has been revised to add that methane should be eliminated to the extent technologically and economically feasible. See Section 4.	Section 4.0

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Proposed RAOs -Third Bullet	*extent technically and economically feasible.*		
RWQCB–5	Page 7 Comments and Directive on Shell's Proposed RAOs -Fourth Bullet	*The Regional Board generally agrees with the RAO with respect to LNAPL. However, the RAO should be reworded to say "remove or treat to the extent technically and economically feasible," rather than "to the extent practicable," to mirror the language in Resolution 92-49.*	The RAO for LNAPL has been revised to indicate that LNAPL will be removed or treated to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result.	Section 4.0
RWQCB–6	Page 7 Comments and Directive on Shell's Proposed RAOs -Fifth Bullet	*The Regional Board does not fully agree with the RAO for groundwater. Maintaining a stable plume in groundwater is important, but the RAO should be to reduce the plume to the extent technically and economically feasible to achieve, at a minimum, the water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply. Maintenance of plume stability may not restore groundwater to its designated beneficial uses.*	RAO for groundwater has been revised as follows: • *Reduce COCs in groundwater to the extent technologically and economically feasible to achieve, at a minimum, the water quality objectives in the Basin Plan to protect the designated beneficial uses, including municipal supply.* .	Section 4.0
RWQCB–7	Page 7 Comments and Directive on Shell's Proposed RAOs -Directive	*Directive: Revise the proposed RAOs in accordance with the comments above.*	The RAOs have been revised in response to RWQCB comments RWQCB-2, and RWQCB-4 through RWQCB-6 (no change was required for RWQCB-3).	Section 4.0

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
RWQCB–8	Page 9 Comments and Directive on Shell's Proposed SSCGs -First Paragraph	*The proposed SSCGs are generally derived from human health risk assessments that focus on reducing risks associated with COCs to a level that is acceptable for residential land use. However, the CAO also requires the proposed SSCGs to comply with Resolution 92-49, the Basin Plan, other regulations and policies, and be based on unrestricted residential land use.*	Comment acknowledged, see response to Comment RWQCB-1. The SSCG analysis considers Resolution 92-49, the Basin Plan, and unrestricted land use.	Section 9.0.
RWQCB–9	Page 9 Comments and Directive on Shell's Proposed SSCGs, Soil -First paragraph	*The proposed SSCGs for soils for many of the COCs, including but not limited to TPH and benzene, exceed background levels. The Report does not contain an analysis of the cleanup levels that are economically and technically feasible for the COCs. To comply with Resolution 92-49, the SSCGs must range between background and the level that is technically and economically feasible. The SSCGs must also be protective of groundwater and be based on unrestricted residential land use.*	The Revised SSCG Report includes an analysis of the economic and technological feasibility of SSCGs associated with representative potential remedial options for the Site (See Comment RWQCB-1). This analysis includes evaluation of remedial options that are protective of groundwater and result in unrestricted land use. Using this analysis, SSCGs for all COCs are provided.	Section 9.0.
RWQCB–10	Pages 9-10 Comments and Directive on Shell's Proposed SSCGs,	*The SSCGs also do not comport with the Regional Board's Interim Site Assessment and Cleanup Guidebook, May 1996, and do not consider criteria such as waste concentrations, depth to the water table, the nature of the*	The 1996 Regional Board's Interim Site Assessment and Cleanup Guidebook and USEPA Regional Screening Level methodology are considered in the development of SSCGs. Groundwater data indicate the dissolved plumes are stable. The approach presented in the report is	Section 6 and 8.

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Soil -First Paragraph	*chemicals, soil conditions and texture, and attenuation trends, and human health protection levels set forth in USEPA Regional Screening Levels (Formerly Preliminary Remediation Goals).*	consistent with the Regional Board Guidebook, and proposes "alternative soil screening cleanup levels that are supported by 'risk assessment approaches' and/or 'fate and transport modeling' if they also address groundwater protection" (page 4-3 of the Guidebook). Concentrations in soil and groundwater and attenuation trends were considered in this assessment. The assessment indicated that remediation of soil in the upper 10 feet (the depth interval in the CAO) will not result in a change in groundwater quality (See Section 8). However, in response to agency comment numerical SSCGs have been developed considering leaching to groundwater and the 1996 Regional Board's Interim Site Assessment and Cleanup Guidebook and RSL methodology. The human health protection levels (in a manner similar to those presented in the USEPA Regional Screening Levels) were quantitatively characterized and SSCGs considering human health risks presented in Table 6-1 and 6-2. . The Revised SSCG Report clarifies this evaluation and presents additional information regarding soil cleanup goals for the protection of groundwater.	
RWQCB–11	Page 10 Comments and Directive on Shell's Proposed SSCGs,	*The Report derives SSCGs based on contaminant fate and transport and human health risk criteria. This methodology does not completely comport with CCR, title 23, section*	See response to comment RWQCB-10. SSCGs have been developed for leaching to groundwater. The potential for residual hydrocarbons on site to generate vapor in the soil in the future has been	Section 6. Also, see Section 8.4

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Soil -First Paragraph	*2550.4, which requires that cleanup levels must be protective of groundwater quality. The proposed SSCGs would allow significant quantities of wastes to remain beneath the Site, which may not be protective of groundwater and support unrestricted residential land uses. Further, in some areas of the Site, these wastes may persist and continue to generate soil vapor.*	extensively evaluated through the soil vapor and sub-slab soil vapor monitoring program. The site is mature (i.e., more than 45 years) and residual COCs in soil will not result in concentrations in soil vapors or leachate that are higher than current measurements. Concentrations are expected to decrease as additional weathering of the residual COCs occurs. The Revised SSCG Report clarifies these points and presents additional information regarding soil cleanup goals for the protection of groundwater	
RWQCB–12	Page 10 Comments and Directive on Shell's Proposed SSCGs, Soil -First Bullet	*The Regional Board disagrees that the proposed COCs are limited to TPH-related compounds. During the Site investigation, chlorinated VOCs were detected on Site. Shell is required to include all compounds detected on site as COCs and develop RAOs and SSCGs to address all COCs. Also, as indicated by the UCLA Expert Panel's Interim Report, "It is possible that cleaning of machinery and other operations on-site resulted in release of these CVOCs on-site. This cannot be ruled out." (See UCLA Expert Panel Interim Report at p. 13.)*	RAOs and SSCGs have been modified to address both Site-related and non-Site-Related COCs. Also, additional details regarding the distributions of CVOCs, in particular PCE and TCE in soil, sub-slab soil vapor, and groundwater and potential sources for CVOCs are included in the Revised SSCG Report. See response to RWQCB-2 and Sections 6, 7, 8.	Sections 6, 7, 8
RWQCB–13	Page 10	*The OEHHA Memorandum and UCLA Expert Panel Interim Report identify several issues regarding the risk*	See response to Comment RWQCB-1. The fraction-specific TPH SSCGs for deeper soils (e.g., > 2 to 10 feet bgs) are higher than the SSCGs	Section 6

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Comments and Directive on Shell's Proposed SSCGs, Soil -Second Bullet	*calculations. A key issue concerns segregating the shallow soil exposure scenario into two layers: 0-2 feet bgs and 2-10 feet bgs. The fraction-specific soil SSCGs for TPH ranges (Appendix A Page 17-20) for soil between 2 and 10 feet bgs are quite high. The Report assumes specific exposure conditions of 4 days per year exposure frequency to subsurface soils between 2 and 10 feet bgs.*	developed for frequent exposures due to the reduced frequency assumption. It is unlikely that residents would contact deeper soils at the same frequency as surface soils. Therefore an exposure frequency of 4 days per year was used based on 1/10th of the USEPA recommended event frequency of 40 events per year for an adult resident gardening outdoors on a more routine basis (USEPA, 1997). Since the value of 40 days per year is based on routine gardening, an adjustment to this value was made to account for infrequent contact to account for instances where a resident may contact deeper soil (e.g., planting a tree). In addition, it is unlikely that residents would contact soils from a deeper excavation (such as during a major renovation or utility repair work) as these soils could not be placed on site due to the developed nature of the neighborhood and lack of area to place the excavated soils. The conceptual model for this assumption is consistent with existing institutional controls (e.g., requirement for a permit for excavation) to prevent redistribution of deep soils at the surface. A soil management plan will be prepared either as a part of, or subsequent to, the RAP to provide the detailed approach to preventing residential exposure to subsurface soils impacted by Site COCs. Section 6 has been revised to include the rationale described above. .	
RWQCB–14	Page 10	*The proposed chemical-specific SSCGs*	The SSCGs are independent of the site data and are	Section 6

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Comments and Directive on Shell's Proposed SSCGs, Soil -Third Bullet	*are based on the average concentrations or the 95[%] Upper Confidence Limit (95UCL) chemical concentrations calculated for each property, rather than using maximum concentrations in soil. Although the use of the 95UCL was approved by the Regional Board for Human Health Screening Evaluations, 95UCL may not be appropriate for SSCGs.*	not based on average concentrations or the 95UCL (i.e. the site concentration data is not used in the SSCG calculation). The comparison of site data (e.g., maximum or average concentrations) to SSCGs will be addressed in the forthcoming RAP. Note, however, that OEHHA and the expert panel comments support the use of 95UCLs for remedial action planning. The 95 UCL is commonly used as the exposure point concentration when sufficient data are available (Cal-EPA, 2005; Cal-EPA, 1996; USEPA, 2002). Clarification of this point is included in the Revised SSCG Report.	
RWQCB–15	Page 10 Comments and Directive on Shell's Proposed SSCGs, Soil -Fourth Bullet	*The proposed SSCGs are based on chemical-specific risks and do not consider cumulative risks to receptors that may exceed 10^{-6}.*	The chemical-specific SSCGs are based on a risk of 10^{-6} because the exact chemical distribution is not known. Rather than assume a certain distribution of risk and hazard among chemicals ahead of time, the site data will be evaluated in the HHRA to identify the final COCs. In addition as presented in the RAOs section, the forthcoming HHRA will address cumulative risk.	Section 6
RWQCB–16	Page 10 Comments and Directive on Shell's Proposed SSCGs,	*The proposed SSCGs need to address all areas of the Site. The proposed SSCGs do not address areas below hardscape. The Regional Board does not typically distinguish SSCGs based on hardscape and softscape because*	The Revised SSCG Report includes a Screening FS that evaluates the technological and economic feasibility for remediation beneath hardscape and softscape areas and establishes SSCGs according to the results of the evaluation. The actual corrective actions for soils beneath	Section 9

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Soil -Fifth Bullet	*such an approach is not likely to be protective of unrestricted residential land use or groundwater protection.*	hardscape areas will be presented in the RAP.	
RWQCB–17	Page 10 Comments and Directive on Shell's Proposed SSCGs, Soil -Sixth Bullet	*Fruits and vegetables grown in the yards of the homes at the Site may uptake COCs, but that exposure scenario has not been considered in developing SSCGs.*	Potential uptake of chemicals from soil into fruit and vegetables is discussed in Section 2.3 of the SSCG report. Evidence from the literature indicates that for the chemicals related to crude oil, PAHs and BTEX which are primary COCs for the Site, uptake from the soil into plants and fruit does not play a significant role. A number of studies suggest that air deposition is the major pathway for plants' uptake of PAHs. Rapid degradation and/or volatilization to the atmosphere would prevent effective uptake of BTEX by plant roots. Volatile contaminants in general have a low potential to accumulate by root uptake from soil because they quickly escape to air. Consistent with the literature, Cal-EPA OEHHA does not require evaluation of the soil to root uptake pathway for organic compounds (Cal-EPA OEHHA, 2012). Based on this information, this exposure scenario was not considered in the derivation of the SSCGs. This information is also presented in Section 6, Soil SSCGs.	Section 2.3, Section 6
RWQCB–18	Page 11 Comments and Directive on Shell's Proposed SSCGs,	*The proposed SSCGs for TPH in soil do not support unrestricted residential land use for several reasons, including, but not limited to:* • *Using the proposed SSCGs, land use restrictions (also known as deed*	As noted in the response to RWQCB-1 a Screening FS is used to evaluate the technological and economic feasibility of SSCGs. The Screening FS evaluates representative potential remedial options including options with and without land use restrictions. The resulting SSCGs associated with	Section 9.0

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Soil -Seventh and Eight Bullet	*restrictions or environmental covenants) may be necessary to inform and protect existing and future residents from exposure to certain COCs. The proposed SSCGs in soil cannot exceed human health values for dermal contact at shallow depths unless land use restrictions to control exposure are implemented. Any land use restrictions would be required to be recorded by the existing property owner.* • *The proposed SSCGs for TPH would continue to pose a nuisance as defined in California Water Code section 13050(m) because the properties would be subject to continuing land use restrictions.*	each remedial option include consideration of nuisance. Institutional controls are discussed in Section 9.2, and include options such as adding a notification overlay to the existing excavation and building permit regulatory process, and other controls that are commonly used at sites to achieve cleanup objectives. These controls will be designed to limit the exposure of residents to deeper soils. Institutional controls are not expected to obstruct the free use of the properties at the Site or otherwise constitute a nuisance under Water Code § 13050(m).	
RWQCB–19	Page 11 Directive on Shell's Proposed SSCGs, Soil	*Directive: Revise the Report to: (1) include an evaluation of compliance with Resolution 92-49, including determining cleanup levels that are technically and economically feasible*	As noted in the response to RWQCB-1, a Screening FS is used to evaluate the technological and economic feasibility of SSCGs. The Screening FS evaluates representative potential remedial options including options with and without land use restrictions. The resulting SSCGs associated with each remedial option include consideration of nuisance.	Section 9.4
RWQCB–20	Page 11 Directive on Shell's Proposed SSCGs,	*Directive: Revise the Report to: (2) provide SSCGs that are inclusive of both hardscape and softscape areas of the Site;*	The Screening FS is used to develop SSCGs that are technologically and economically feasible. The Screening FS includes representative potential remediation scenarios that address soils beneath both softscape and hardscape.	Section 9.0

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Soil			
RWQCB–21	Page 11 Directive on Shell's Proposed SSCGs, Soil	*Directive: Revise the Report to: (3) provide the rationale for using average concentrations or propose another methodology;*	The SSCGs are independent of the site data and are not based on average concentrations or the 95UCL (i.e. the site concentration data is not used in the SSCG calculation). The comparison of site data (e.g., maximum or average concentrations) to SSCGs will be addressed in the forthcoming RAP. Note, however, that OEHHA and the expert panel comments support the use of 95UCLs for remedial action planning. The 95 UCL is commonly used as the exposure point concentration when sufficient data are available (Cal-EPA, 2005; Cal-EPA, 1996; USEPA, 2002). Clarification of this point is included in the Revised SSCG Report.	Section 6
RWQCB–22	Page 11 Directive on Shell's Proposed SSCGs, Soil -	*Directive: Revise the Report to: (4) address the comments regarding supporting unrestricted residential land uses*	As noted in the response to RWQCB-1 a Screening FS is used to evaluate the technological and economic feasibility of SSCGs. The Screening FS evaluates representative potential remedial options including options with and without land use restrictions. The resulting SSCGs associated with each remedial option include consideration of nuisance. Institutional controls are discussed in Section 9.2, and include options such as adding a notification overlay to the existing excavation and building	Section 9.0

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
			permit regulatory process, and other controls that are commonly used at sites to achieve cleanup objectives. These controls will be designed to limit the exposure of residents to deeper soils. Institutional controls are not expected to obstruct the free use of the properties at the Site or otherwise constitute a nuisance under Water Code § 13050(m).	
RWQCB–23	Page 11 Comments and Directive on Shell's Proposed SSCGs, Soil Vapor -First Paragraph	*The Report does not propose SSCGs for soil vapor COCs because the Report states that vapor intrusion is not affecting indoor air quality based on an analysis of approximately 300 indoor air tests. A multiple lines-of-evidence approach was used to reach this conclusion. However, the Regional Board notes that soil vapor can be generated from COCs sorbed to the soil column and can continue to be generated into the future. Overall, the proposed SSCGs would leave a significant mass of hydrocarbons in the subsurface. Such hydrocarbons may continue to degrade and generate VOCs that may pose future risks to humans. The proposed SSCGs do not appear to consider the persistence and permanence of potential adverse effects.*	The investigations conducted at the site have evaluated the potential for soil vapor to be generated from COCs sorbed to the soil column. Given the history of the site, the data collected are conservative assessments of future conditions (i.e., soil concentrations and the potential for volatilization from soil will decrease in the future as additional natural biodegradation and weathering occur). As the result, the vapor intrusion evaluation addresses concerns regarding the presence of residual COCs in soils. In the previous report Soil Vapor SSCGs were not developed for the vapor intrusion pathway as the multiple lines of evidence evaluation indicates that soil vapor is not significantly affecting indoor air quality, However in response to the RWQCBs directive, SSCGs for soil vapor and the vapor intrusion pathway have been developed. Section 7 presents the soil vapor SSCGs.	Section 7
RWQCB–24	Page 11	*The Regional Board notes that the Report proposes that a vapor intrusion*	Property-specific evaluations of the vapor intrusion pathway have been presented in the Phase II	No Change; see Section 7 and

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Comments and Directive on Shell's Proposed SSCGs, Soil Vapor -First Paragraph	*assessment will be made on a property-specific basis to assess whether the sub-slab data result in indoor air concentrations above background, rather than a numeric site-specific cleanup for soil vapor. In addition, the concrete in the soils below grade may contribute to soil vapors and needs to be evaluated. The Regional Board has received, and is evaluating, a separate report from Shell regarding the slabs. Given the amount of hydrocarbons in the subsurface varies throughout the Site, a property-specific evaluation is appropriate.*	Interim, Follow-up, and Final Interim Reports submitted to the Regional Board. Additionally, the HHRA and RAP will include a property-specific evaluation of the vapor intrusion pathway. The investigations conducted at the site have included samples collected above concrete reservoir slabs present in the sub-surface. There is no evidence that the concrete in soils below grade are contributing to soil vapors. We understand that the Regional Board is evaluating the Assessment of Environmental Impact and Feasibility of Removal of Residual Concrete Reservoir Slabs report dated June 28, 2013. Based on the data collected at the Site and that it is a mature site (i.e., hypothetical impacts from concrete in soils are addressed by the current sampling program), no changes are made to the Revised SSCG Report in response to this comment.	Appendix B
RWQCB–25	Pages 11-12 Comments and Directive on Shell's Proposed SSCGs, Soil Vapor	*The Report specifies screening levels for VOCs in sub-slab vapors that are 1% of the CHHSLS for indoor air. This implies that indoor air concentrations resulting from vapor intrusion are expected to be no more than 1% of the sub-slab concentrations (i.e., the attenuation factor is assumed to be 0.01*	Based on the comments from Regional Board, Regional Board Staff and the Expert Panel, the vapor intrusion evaluation has been updated to incorporate data collected since the SSCG report was submitted and to address Regional Board Comments. The amount of data in the vapor intrusion data set is now more robust than what was available during the initial vapor intrusion	Section 7 and Appendix B

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	-Second Paragraph	*or less). Regional Board staff review of the statistical analysis of sub-slab soil vapor and indoor air data for vapor intrusion evaluation suggests that some VOCs detected in indoor air may be there in part from the intrusion of sub-slab vapors. (See attached Regional Board Staff Memorandum) Also as indicated by the UCLA Expert Panel's Interim Report, "any determination that there is a relationship between sub-slab soil vapor and indoor air will have a direct and profound impact on all risk estimates and cleanup calculations." (See attached UCLA Expert Panel Interim Report at p. 5) (2) Develop SSCGs for soil vapor based on potential vapor intrusion concerns in individual homes*	assessment. The updated vapor intrusion assessment concludes that indoor air concentrations are indistinguishable from background concentrations. Although the literature background comparison and the multiple linear regression analysis indicate that the indoor concentrations are due to background sources and not due to sub-slab soil vapor levels, soil vapor SSCGs have been calculated for corrective action planning as directed by the Regional Board. .	
RWQCB–26	Page 12 Directive on Shell's Proposed SSCGs, Soil Vapor	*Shell is required to address the following: (1) Propose numeric SSCGs for VOCs in soil vapor that are equivalent to sub-slab screening levels or develop a site-specific attenuation factor (AF) to support development of a site-specific sub-slab vapor cleanup goal using indoor air and sub-slab data for VOCs*	In response to agency comments, the Revised SSCG Report includes numeric SSCGs for VOCs in soil vapor that are based on conservative, upper-bound a site-specific attenuation factor. The rationale for the site-specific attenuation factor is presented in Appendix B and the numeric SSCGs for VOCs in soil vapors are presented in Section 7.	Section 7 and Appendix B.
RWQCB–27	Page 12	*Shell is required to address the following: (2) Develop SSCGs for soil*	In response to agency comments, the Revised SSCG Report includes numeric SSCGs for VOCs	Section 7 and Appendix B

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Directive on Shell's Proposed SSCGs, Soil Vapor	*vapor based on potential vapor intrusion concerns in individual homes*	in soil vapor that are based on a site-specific attenuation factor. The rationale for the site-specific attenuation factor is presented in Appendix B and the numeric SSCGs for VOCs in soil vapors are presented in Section 7.	
RWQCB–28	Page 12 Directive on Shell's Proposed SSCGs, Soil Vapor	*Shell is required to address the following: (3) Determine when concentrations of TPH may present a nuisance and detectable odor in accordance with the San Francisco Bay Regional Water Quality Control Board's Environmental Screening Levels (ESL) document.*	ESLs for TPH in soil vapor are now included as SSCGs to address nuisance.	Section 7 and Table 9-3
RWQCB–29	Page 12 Comments and Directive on Shell's Proposed SSCGs, Indoor Air (Methane) -First Paragraph and Directive	*The Regional Board agrees that the proposed SSCGs for methane may be suitable for risk management screening levels. The SSCGs are also consistent with DTSC guidance and have been approved by the Los Angeles County Fire Department for Site investigation screening levels. However, the proposed SSCGs only consider methane above ground or in vaults. Methane in soil vapor also represents a safety risk as it may contribute to elevated levels that can accumulate in structures, which pose a potential safety risk.* *Directive: Shell is directed to develop SSCGs for methane in soil vapor for residential exposure scenarios.*	Comment acknowledged. However, the SSCGs for methane listed in the SSCG report are applicable to soil vapor and not limited to above-ground or vault concentrations. The Revised SSCG Report clarifies that the SSCGs for methane are intended to be used for soil vapor and above ground or in vaults.	Section 7.2

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
RWQCB–30	Page 12 Comments on Shell's Proposed SSCGs, Groundwater -First Paragraph	*The Report does propose removal of LNAPL to the extent practicable. However, pursuant to Resolution 92-49, LNAPL should be removed "to the extent technically and economically feasible." …*	The third RAO listed in Section 3 of the SSCG report, "Remove LNAPL to the extent practicable and where a significant reduction in current and future risk to groundwater will result" was included to address the requirement in Resolution 92-49. In response to the Regional Board comments, this RAO is revised to state: "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."	Section 4.0, Section 9.0
RWQCB–31	Pages 12-13 Comments on Shell's Proposed SSCGs, Groundwater -Second Paragraph	*The proposed SSCGs for soil do not consider the effects of continuing migration of waste into groundwater in excess of Basin Plan water quality objectives nor the permanence of the potential adverse effects. To comply with Resolution 92-49, cleanup levels less stringent than background conditions must not result in exceedance of water quality objectives set forth in the Basin Plan. Groundwater beneath the site is impacted with various chemicals that exceed their respective MCLs, including benzene, naphthalene, tetrachloroethene (PCE), trichloroethene (TCE), and tert-butyl alcohol (TBA). Although the proposed SSCGs to achieve background conditions appear appropriate, the period of time to reach these goals through monitoring and natural*	Section 8 has been revised to clarify that the SSCGs for soil and groundwater are consistent with the Basin Plan and Resolution 92-49. The proposed SSCGs for groundwater are Primary MCLs or NLs for all COCs that exceed Primary MCLs or NLs (petroleum related compounds and chlorinated compounds), and background levels for metals. SSCGs are proposed for all COCs that exceed Primary MCLs, NLs or background (metals) regardless of whether they are considered Site-related or not. Soil SSCGS for leaching to groundwater have been developed using the Primary MCL or NL as the target groundwater concentration. Based on the site conceptual model and the age of potential petroleum releases at the Site, groundwater impacts from leaching from Site soils are expected to decrease through time. Crude oil present in the vadose zone above the groundwater	Sections 2.1, 6.3, 8.3.1, 8.3.2, 8.4, 9.4

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		attenuation has not been analyzed. The attenuation rate for the COCs at the Site may be so long as to render these methods unsuitable for meeting the proposed SSCGs within a reasonable time frame and eliminate the potential impact to underlying aquifers	table and in a limited area at or below the water table has been subject to biological degradation and leaching over a period of more than 45-years. It is expected that benzene concentrations in soils will be further reduced over time by degradation and/or continued, but reduced leaching, as the sources diminish. Benzene is the main site-related COC. The benzene plume at the Site is well defined, stable, and naturally attenuating. Analysis described in Section 8 and Appendix E indicates that the benzene plume could be reduced to MCL concentrations in 70 to 320 years through natural attenuation depending on the level of source reduction achieved. This estimate is approximate; however, utilizing hot spot groundwater remediation (e.g. areas of COC concentration >100x MCL) and targeted SVE in areas of elevated benzene concentration in the vadose zone coupled with LNAPL remediation, would likely result in meeting benzene MCLs in ~ 100 years. These remedial efforts are expected to reduce other petroleum related compounds and arsenic to their respected SSCGs in a similar time frame, or less. As described in the response to comment RWQCB-2, CVOCs in Site groundwater are believed to originate from upgradient sources. Analysis of	

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			degradation of these compounds beneath the Site has not been conducted because the status of their upgradient sources is unknown. However, assuming that the upgradient sources are remediated, the concentrations on-Site would be expected to return to MCL or background levels.	
RWQCB–32	Page 12 Directive on Shell's Proposed SSCGs, Groundwater	*Directive: Shell is required to: (1) propose removal of LNAPL "to the extent technical technologically and economically feasible" in accordance with Resolution 92-49;*	The Revised SSCG Report states that removal of LNAPL will be "to the extent technologically and economically feasible, and where a significant reduction in current and future risk to groundwater will result."	Section 9.0
RWQCB–33	Page 12-13 Directive on Shell's Proposed SSCGs, Groundwater	*Directive: Shell is required to: (2) propose SSCGs for ground water to achieve, at a minimum, applicable Basin Plan water quality objectives within a reasonable time frame and that take into account continuing migration of waste into groundwater.*	The Revised SSCG Report clarifies that the SSCGs for groundwater meet the requirements of the Basin plan and consider potential continuing migration of waste into groundwater See Response to comment RWQCB-31	Sections 8.4, 9.4
RWQCB–34	Page 13 Directive to Revise Report -First Paragraph	*Shell is required to revise the Report and the SSCGs, as appropriate, in accordance with the specific directives and other comments provided in this letter. Shell is also directed to address all comments in the attached OEHHA Memorandum, UCLA Expert Panel Interim Report, and Regional Board Staff Memorandum*	The SSCG report and SSCGs have been revised (as appropriate) in accordance with the directives and other comments provided in this letter. Comments provided by OEHHA, the UCLA Expert Panel, and Regional Board Staff are addressed in this Response to Comments and the Revised SSCG Report.	

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RWQCB–35	Page 13 Directive to Revise Report -First Paragraph	*Shell is further directed to meet with Regional Board staff no later than September 18, 2013 to discuss shell's approach to revising the Report and proposed SSCGs.*	Shell met with the Regional Board staff on August 30, 2013 to discuss Shell's approach to revising the Report and proposed SSCGs.	
RWQCB–36	Page 13 Directive to Revise Report -First Paragraph	*Revisions are necessary to take into consideration the requirements of Resolution 92-49, the Basin Plan, and regulations and policies referred to in these comments; to address the comments contained in the attached OEHHA Memorandum, UCLA Expert Panel Interim Report, and Regional Board Staff Memorandum; and to assure that SSCGs are sufficient to be protective of unrestricted residential land uses.*	Revisions to the document have been made to clarify that the guidance documents and policies referenced in this comment are considered in the development of SSCGs that are technologically and economically feasible. SSCGs consider unrestricted land use (see also comments RWQCB-1 and RWQCB-18) Additionally, the Revised SSCG Report addresses comments included in the OEHHA memorandum, the UCLA Expert Panel Interim Report, and Regional Board Staff Memorandum as outlined in this response to comments table.	Section 9.0 and this response to comment table.
RWQCB–37	Page 13 Directive to Revise Report -Third to Fourth Paragraphs	*Please note that the Regional Board requires Shell to include a perjury statement in all reports submitted under the CAO. The perjury statement shall be signed by a senior authorized Shell Oil Products US representative (and not by a consultant).The statement shall be in the following format:* *"I, [NAME], do hereby declare, under penalty of perjury under the laws of the State of California, that I am [JOB*	The Revised SSCG Report includes the perjury statement required by the Regional Board.	Preamble to the report

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		TITLE] for Shell Oil Company, that I am authorized to attest to the veracity of the information contained in [NAME AND DATE OF REPORT], that the information contained in the reports described herein is true and correct, and that this declaration was executed at [PLACE], [STATE], on DATE]."		
RWQCB–38	Page 3 Regulatory Requirements for Establishing SSCGs State Water Board Resolution No. 92-49	*Resolution 92-49 requires the Regional Board to assure that waste is cleaned up to background conditions, or if that is not reasonable to an alternative level that is the most stringent level that is economically and technologically feasible in accordance with CCR, title 23, section 2550.4.*	We note that Resolution No. 92-49 does not mandate cleanup of soil, soil vapor and indoor air to background levels for each of those media. Instead, Resolution No. 92-49 requires that waste is cleaned up and abated: "in a manner that promotes attainment of either background water quality, or the best water quality which is reasonable if background levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic, social, tangible and intangible." The focus in Resolution No. 92-49 with respect to remedial activity is on water quality and not on all media. Waste in non-water media (such as soil) should be	No change required. Clarification added to Section 8.4.2.

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			addressed through remediation to promote the attainment of background water quality (not, for example, background levels in soil) or the best water quality that is reasonably feasible given the considerations listed.	
RWQCB–39	Page 4 Regulatory Requirements for Establishing SSCGs California Code of Regulations, Title 23, Section 2550.4	*Resolution 92-49 incorporates, by reference, CCR, title 23, section 2550.4. Section 2550.4 guides the establishment of concentration limits for COCs in corrective action programs in California. Section 2550.4 states, in part: …* *(d) In establishing a concentration limit greater than background for a constituent of concern, the regional board shall consider the following factors:* *(1) potential adverse effects on ground water quality and beneficial uses, considering: …* *(G) the potential for health risks caused by human exposure to waste constituents; …* *(I) the persistence and permanence of adverse effects…*	We note that the factors that the Regional Board shall consider in establishing concentration limits greater than background under 23 Cal. Code Regs. § 2550.4 also include "(E) the current and potential future uses of ground water in the area; [and] (F) the existing quality of ground water, including other sources of contamination or pollution and their cumulative impact on the ground water quality. As explained in Section 8, groundwater beneath the Site in the Shallow Zone and the Gage aquifer is not currently used for drinking water supply and its future use is not anticipated. Also, offsite impacts appear to contribute to groundwater conditions at the Site. These factors support the SSCGs recommended for groundwater at the Site.	No change required. Section 8 contains a discussion of groundwater use and offsite sources of groundwater impacts.

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RWQCB–40	Page 5 Regulatory Requirements for Establishing SSCGs State Water Board Resolution No. 68-16	*The CAO requires that all cleanup goals comply with the State Water Board's "anti-degradation policy." This policy requires attainment of background levels of water quality, or the highest level of water quality that is reasonable in the event that background levels cannot be restored. Cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of water, and not result in exceedance of water quality objectives in the Regional Board's Basin Plan.*	While we believe that the proposed SSCGs meet the stated objectives, we note that State Water Board Resolution No. 68-16 may not be applicable here. Resolution No. 68-16 was implemented to regulate "the granting of permits and licenses for unappropriated waters and the disposal of wastes into the waters of the State" where groundwater conditions are better than water quality levels. In such cases, new discharges may only be permitted where certain findings are made. The establishment of SSCGs for the Site does not include a request for approval for disposal of wastes into the groundwater beneath the Site; to the contrary the proposed SSCGs, the future submission of the RAP and the other steps Shell is taking to comply with the CAO are all aimed at addressing the effects of existing Site-related COCs. Also, Resolution No. 68-16 was implemented to maintain water quality conditions where such conditions are better than water quality levels established in a policy, such as the Basin Plan, at the time of its adoption. Given the historical nature of the Site conditions, it appears unlikely that water quality at the Site (with respect to the COCs in groundwater) was better than the standards set forth in the Basin Plan when it was adopted in 1994. "When undertaking an antidegradation analysis, the Regional Board must compare	No change required. Clarification added to Section 8.4.2.

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			the baseline water quality … to the water quality objectives. If the baseline water quality is equal to or less than the objectives, the objectives set forth the water quality that must be maintained or achieved. In that case the antidegradation policy is not triggered." *Asociacion de Gente Unida por el Agua v. Cent. Valley Reg'l Water Quality Control Bd.*, 210 Cal.App.4th 1255, 1270 (2012).	
James C. Carlisle, OEHHA, Memorandum dated July 22, 2013				
OEHHA–1	Page 1 Comment 1	*The appropriate exposure frequency and duration for the construction worker are site-specific and should be based on the most likely construction scenarios.*	Agreed. The exposure frequency and duration for the construction worker included in the SSCG report are based on the most likely construction scenarios. No changes have been made in response to this comment.	No change to report
OEHHA–2	Page 1 Comment 2	*Proposed gastrointestinal and dermal absorption fractions should be referenced.*	The Revised SSCG Report (Appendix A) includes references to the proposed gastrointestinal and dermal absorption factors.	Appendix A
OEHHA–3	Pages 1-2 Comment 3	*Residents are only considered to be exposed to deeper soils 4 days per year, based on a tree planting scenario. Page 23 states that soils from 0-10 feet were evaluated to address the scenario that deep soils contact would occur during a major renovation project such as pool installation or underground utility work. Since the site is fully developed, this scenario is considered unlikely. Nonetheless, this is a commonly*	The exposure frequency of 4 days per year is based on 1/10th of the USEPA recommended event frequency of 40 events per year for an adult resident gardening outdoors on a more routine basis (USEPA, 1997). Since the value of 40 days per year is based on routine gardening, an adjustment to this value was made to account for infrequent contact to account for instances where a resident may contact deeper soil (e.g., planting a tree). In	Section 6, Section 9 and Appendix A.

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		evaluated scenario and its omission may be questioned, regardless of how unlikely it is. If renovation involving excavation were to occur, then residents could be exposed to deeper soils that are redistributed to the surface, and this exposure would likely be greater than four days per year. During our teleconference, OEHHA was advised that there is no room to place excavated soil on these lots, and that any excavated soil would have to be hauled away.	addition, it is unlikely that residents would contact soils from a deeper excavation (such as during a major renovation or utility repair work) as these soils could not be placed on site due to the developed nature of the neighborhood and lack of area to place the excavated soils. The conceptual model for this assumption is consistent with existing institutional controls (e.g., requirement for a permit for excavation) to prevent redistribution of deep soils at the surface. A soil management plan will be prepared either as a part of, or subsequent to, the RAP to provide the detailed approach to preventing residential exposure to subsurface soils impacted by Site COCs. This text has been added to Section 6 and Appendix A and referenced in Section 9.	
OEHHA–4	Page 2 Comment 4	*Please explain the differences between the VF equation in Section 3.1.2.1 and Equation 4-8 in the EPA Soil Screening Guidance on which it is based.*	These equations are equivalent. The VF equation in the EPA Soil Screening Guidance was modified to use nomenclature consistent with the remainder of the SSCG report. Appendix A has been revised to show the equivalence between Equation 4-8 in the EPA Soil Screening Guidance and the VF equation in Section 3.1.2.1 of Appendix A.	Appendix A
OEHHA–5	Page 2 Comment 5	*Construction and maintenance workers are assumed to be exposed to vapors from soil and soil vapor. These pathways may also be complete for*	For residential exposure to soil vapor the most sensitive pathway is the vapor intrusion pathway which is addressed through the indoor air evaluation for each property and the soil vapor	Section 6 and 7.

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		onsite residents, who would have a greater exposure, resulting in lower SSCGs.	SSCGs presented in the revised report. Potential outdoor air exposures to vapors from soil is incorporated into the soil SSCG calculation. In addition, the community outdoor air sampling program demonstrated air concentrations within the Site boundary are not significantly different from concentrations from areas to the east (generally downwind) and west (generally upwind) of the Site. Consequently, soil vapor to outdoor air screening levels were developed for the soil vapor to outdoor air pathway for residential exposures. These points were added to the revised text in Section 6 and 7.	
OEHHA–6	Page 2 Comment 6	*In order to fully evaluate background arsenic and PAHs, reviewers need to see site-wide arsenic & PAH data.*	Understood. The approach to evaluate background arsenic and PAH data are presented in Appendix A. The full evaluation and site-wide data will be presented in the forthcoming HHRA (which will be submitted with the RAP). Both arsenic and PAHs have been retained as COCs for the SSCG report. No edits to the report will be made in response to this comment.	No change to report
OEHHA–7	Page 2 Comment 7	*Page 27 states that the Site-Specific Clean-Up Goals (SSCGs) will be compared to the 95 percent upper confidence limit (UCL_{95}) for each property.* *a. OEHHA agrees that this is appropriate for risk-based SSCGs.* *b. However, OEHHA does not agree that this is appropriate for background-*	Agreed. The OEHHA-7 comments are consistent with our recommended approach and these points are clarified in in Appendix A where the background comparison approach is presented. The intent was to compare an upper-bound estimate such as the data maximum to the background UTL value.	Appendix A

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		based SSCGs if the Southern California UTL (the upper confidence limit on the 95th percentile) is used, for the following reason: *i. A person exposed to general Southern California soil arsenic would be exposed mostly to soils with less than 12 mg/kg arsenic, with less than 5% of samples equal to or greater than 12 mg/kg.* *ii. However, a person exposed to soils on a property with a UCL_{95} soil arsenic concentration of 12 mg/kg would be exposed to soils with arsenic concentrations above and below 12 mg/kg. This person's exposure would exceed the general Southern California background exposure.* *c. An upper-end statistic like a UTL of a maximum would be a more reasonable basis for comparison.*		
OEHHA–8	Page 2 Comment 8	*The site-wide average and UCL_{95} concentrations of the compounds of concern are not useful metrics for assessing exposure to the residents on the 285 individual lots. This site-wide approach could mask localized problem areas: the UCL on the mean for the entire site could be below risk-based*	Agreed. Site-wide average and UCL concentrations have not been proposed to evaluate exposure to the residents and will not be included in the evaluation for the residential receptors in the forthcoming HHRA. No edits to the report will be made in response to this comment.	No change to report

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		thresholds despite risk and hazard estimates for some individual properties exceeding risk-based thresholds.		
OEHHA–9	Page 2 Comment 9	*OEHHA supports assessment of exposure and risk over the area to which individuals are likely to be exposed. Each resident is exposed primarily to the soil on his or her individual lot and to the air in and around and his or her house. That means assessing exposure for each parcel separately.*	Agreed. The forthcoming HHRA will consider exposure over the area to which individuals are likely to be exposed. No changes to the SSCG Report are required to address this point, but the HHRA will follow this recommendation.	No change to report
OEHHA–10	Page 2 Comment 10	*Parcel-specific risks may be calculated based on the UCL_{95} for that parcel; however, if there are insufficient samples from a given parcel to calculate a UCL, the exposure and risk calculations should be based on the maximum detected concentration in a particular medium on that parcel.*	Agreed. The forthcoming HHRA will include parcel-specific risks calculated using the 95UCL for that parcel provided that sufficient data to calculate the UCL are available, or using the maximum concentration if a 95UCL is not able to be calculated.. The HHRA will include a description of the data necessary to calculate a 95UCL. Calculation of the 95UCL is not within the scope of the Revised SSCG Report. No edits to the report will be made in response to this comment.	No change to report
OEHHA–11	Page 3 Comment 11	*The statement (page 29) that soil vapor samples collected at depth are not considered in the residential receptor analysis needs further explanation.*	Because the most sensitive exposure to residential receptors is by the vapor intrusion pathway, the sub-slab soil vapor data are more relevant to address potential exposures than deeper soil vapor results. This is consistent with the DTSC vapor intrusion guidance (see the bottom of page 4 of the DTSC guidance). This point is clarified in	Section 7.1

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			Section 7.	
OEHHA–12	Page 3 Comment 12	*OEHHA calculated risks and hazards corresponding to selected SSCGs using standard exposure equations for workers and residents. The resulting risk and hazard estimates were 1 x 10^{-6} and the resulting hazard estimates were 1 or less.*	Comment noted. This is consistent with the approach described in the SSCG report. No edits to the report will be made in response to this comment.	No change to report
OEHHA–13	Page 3 Comment 13	*SSCGs must be evaluated in the context of how they will be used. OEHHA supports the summation of chemical-specific risks and hazards to estimate cumulative risks and hazards (as proposed on page 27).*	Agreed. This is consistent with the approach described in the SSCG report. No edits to the report will be made in response to this comment.	No change to report
OEHHA–14	Page 3 Comment 14	*No SSCGS are provided for VOCs in soil gas.*	SSCGs were provided in the SSCG Report for soil vapor and construction worker exposure. Based on the RWQCB comments, the Revised SSCG Report includes SSCGs for VOCs in soil vapor for the vapor intrusion pathway,	Section 7 and Appendix A
OEHHA–15	Page 3 Comment 15	*Table B-1 gives concentrations of various VOCs used in the regression analysis. For non-detects, the minimum analytical reporting limit was used in the analysis. These values differ from the detection limits cited in the individual property reports. Please explain the use of the minimum analytical reporting limits.*	The analytical laboratories reported estimated values that were less than the reporting limit, but greater than the detection limit (i.e., J-flagged results) for indoor air samples and soil vapor results for naphthalene. Consequently, when the laboratory reports a non-detected result for these analyses, the concentration is less than the detection limit. A note is added to the data summary tables in Appendix B to explain this point.	Appendix B
OEHHA–16	Page 3	*As more paired indoor/sub-slab data are generated, the regression analysis*	The regression analysis has been updated to include data collected through Aug. 31, 2013. Results from	Appendix B

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	Comment 16	*should be expanded to include these data. Since co-variation could limit the effect of removing one variable on r^2, OEHHA suggests single regression in addition to the multiple regression method used.*	over 380 indoor air sampling events are now included in the regression analysis. The updated vapor intrusion analysis includes a single regression analysis to assess the dependence of empirical attenuation factor on sub-slab soil vapor concentration.	
OEHHA–17	Page 3 Comment 17	*Paired indoor/sub-slab data for various VOCs can be used to estimate site-specific attenuation factors (SSAFs). If supported by adequate data, these SSAFs may provide an alternative to the generic assumed AF of 0.01.*	Paired indoor/sub-slab data have been further evaluated to estimate an upper-bound site-specific attenuation factor for corrective action decision making. This additional analysis is included in Appendix B of the Revised SSCG Report.	Appendix B
OEHHA–18	Page 3 Comment 18	*The separation of soil vapor and indoor air into separate sections seems unnecessary and results in redundancy.*	Agreed. Discussion of soil vapor and indoor air have been combined into a single section in the Revised SSCG Report.	Section 7
OEHHA–19	Page 3 Comment 19	*Table A9 presents risk-based clean-up goals; Table 12 presents background-based clean-up goals. A table of final clean-up goals with a column showing whether they were risk-based or background-based would improve transparency.*	Agreed. The final cleanup goal table has prepared and identifies if the SSCG is background or risk-based.	Table 9-2
OEHHA–20	Page 3 Comment 20	*The first three sentences in the second full paragraph on page 24 deal with COCs. The next three sentences discuss sampling strategies, and do*	Agreed. A paragraph break is inserted at the suggested location.	Section 6

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		not belong in the same paragraph.		
OEHHA–21	Page 3 Comment 21	*The statement that metals that are below CHHSLs are not considered site-related defies logic. Site-related chemicals can be present at concentrations less than CHHSLs.*	Noted. The text has been revised to remove reference that metals below CHHSLs are not considered site-related.	Edit on page 14, first full paragraph under Section 2.1.4.
OEHHA–22	Page 3 Comment 22	*The second full paragraph on page 26 deals with background metals except for the last sentence. The latter does not belong in that paragraph and its presence there could be confusing.*	The intent was to be clear that a background analysis for lead would not be conducted. The last sentence has been modified to provide this clarification.	Edit on page 43, second paragraph.
OEHHA–23	Page 3 Comment 23	*In the same paragraph, the phrase "will be used", implying that the work will be done in the future, is confusing, since it appears that this selection is complete.*	The Revised SSCG Report presents the preliminary list of COCs for evaluation in the RAP. The forthcoming HHRA will provide the final analysis following the approached presented in Appendix A. No edits to the report will be made in response to this comment.	No change to report
OEHHA–24	Page 4 Comment 24	*Table 7 is titled "Site-specific cleanup goals for soil", but these do not appear to be final clean-up goals since some of them are below background.*	Agreed. Similar to our response to comment OEHHA-19, a table of final SSCGs is included in the Revised SSCG Report (Table 9-2) that provides a final list of SSCGs and distinguish the basis for the SSCG.	Table 9-2
OEHHA–25	Page 4 Comment 25	*In the first sentence in section 7, "prevent" should probably be "limit".*	Agreed. As discussed in our response to comment OEHHA-18, the indoor air section is combined with the soil vapor section. The description of the RAOs for indoor air, uses the word “limit” rather than “prevent”.	Section 7
OEHHA–26	Page 4	*In the following paragraph, "impacts"*	Agreed. The use of the word “vapors” is clearer in	Section 7.1.1.2

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	Comment 26	*should probably be "vapors" (3x).*	these instances.	
OEHHA–27	Page 4 Conclusions -First Bullet	*Please reconsider whether residents could be exposed to soils in the 2-10 foot depth horizon more than 4 days per year. This could be following major renovation projects such as pool installation or underground utility work involving redistribution of soils and/or in the course of gardening, planting, etc.*	As discussed in the response to OEHHA Comment #3, it is unlikely that soils from a deeper excavation (such as during a major renovation or utility repair work) would be placed on site due to the developed nature of the neighborhood and lack of area to place excavated soils. The conceptual model for this assumption includes institutional controls (e.g., requirement for a permit for excavation) to prevent redistribution of deep soils at the surface. Clarification of this point has been added to the soils sections (Section 6) and the Screening FS section (Section 9.0).	Section 6 and Section 9
OEHHA–28	Page 4 Conclusions -Second Bullet	*A Table showing final SSCGs and whether each is health-based or background-based would improve transparency.*	Agreed. A table showing the final SSCGs and the basis for the SSCG is included in the Revised SSCG Report.	Table 9-2
OEHHA–29	Page 4 Conclusions -Third Bullet	*OEHHA questions the appropriateness of comparing background-based SSCGs to the 95 percent upper confidence limit (UCL_{95}) for each property. In order to fully evaluate background arsenic and PAHs, reviewers need to see site-wide arsenic & PAH data.*	Agreed. These comments are consistent with our recommended approach and this is clarified in Appendix A where the background comparison approach is presented. The intent is to compare an upper-bound estimate such as the data maximum to the background UTL value. The approach to evaluate arsenic and PAH data is presented in Appendix A. The full evaluation and site-wide data will be presented in the forthcoming HHRA. Both arsenic and PAHs have been retained as COCs for the Revised SSCG Report.	Appendix A
OEHHA–30	Page 4	*Please consider evaluating the*	Additional detail regarding the outdoor vapor	Section 7

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	Conclusions -Fourth Bullet	*outdoor vapor inhalation pathway for residents or explain the exclusion of this pathway.*	inhalation pathway to residents based on the outdoor air study is added to Section 7 (Soil Vapor, Indoor Air, and Outdoor Air). For potential residential exposures to soil vapor, the vapor intrusion pathway is considered the most sensitive pathway and SSCGs have been derived for this pathway in the revised report. Also, note that the risk-based soil cleanup goals consider potential outdoor air inhalation exposures (i.e., the VF is used to evaluate potential migration from soil to outdoor air).	
OEHHA–31	Page 4 Conclusions -Fifth Bullet	*OEHHA supports assessing exposure and risk over the area to which individuals are likely to be exposed. This is typically the UCL_{95} for each property, but if there are not enough samples from a given parcel to calculate a UCL, the exposure and risk calculations should be based on the maximum detected concentration in a particular medium on that parcel.*	The forthcoming HHRA will include parcel-specific risks calculated using the 95UCL for that parcel provided that sufficient data to calculate the UCL are available. The HHRA will include a description of the data necessary to calculate a 95UCL. Calculation of the 95UCL is not within the scope of the Revised SSCG Report. No edits to the report will be made in response to this comment.	No changes to report
OEHHA–32	Page 4 Conclusions -Sixth Bullet	*OEHHA supports the summation of chemical-specific risks and hazards to estimate cumulative risks and hazards. The implication of cumulative risks and/or hazards that exceed target levels needs to be considered.*	Agreed. This is consistent with the approach described in the SSCG report. No edits to the report will be made in response to this comment.	No changes to report
OEHHA–33	Page 4 Conclusions -Seventh Bullet	*The communication issues noted above should be addressed by providing additional information and/or correcting the text as indicated.*	Agreed. The SSCG report has been revised in response to the OEHHA comments.	

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C.P. Lai, LARWQCB, Memorandum dated August 14, 2013				
Regional Board Staff –1	Page 1 Comment 1	*To assess the vapor intrusion pathway at the former Kast property, the spatial distribution of concentrations of sub-slab soil vapor, indoor air, and outdoor air respectively for benzene, ethylbenzene, naphthalene and toluene were analyzed by staff using 2012 data and presented in Figure 1 through Figure 4. It can be seen from these Figures that at some of the parcels the concentrations of sub-slab soil vapor are higher than those of indoor air and outdoor air as shown in Table 1 as well. The maximum measured concentrations of petroleum hydrocarbons vary from 1200 to 15 in different petroleum compounds at sub-slab layer, 91 to 4.4 at indoor layer, and then 22 to 1.6 at outdoor layer. Similarly for mean measured concentrations of petroleum hydrocarbons at different layers, they vary from 13.08 to 2.48 at sub-slab layer, 8.44 to 0.53 at indoor layer, and then 3.36 to 0.22 at outdoor layer. It is obvious that high concentrations of these compounds disperse and transport from sub-slab soil to indoor air, and then outdoor air. These physical pathways demonstrate that the indoor air concentrations above indoor*	We understand and agree that the average concentrations in sub-slab soil vapor are higher than average indoor air concentrations which are higher than average outdoor air concentrations, but while these factors are consistent with a complete vapor intrusion pathway, a comparison of these relative concentrations alone cannot be used to conclude that the vapor intrusion pathway is complete. Due to the wide-spread indoor background sources of VOCs identified at the site (e.g., chemicals in indoor air due to household product use), a similar relationship between these concentrations would be seen even when the vapor intrusion pathway is not complete. If background contributions of these VOCs are considered, it cannot be concluded that "high concentrations of these compounds disperse and transport from sub-slab soil to indoor air, and then outdoor air". Indoor air concentrations measured at the site are indistinguishable from background concentrations. This point has been made in the residential Interim Follow-up and Final Interim reports for homes where air sampling was conducted. The vapor intrusion evaluation (Appendix B) has been updated with additional data collected since the SSCG report was submitted. The updated	Section 7.1 and Appendix B

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		screening levels at some of the parcels appear to be from the sub-slab soil vapor, which is the result of vapor intrusion.	vapor intrusion evaluation supports the conclusions presented in the SSCG report.	
Regional Board Staff –2	Page 1 Comment 2	*The concentrations of sub-slab and indoor air vary both spatially and temporally as indicated above* [Comment Lai-1]. *As such, the linear regression analysis used by Geosyntech* [sic] *to evaluate the direct relationship between indoor air concentrations and sub-slab soil vapor concentrations would be insignificant. As shown in the statistical results obtained by Geosyntech* [sic] *using dataset in 2012, it indicated that there is no statistically significant relationship between the sub-slab soil vapor and indoor air concentrations for petroleum hydrocarbons. As mentioned above, staff does not completely agree with this conclusion because of the inconsistency with spatial distribution of field data as discussed in item 1* [Comment Lai-1] *above.*	We agree that there is spatial and temporal variability in the sub-slab soil vapor and indoor air data. This is why the statistical analysis compares concentrations collected at the same property and sampling date. The Regional Board Staff comment clarifies why it is not appropriate to make conclusions regarding the vapor intrusion pathway for the site based on a comparison of average sub-slab soil vapor and indoor air concentration for the Site. The vapor intrusion evaluation (Appendix B) has been updated with additional data collected since the SSCG report was submitted. The updated vapor intrusion evaluation supports the conclusions presented in the SSCG report.	Section 7.1 and Appendix B
Regional Board Staff–3	Pages 1-2 Comment 3	*Staff also found that there exists a significant relationship between vapor attenuation factor and sub-slab soil vapor concentration for petroleum hydrocarbon compounds (PHCs). Vapor attenuation factor is defined as*	The basis for the statement that there exists a significant relationship between vapor attenuation factor and sub-slab soil vapor concentrations is not supported by the data analysis included in the memorandum.	Section 7.1 and Appendix B

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		the ratio of the indoor air concentration to the subsurface vapor concentration, which is a measurement of the overall dilution that occurs as vapors migrate from a subsurface source into a building. These relationships in log-log scale are presented in Figure 5 through Figure 8. The probability distributions of vapor attenuation factor for these PHCs are also shown in Figure 9 through Figure 12. It can be seen that when vapor attenuation factor screening level is set to be 0.01 to 0.5, the indoor air concentrations have strong relationship with sub-slab soil vapor concentrations for PHCs at some of the parcels. In addition, the relationships in log-normal scale are presented in Figure 13 through Figure 16. It can be seen that a constant-valued attenuation factor (the horizontal portion of the line in Figure 13 through 16) is observed at high sub-slab soil concentrations. At smaller sub-slab soil concentrations, the background contribution to indoor air concentrations becomes larger than the subsurface contribution, which manifests as a plateau in indoor air concentrations and imposes an upward	• The vapor attenuation factor correlation plots in Figures 5 through 8 show an inverse relationship between the attenuation factor and sub-slab soil vapor concentrations (as indicated by the correlation lines shown in these figures). As discussed in the USEPA white paper on the development of empirical vapor intrusion attenuation factors (USEPA, 2012c), a decreasing trend in attenuation factors as a function of sub-slab soil gas concentrations is an indication that indoor air concentrations are biased by background sources. • Figures 13 through 16 indicate attenuation factors at higher concentrations are approaching an asymptotic limit; however, the data are insufficient to suggest that this asymptote has been reached. • The conclusion appears to be based on a few data points (3 for benzene, 3 for ethylbenzene, and 1 for toluene). The data for naphthalene are not supportive of this conclusion, because the data presented in Figure 11 indicates that all the naphthalene data are log-normally distributed with no outliers (i.e., all indistinguishable from background).. It is not clear how Regional Board staff have concluded that "when vapor attenuation factor screening level is set to be 0.01 to 0.5, the indoor air concentrations have a strong relationship to sub-slab soil vapor concentrations for PHCs at some of	

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		bias in the attenuation factor. These analyses demonstrate that attenuation factors representing vapor intrusion are observed when indoor air concentrations are greater than background indoor air levels (i.e. not contributed by sub-slab concentrations) and/or when sub-slab soil concentrations are high.	the parcels." While there are a handful of samples with high sub-slab soil vapor concentrations that indicate an attenuation factor of 0.01 to 0.5, data are not provided in the report to indicated that these points have a strong relationship to indoor air. No examples are provided in the comment letter to support this statement and the vapor intrusion attenuation factor vs sub-slab soil vapor correlation plots cannot be used to support this conclusion. We agree that at small sub-slab soil vapor concentrations, the background contribution to indoor air is much larger than potential subsurface contribution. And that it is more appropriate to examine data collected with high sub-slab soil vapor concentrations. However, the data set included in the SSCG report was insufficient to examine trends for high sub-slab soil vapor concentrations. The vapor intrusion evaluation (Appendix B) has been updated with additional data collected since the SSCG report was submitted. The revised vapor intrusion evaluation specifically discusses the empirical attenuation factors for data pairs with elevated sub-slab soil vapor concentrations. Many of the points discussed in the Regional Board Staff comments are included in this updated evaluation. Through August 31, 2013, 387 concomitant indoor	

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			air and sub-slab soil vapor sampling events have been conducted at the Site. Over 11,000 data pairs where constituents were detected in sub-slab soil vapor and indoor air (during the same sampling event) are available for the vapor intrusion analysis. The Revised SSCG Report includes an analysis similar to the evaluation conducted by Dr. Lai, but uses a larger data set than what was previously available. This analysis is used to calculate a conservative upper-bound attenuation factor that may be used to calculate sol vapor SSCGs. The updated evaluation notes, however, that the estimated attenuation factor is biased high due to background sources (similar to what is indicated in the Regional Board Staff comment).	
Regional Board Staff –4	Page 2 Last Paragraph	*In summary, these results including the spatial distribution of concentrations and the relationships between attenuation factor and sub-slab concentration support the line of evidence for vapor intrusion in the Kast Property.*	The analysis conducted by Regional Board staff did not adequately consider background contributions to indoor air measurements. As described in DTSC and USEPA guidance documents, consideration of background is an important component of the vapor intrusion pathway analysis. The vapor intrusion evaluation (Appendix B) has been updated with additional data collected since the SSCG report was submitted. The revised vapor intrusion evaluation specifically discusses the empirical attenuation factors for data pairs with elevated sub-slab soil vapor concentrations. The updated vapor intrusion evaluation supports the conclusions presented in the SSCG report.	Section 7.1 and Appendix B

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UCLA Expert Panel, Memo dated July 24, 2013				
Expert–1	Page 3 Background Relevant to Application of the Technical Review Principles -Third Paragraph	*However, it is not clear whether 1) the HHSREs are now considered to constituent* [sic] *the "full" human health risk assessment, as the Expert Panel is hearing from Regional Board staff, or 2) whether a "full" human health risk assessment is scheduled for release in the future, as is stated in the SSCG report: "A full Human Health Risk Assessment (HHRA) incorporating the SSCGs proposed in this report will be conducted to further evaluate potential health risks once the site characterization work is complete. The HHRA will be used to guide final response action for impacted media at the Site and will likely be included in the Remediation Action Plan" (Site-Specific Cleanup Goal Report, Feb, 2013, page ES-1). The Expert Panel has concerns with either scenario 1) or 2).* *<u>Concerns with Either Scenario:</u>* *1) The HHSRE does not follow the guidelines of a standard human health risk assessment.* *2) Alternatively, the utility of developing this document after the execution and release of the SSCG is potentially problematic for key decision*	The HHSREs are intended to identify if interim measures are warranted and will not be used to develop the RAP. A “full” human health risk assessment (HHRA) will be completed and included with the RAP. Comment acknowledged. No changes to the SSCG report were made in response to this comment.	No changes to report

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		makers at the Water Board. Typically, a human risk assessment should inform cleanup goals rather than be released after the cleanup goals are determined.		
Expert–2	Page 5 Sub-slab soil vapor and residential air quality -First to Fifth Paragraphs	*The most consequential decision is whether to accept, reject, or request modifications to the Geosyntec analysis of the relationship, (or lack thereof), between chemical-specific sub-slab soil vapor concentrations and residential indoor air monitoring.* • *Any determination that there is a relationship between sub-slab soil vapor and indoor air will have a direct and profound impact on all risk estimates and cleanup calculations, i.e., there will be a definite increase in risk estimates and a concomitant lowering (more stringent) of chemical-specific cleanup levels as pathway additivity will clearly change the calculations.* <u>*Concern:*</u> *The statistical analysis done to determine whether there is sub-slab to indoor air VOC (volatile organic compound) transfer, although impressive in the volume of data used, is flawed because it ignores spatial and temporal factors. It would be much more valuable if it was done for each*	The statistical analysis does not ignore temporal and spatial variability, but considered indoor air and sub-slab soil vapor data collected at the same property and same sampling date. This approach was used to address the spatial and temporal variability in the data. For example indoor air data are only compared to sub-slab, garage air, and outdoor air data collected at the same residential property at during the same sampling event. We agree that it would be inappropriate to compare sub-slab soil vapor, indoor air, outdoor air, and garage air data collected at different properties or on different sample dates. The efforts to address temporal and spatial variability is discussed in Appendix B. The "high" levels of PCE in sub-slab soil vapor referenced in the Expert Panel comment are: 24436 Panama – 9.6 $\mu g/m^3$ 24617 Marbella – 39 $\mu g/m^3$ 24737 Marbella - 33 $\mu g/m^3$ 24737 Marbella - 21 $\mu g/m^3$ As discussed in the vapor intrusion evaluation (Appendix B), these concentrations should not be	Section 7, Appendix B.

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		individual home, rather than for the aggregate; mixing data from various time periods can also distort the results. *However, a review of the sub-slab concentrations compared to the indoor air concentrations for each of the VOCs indicates that: (1) the 10-12 homes with elevated levels of a given VOC in the sub-slab soil vapors do not have elevated levels of that VOC in indoor air; (2) the few homes with elevated levels of a given VOC in indoor air have low levels of the same VOC in sub-slab vapors; (3) higher levels of indoor benzene or toluene concentrations correlate well with high levels of garage benzene or toluene concentrations, suggesting that this is the more likely source of benzene or toluene in these homes. The only apparent exceptions (from a preliminary analysis) were high levels of PCE in sub-slab soil vapor and indoors for 24436 Panama Ave, 24617 Marbella Ave and 24737 Marbella Ave.* *In light of the assertions by Everett and Associates that the input data in the statistical analysis is incomplete (as depicted in Everett's letter in Page 9), it may be necessary to review the results with a higher level of scrutiny.*	considered "high" and a threshold of 100 $\mu g/m^3$ is recommended as a more reasonable value to characterize "elevated": sub-slab soil vapor concentrations. The vapor intrusion evaluation (Appendix B) has been updated with additional data collected since the SSCG report was submitted. The revised vapor intrusion evaluation specifically discusses the empirical attenuation factors for data pairs with elevated sub-slab soil vapor concentrations. The updated vapor intrusion evaluation supports the conclusions presented in the SSCG report. Based on Regional Board comments, numerical soil vapor SSCGs for the vapor intrusion pathway are presented in the Revised SSCG Report.	

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Expert–3	Pages 5-6 Consistency in chemical of concern selection between the SSCG and HHSRE -First to Fifth Paragraphs	*The absolute number of potential chemicals of concern (COCs) retained matters as the more carcinogens that are retained, mathematically the more it will drive back calculated cleanup levels as carcinogens are considered to be additive.* • *It matters if there are 10 versus 30 carcinogenic and/or non-carcinogenic compound selected.* *<u>Concern:</u>* *DTSC guidance typically advises that compounds retained if there is a "hit" regardless of whether there are otherwise numerous non-detects for the same compound. This procedure was followed for the HHSRE; however, a different process was utilized in the SSCG.* *The SSCG excluded certain detects based on overall frequency of detection. In risk assessment practice there is a screening argument that is often made for dropping compounds based on level of non-detects versus a single detect.* *In terms of transparency the different COC selection methodology across reports should be highlighted AND the impact of this decision further characterized (sensitivity).*	The HHSRE methodology was developed to provide a conservative screening of data to determine if interim actions were warranted at the Site. For the SSCG report, the methodology for the full HHRA analysis is presented which incorporated a COC selection process based on a conservative risk-based screen and comparison to background. For the frequency of detection screen chemicals detected in 5 or less soil samples were excluded. Given the large dataset (over 10,000 samples) for soil, this screening step is less than 0.05 percent and was considered conservative and an indication that the chemical is not a COC. A frequency of detection screen was not used for soil vapor data. While fewer COCs were selected for SSCG derivation (as compared to the number of chemicals screened in the HHSREs) because of the low concentrations relative to the risk-based screening levels and very low frequency of detection of excluded chemicals using that screening criterion, the overall impact on the risk characterization for the site is estimated to be low. This point will be discussed in the uncertainty section of the forthcoming HHRA. The final SSCG values were not adjusted by number of chemicals included in the SSCG derivation process therefore there is no impact on the value calculated. Also please see response to Comment Expert-4 below.	No changes to report

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		Consistency of methodology is critical for regulators and decision-makers. • *The calculated media-specific SSCG values would mathematically change (become more stringent) if the COC process used in the HHSRE was utilized.*	No change has been made in response to this comment.	
Expert–4	Page 6 General and Specific Analysis, Calculation of SSCG without considering additivity of risk and hazards -First and Second Paragraphs	*HHRA Note 4 (Page 12) states "Risk must be summed across all carcinogenic chemicals and exposure pathways (including vapor intrusion to indoor air evaluated separately from comparison to RSLs). Similarly, hazard quotients must be summed across all chemicals and exposure pathways (including vapor intrusion to indoor air evaluated separately from comparison to RSLs) for threshold (non-carcinogenic) effects to provide a hazard index. ... If the summed hazard index for the site is greater than one, then the hazard index may be recalculated for chemicals which have the same toxic manifestation or which affect the same target organ."* *<u>Concern:</u>* *The number of both carcinogenic and non-carcinogenic chemicals is greater than 10 for both site-wide and residential-specific COCs. While the*	When the forthcoming HHRA is conducted cumulative risks and hazards will be calculated and corrective actions will be based on the SSCGs presented in this report and the cumulative HHRA results. As discussed in the previous comment the impact of excluding chemicals based on low concentrations relative to risk-based screening levels and a very low frequency of detection will be addressed in the uncertainty section of the HHRA. The concern mentioned in the comment is understood; however, we believe dividing the SSCGs by the number of COCs to calculate a lower value to address cumulative risk issues is overly conservative and assumes that the chemicals are equally distributed. For most sites there are a subset of chemicals that contribute the majority to risk and hazard. Rather than assume a certain distribution of risk and hazard among chemicals ahead of time, the site data will be evaluated in the HHRA to identify the final COCs. In addition as	No changes to report

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		SSCG uses 10^{-6} as the target risk and 1.0 for threshold hazard index, as the number of COCs becomes >10, the mathematical impact results in an overall risk greater than 10^{-5} and hazard risk well over 1. The SSCG does take additivity partially into account by multiply [sic] *any target or threshold by 0.1 but again there are more than 10 COCs. Most states including California typically use 10^{-5} as a carcinogenic target. While cumulative and/or individual risks can be at the 10^{-4} level this is not typical and may not be agreeable to either regulators or Water Board decision makers.*	presented in the RAOs section, the forthcoming HHRA will address cumulative risk. No change has been made in response to this comment.	
Expert–5	Page 6-7 Calculation of SSCG without considering additivity of risk and hazards, SSCGs for soils -First and Second Paragraphs	*The analysis provide* [sic] *for the development of SSCGs for soils in general follows reasonable methods and assumptions. Yet several issues deserve attention.* <u>*Concerns/Issues:*</u> *One important point is the SSCGs were developed for each COC independently, but there may be several COCs at any one location that exceed the SSCGs, and even though they may all be remediated to the SSCGs, when added up them may still exceed the one in a million or HQ =1 target levels; adequate measures*	Please see responses to Comments RWQCB 15, OEHHA-4 and Expert-4 Cumulative risks will be evaluated in the HHRA and considered in the RAP. The investigations conducted at the site have been extensive and included samples collected in areas of higher soil concentrations. Based on the site conceptual model and the age of potential petroleum releases at the Site, the potential for VOCs to volatilize from Site soils are expected to decrease through time. Crude oil present in the vadose zone has been subject to weathering	No changes to report

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		need to be in place to avoid this situation. The 0-2 ft bgs levels (EF = 350 days/yr) seem adequate for protecting residents, including children, to exposure of site soils. There is a bit more concern with the 2-10 ft bgs (EF = 4 days/yr) levels which are two orders of magnitude higher in general, due to the low exposure frequency (EF) expected. While it is valid to assume a very low exposure frequency, these higher levels in soils may under certain circumstances be a source of sub-slab soil vapors that could slowly leak into the subsurface soils (0-2 ft below gruond [sic] *surface or bgs) and under exceptional circumstances into homes. It may also be a concern for construction workers, although this has been addressed (Table 8). In fact, the difference between the subsurface levels (0-2 ft bgs) for residents and the 0-10 ft bgs SSCGs of VOCs for construction workers is so small, that it makes sense to use the SSCGs for VOCs from the subsurface levels throughout the entire first ten feet bgs.*	conditions over a period of more than 45-years. It is expected that VOC concentrations in soils will be further reduced over time and that conditions will not change that will cause soil vapors to migrate into areas where they have not been detected during this investigation. As has been noted soil SSCGs have been developed considering volatilization from soil for construction workers. In addition soil vapor SSCGs have been developed for construction workers which more directly addressed the potential for VOCs present in the vadose zone to volatilize. As discussed in Section 6 of the report, it is anticipated that potential exposures to construction workers in deeper soils (e.g.>2 feet bgs) will be addressed through a soil management plan. No change has been made in response to this comment.	
Expert–6	Page 7 Calculation of SSCG without considering	*It has been suggested that the 95 UCL be used as the criterion to use for each property. The PRPs should realize that a greater number of soils samples will*	The 95UCL calculation methodology includes steps to address to the condition if there are two few samples to calculate a 95UCL (the maximum value is used). When the forthcoming HHRA is	No changes to report

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	additivity of risk and hazards, SSCGs for soils -Third Paragraph	*be needed to determine a 95 UCL, given the large variability in COC concentrations in a given property. In addition, when there are some clear hot spots above the 95 UCL, a more thorough investigation is warranted to make sure that a site with high levels of contamination in some small hot spots is not classified as not requiring remediation because the hot spot is combined with data from cleaner soils.*	conducted, the data will be reviewed to determine if much higher concentrations are present that may need to be addressed. If samples are present at much higher concentrations, these will be identified for consideration in the RAP. No change has been made in response to this comment.	
Expert–7	Page 7 Calculation of SSCG without considering additivity of risk and hazards, SSCGs for soils -Fourth Paragraph	*In addition, given the tolerance in SSCGs (e.g. not requiring cleanup to TPH = 100 mg/kg), it may make sense to request that the PRPs set up a trust fund that would be available in the future (next 20-25 yers* [sic]*) for (1) long term monitoring of COCs in indoor air and sub-slab soil vapors (once a year in key locations which have tested high in the past, plus a few random additional locations); (2) providing adequate protection to construction workers and nearby residents in the case that excavation below 2 ft bgs is needed for an extended period (e.g. 5 days or more); (3) engineering controls for methane in sub-surface as needed.*	These issues will be addressed in the forthcoming RAP.	No changes to report
Expert–8	Pages 7-8 Sensitivity	*As the COC selection results in 26 different carcinogens (12 Site COCs)*	As discussed earlier, we believe dividing the SSCGs by the number of COCs to calculate a lower	No changes to report

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	-First to Second Paragraphs	*and 34 non-carcinogens (15 Site COCs) the SSCG can be calculated based on the target risk or acceptable hazard quotient divided by the number of COC that make up that risk/hazard.* *<u>Concern/Issue:</u>* *The sensitivity (impact) of this change should and can be easily shown for Board decision makers.*	value to address cumulative risk issues is overly conservative and assumes that the chemicals are equally distributed. For most sites there are a subset of chemicals that contribute the majority to risk and hazard. Rather than assume a certain distribution of risk and hazard among chemicals ahead of time, the site data will be evaluated in the HHRA to identify the final COCs. In addition as presented in the RAOs section, the HHRA will address cumulative risk. No change has been made in response to this comment.	
Expert–9	Page 8 Consistency and objectivity of screening levels -First to Third Paragraphs	*Screening levels developed in the HHSRE (Human Health Screening Evaluation Work Plan; Geosyntec 2009] are stated (pg 3) to be "consistent with" Cal-EPA-OEHHA and USEPA RSL." Geosyntech* [sic] *writes that COC screening was conducted using risk-based screening levels (RBSLs) that were calculated assuming potential residential exposures to COC in soil and soil vapor as part of the HHSRE process and presented in the approved HHSRE Work Plan (Geosyntec 2009) and that the screening criteria is 1/10 of the RBSLs regardless whether of Cancer (C) or Non Cancer (NC). Geosyntech also describes the*		

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		background screen for both metals and carcinogenic PAHs (known as "cPAH"). • *Objectivity- It is unclear at this stage of the review whether the DTSC list of cPAHs was analyzed versus the shorter OEHHA cPAH list, i.e., DTSC includes several PAHs as "carcinogenic" that are not typically considered as cPAHs by USEPA or OEHHA.* *<u>Concerns:</u>* *1. Cal-EPA January 2005 (Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, page 6) indicates that standard "Superfund" algorithms are used for unrestricted land use scenario. HHRA Note 3 (version August 2012 updated May 2013, see Summary page 1) indicates that the EPA RSLs are appropriate risk based screening levels unless the analyte is listed on one of the accompanying tables then the RSL on the table should be used.*	The PAHs were analyzed by USEPA Method 8270 and USEPA Method 8270SIM and included the carcinogenic PAHs (cPAHs) that are commonly considered in the B(a)P-eq calculation as presented in the CalEPA DTSC background PAH methodology document (CalEPA DTSC, 2009) as well as other PAHs that are considered carcinogenic. The list of PAHs assumed to be a part of the cPAHs and B(aP)-eq evaluation are discussed in the text of Appendix A. Because the CalEPA toxicity values may be different than those published by USEPA, Risk-Based Screening Levels were derived in the HHSE Work Plan for use in the HHSRE for each property. These values were derived using algorithms consistent with USEPA and CalEPA guidance. The methodology was presented in the HHSE Work Plan and approved by CalEPA OEHHA for use at the Site. This has been included in the Revised SSCG Report text.	Appendix A.
Expert–10	Page 8 Consistency and objectivity of screening levels	*EPA RSL equations were not used* [sic] *as mutagenic effects were not included in the RBSL calculations (determined using verification calculations and the provided spreadsheets). While HHRA*	CalEPA currently does not have explicit guidance on including mutagenic effects in risk calculations. However for TCE, CalEPA has more recently requested that mutagenic effects be considered for this chemical on a project-specific basis.	Appendix A

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	-Concerns 1a	*Note 3 (Page 4) indicates that in 2008 the RSLs did include this effect, it is unclear whether Cal-EPA fully implements the uncertainty factors as the corresponding equations have not be* [sic] *referenced in the Cal-EPA documents review to date. This would impact the PAH RBSLs which are calculated using Cal-EPA toxicity values.*	Therefore, the adjustment was incorporated into the revise SSCG for TCE. The methodology for deriving the RBSL for B(a)P was updated to include the revised CalEPA toxicity value and was discussed with CalEPA OEHHA. The revised methodology and RBSL were presented in the Addendum to the HHSE Work Plan (HHSE Work Plan Addendum) dated December 17, 2010 (Geosyntec, 2010b), which was approved by the LARWQCB January 12, 2011.	
Expert–11	Pages 8-9 Consistency and objectivity of screening levels -Concerns 1b	*PEF Calculation: In the HHSRE (Table 3), the F(x) is specific for Los Angeles so the resulting PEF is 1.2E+11 m^3/kg. However, in SSCG Report, Appendix A, page 5, the F(x) is noted to be the default from USEPA 2002 (Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites) but the mean wind speed is specific for Los Angeles, so the change results in a PEF of 2.8E+9 m^3/kg. This is two orders of magnitude more conservative, so this may have been a requested change, as USEPA 2002 does not specify that the default be used. USEPA 1996 (Soil Screening Guidance: Technical Background Document) actually provides the Los Angeles specific number for F(x) per Cowherd 1985, as recommend* [sic] *in USEPA 2002. (Note the 2009 HHSRE Work*	The PEF calculation for the SSCG should have incorporated the Los Angeles F(x) term. The Revised SSCG Report has been revised accordingly.	Appendix A

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		Plan did include the Los Angeles F(x) but all later versions of the PEF calculation did not). *While the inhalation dose from particulates is typically very small relative to the incidental ingestion making this variance insignificant (in of itself), it does demonstrate that RBSLs were modified between the HHSRE and the ones used in the SSCG Report. This would indicate that Geosyntec could have made other updates, especially in the case of toxicity updates or guidance updates between 2009 and 2013. The 2010 HHSRE addendum does demonstrate updates due to toxicity, in this case cPAH.*	Toxicity criteria were reviewed prior to the draft SSCG report preparation. Toxicity criteria have again been revised and updated as appropriate in the Revised SSCG Report.	
Expert–12	Page 9 Consistency and objectivity of screening levels -Concerns 1c	*Does not appear that for analytes listed on the HHRA Note 3 Table 1 that the table's soil screening values were used but instead the corresponding Cal-EPA toxicity values from the on-line screening calculator with the exception of the cPAH which used the corresponding TEQ of the Cal-EPA 2010 BaP toxicity value. This is appropriate but as there were no modifications to the exposure parameters or to the equations with the exception of that discussed above in 1a (mutagenic effects)* [Comment Expert-	The RBSLs were used in lieu of published screening criteria as they had been previously reviewed and approved by CalEPA OEHHA for use at the Site. No change has been made in response to this comment.	No changes to report

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		10] *and 1b (PEF which is insignificant)* [Comment Expert-11], *it is unclear why the residential soil RBSLs from USEPA RSLs and the Cal-EPA HHRA Note 3 Table 1 were calculated versus using the published screening concentrations.*		
Expert–13	Page 9 Consistency and objectivity of screening levels -Concerns 2	*HHRA Note 4 (Page 3) dated June 2011 supports the above concerns with the following statement: "As discussed in HHRA Note 3, for the majority of the 706 listed chemicals with RSLs, HERO recommends use of the soil and tap water values listed in the Spring 2010 U.S. EPA RSL table. However some values listed in the U.S. EPA RSL table differ significantly (greater than four-fold) than values calculated using Cal/EPA toxicity criteria and risk assessment procedures. HERO has prepared a reference table for soil and tap water RSLs which indicate contaminants for which: 1) the 2004 EPA Region 9 PRG should be used; 2) the 2004 EPA Region 9 'Cal-modified' PRG should be used; or 3) the Cal/EPA California Human Health Screening Level (CHHSL) should be used."*	The DTSC Human And Ecological Risk Division (HERO) notes along with OEHHA and other CalEPA and USEPA guidance documents were considered in developing the risk assessment approach. The final approach used in the RBSL derivation was reviewed and approved by OEHHA in the HHSE Work Plan as they are the lead agency for the site risk assessment. Since the RBSLs were previously reviewed and approved by a CalEPA agency it was thought they were most appropriate to use for screening at this Site. No change has been made in response to this comment.	No changes to report
Expert–14	Page 9 Consistency and objectivity of	*HHRA Note 4 (Page 9) also indicated that RBSLs used should be annotated as they "do not consider physical*	SSCGs for the residential infrequent exposure scenario and construction worker scenario may be higher than Csat, Residual Concentration (Cres) or	Table 6-1, 9-2 and Appendix A

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	screening levels -Concerns 3	*limitations such as soil saturation and some RSLs exceed the "ceiling limit" concentration of $1x10^{+5}$ mg/kg. Soil RSLs that exceed Csat are denoted as "s." Soil RSLs exceeding $1x10^{+5}$ mg/kg are denoted as "m", meaning that the chemical represents more than 10% by weight of the soil sample. At such concentrations, the assumptions for soil contact used to derive the RSLs may no longer be valid. Cases in which the chemicals are present at concentrations exceeding $1x10^{+5}$ mg/kg or Csat need to be identified and addressed in the risk assessment." This was not done.*	$1x10^{+5}$ mg/kg and are noted in the tables as appropriate. For soil leaching to groundwater the value derived for TPH-motor oil was higher than the residential concentration so the SSCG is assumed to be the Cres value and is noted that way in Table 6-3 and 9-2.	
Expert–15	Page 10 Consistency and objectivity of screening levels -Concerns 4	*HHRA Note 4 (Page 12) "In general, HERO recommends that all detected compounds be selected as COPCs and be included in the quantitative risk evaluation. ... Potential chemical breakdown products must also be considered, and the rationale should not be based on a "bright line" approach (e.g. preliminary cancer risk <1E-07, preliminary HQ<0.1). As detailed above, inorganics which are determined to be present at concentrations consistent with background will still need to be included in the total risk and hazard evaluation."*	The screening approach used in the SSCG report to select COCs is considered appropriate for this site and has been used at other large sites in California. Even after the screening, 40 or more chemicals were retained for SSCG derivation. The uncertainty associated with the COC screening approach will be addressed in the forthcoming HHRA along with the uncertainty associated with excluding metals concentrations that are consistent with background. No change has been made in response to this comment.	No changes to report

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
Expert–16	Page 10 Consistency and objectivity of screening levels -Concerns 5	*RBSLs do not appear to have been updated from the HHSRE (Geosyntec 2009, Table 10) using the more recent Cal-EPA guidance, though small input parameters are indicated (see 1b* [Comment Expert-11]*) to have been different. Earlier Cal-EPA (2005) guidance set the default sub-slab soil vapor to indoor air attenuation factor as 0.01 mg/m^3 to mg/m^3; whereas current guidance Cal-EPA [2011b, Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance)] recommends the attenuation factor of 0.05 mg/m^3 to mg/ m^3. Reviewing the COC selection for Soil Vapor and multiply* [sic] *the screening concentration by 0.2 for the correction, an additional four COC would be selected (styrene and vinyl acetate from non-sub-slab samples and 1,2-dichlorobenzene and cis-l,2-dichloroethene from sub-slab samples). Additionally bromomethane, already selected from sub-slab samples would be selected in the non-sub-slab samples. One would assume only styrene would be classified as a Site COC.*	Based on the vapor intrusion analysis conducted for the Site, the sub-slab soil vapor RBSLs are appropriate screening levels. There is no need to utilize a screening sub-slab attenuation factor of 0.05 when the data indicates a screening attenuation factor of 0.01 is conservative and that the site-specific attenuation factor is less than 0.001 as presented in Section 7 and Appendix B. No changes to the report are proposed in response to this comment.	No changes to report
Expert–17	Page 10	*While the vapor intrusion pathway used* [sic] *for the derivation of the RBSL for*	Comment noted. Pursuant to comments received by the LARWQCB, soil vapor SSCGs are presented in	

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
	Consistency and objectivity of screening levels -Concerns 5	*soil vapor, these SSCGs for soil vapor were calculated for the Utility Worker scenario for all COCs. If the vapor intrusion into the residential structure is believed to be an incomplete pathway (as per Appendix B of the SSCG Report), the RBSLs for soil vapor could be calculated using an industrial air RSL and the soil vapor attenuation for trench/utility workers in order to possibly reduce the number of soil vapor SSCGs.*	this Revised SSCG Report for the vapor intrusion pathway. Therefore, the use of RBSLs based on the vapor intrusion pathway are considered appropriate for residential land use and conservative for the worker exposure scenario as noted in the comment.	
Expert–18	Page 10 Definition of Surface Soil -First and Second paragraph	*HHRA Note 4 (Page 10) states "For evaluation of future residential land use scenarios, soil samples from the 0 to 10 foot (ft) below ground surface (bgs) interval should be collected. While recommended soil sampling depths may vary based on site-specific conditions; in general, discrete soil samples should be collected from both surface (0 to 0.5 ft bgs) and subsurface soil."* <u>*Concerns:*</u> *While the data collection appears to have following this sampling* [sic] *the depth of surface soil was extended to 2 feet. This is considered reasonable given the potential for gardening as referenced in the text. However the data were not presented by depth in any of*	Soil data were presented for different depth intervals (0-2 ft and 0-10 ft) in the interim reports. To facilitate review of the Revised SSCG Report, statistical summaries of soil data for depth intervals of 0-2 ft bgs, >2-5 ft bgs, >5-10 ft bgs and > 10 feet bgs are included in Section 4 (Constituents of Concern and Remedial Action Objectives) Table 4-1.	Table 4-1

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		the documents reviewed, especially in the SSCG document.		
Expert–19	Page 10 Multiple SSCGs for subsurface soil -First to Second paragraphs	*SSCGs were calculated for both residential and construction/utility worker exposure to subsurface soils (Tables 7 and 8, respectively). However, the SSCGs for construction and utility maintenance worker exposures ... will be applied to soils from 0-10 feet bgs" (page 48).* *<u>Concerns:</u>* *Due to the exposure calculation using the child exposure factors in the residential exposure scenario, the SSCGs for the subsurface soils are more conservative for the residential subsurface exposure than the construction/utility worker. Why then was the worker-based SSCGs selected for the subsurface soils?*	SSCGs for construction and utility maintenance workers were calculated for areas where exposure to residents is not expected (e.g., soils within city streets) as well as for residential properties where utility line repair may be needed. The Site Conceptual Model (Section 2) is revised to clarify that residential exposures are assumed only for the residential properties and that both the infrequent residential SSCGs and construction worker SSCGs should be met for deeper soils on residential properties.	Section 2.3
Expert–20	Page 10 Use of cPAH -First to Second paragraphs	*In some cases, benzo(a)pyrene (BaP)-equivalent concentrations are calculated and used in screening-level risk evaluations to assess risk from carcinogenic PAHs.... If the BaP-equivalent concentration is calculated, the OEHHA potency equivalency factors (PEFs) should be used (OEHHA 2002). See Table 1."* [sic]	The calculation methodology for the benzo(a)pyrene equivalents presented in the SSCG report uses the OEHHA potency equivalency factors for PAHs. The calculation of the benzo(a)pyrene equivalents are described in greater detail in Appendix A. The PEFs used and reference to OEHHA guidance are included in Appendix A.	Appendix A

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		Concern: *Document references use of cPAH, especially for background characterization, but the data tables do not show that the cPAH were calculated and background concentration was used only for BaP. Since the maximum BaP concentration was greater than background cPAH, the point becomes moot but should be considered as it makes the argument weak.*		
Expert–21	Pages 11-12 Lead -First to Fourth paragraphs	*Use of the Adult Lead Model (ALM) for the intermittent exposures to subsurface soils is inaccurate due to the lack of steady state scenario.* *Concern:* *Lead SSCG is not accurate for subsurface soil. USEPA (1994, 2003a, 2003b) recommends a minimum frequency of one day per week and duration of three consecutive months. For most of the construction/utility worker populations, this assumption is not met within the neighborhood or Site. Given the half-life of lead in blood is 30 days, the lead levels in the blood will not reach steady state but will probably be at least partly flushed from the blood prior to the next exposure. The current biokinetic models are not appropriate to*	In response to this comment, the use of the ALM and the exposure assumptions for the infrequent residential and construction worker exposure scenarios were reviewed. The lead SSCGs have been revised to incorporate USEPAs recommendations from *USEPA's 2003b guidance Assessing Intermittent or Variable Exposures at Lead Sites* and supporting documentation for the ALM including that a minimum exposure frequency and exposure duration of 1 day per week for 3 months be used to account for the model's steady-state assumption. For the residential exposure scenario it was assumed that an adult resident would be the most likely individual to contact deeper soils while conducting activities such as planting a tree. Therefore the time-weighted average approach was not used.	Section 6, Table 6-1, Table 9-2, Appendix A

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		evaluate non-steady-state exposures to lead and may underestimate the peak blood concentrations following short-term transient exposure. *USEPA's 2003b guidance ASSESSING INTERMITTENT OR VARIABLE EXPOSURES AT LEAD SITES addresses how "to use the IEUBK model and ALM to assess a wider variety of exposure scenarios, including exposure from more than one location, varying intensities of exposure, track-in of soil from another location, and intermittent air exposures." Given the subsurface exposure is described by Geosyntec as the potential of the resident (child and adult) to come in contact with subsurface soil 4 times per year, the USEPA guidance would recommend using the time-weighted average to evaluate the child exposure. USEPA guidance (2003b) considers three (3) months "to be the minimum exposure to produce a quasi-steady-state PbB concentration. The reliability of the models for predicting PbB concentrations for exposure durations shorter than 3 months has not been assessed." This document for the ALM recommends using the shortest averaging time of the exposure, for*		

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		example the exposure could be per week or 90 days. *While the utility worker exposure is not over the full exposure period, the weighted media concentration will not be annualized across the year, even though the models will assume the exposure occurs over a year. The TRW recommends not annualizing the weighted concentrations even though some of the lead burden accumulated during the exposure season will be eliminated during the intervening months between seasonal exposures. However, neither the IEUBK nor the ALM can simulate this loss of lead, so model predictions correspond to a full year of exposure to a constant exposure level regardless of the actual exposure period. The seasonal exposure can occur successively over years or for only one year. Since the model cannot predict the wash out period (no exposure), the resulting risk assessment is probably over-estimating the resulting risk.*		
Expert–22	Page 12 Recap of the technical review -First Paragraph	*If the point of the entire risk assessment exercise is to provide a clear road map for regulators, Water Board decision makers and the public stakeholders* [sic] *then there are critical issues that should*	The SSCG report has been revised to make the approach more transparent and explain a consistent and objective analysis. However, this is a technical report and must transmit and explain technical concepts. The Executive Summary contains a	See Executive Summary

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		be more clearly addressed. Critical stakeholders should be able to more clearly follow a transparent, consistent and objective analysis that includes an analysis of the sensitivity of key assumptions and technical decisions.	simplified summary of the Revised SSCG Report. Additional discussion of key assumptions is included in Appendices A and B. See also response to Comment RWQCB -1.	
Expert–23	Page 12 GW Plume Delineation -First Paragraph	*The extent of the plumes (different plumes for different COCs) is not explicitly determined in the information provided.*	Details of the distribution of key COCs in groundwater have been added to the Revised SSCG Report. Maps showing the distributions of benzene, TCE, and PCE in groundwater are included as Appendix E.	Section 8, Appendix E
Expert–24	Pages 12-13 GW Plume Delineation -First Paragraph	*In addition, the plume delineation analysis should establish the rate of migration of the various COCs, to better understand the risk to neighboring properties and wells. A gradient is provided, as well as soil types (sands) for the aquifers, but there should be some evaluation of adsorption (retardation), biodegradation and other processes that will support the assertion that the plumes are stable and will eventually be decreasing, not just a statistical analysis (MAROS) of benzene (one COC).*	Benzene is considered the primary COC of concern. A publicly available and widely used software, Bioscreen, was utilized to estimate potential attenuation of benzene concentrations in the future. Evaluation of TCE and PCE plume migration was not conducted given the uncertainties regarding distribution and source upgradient of the Site. Please see additional discussion of the source of TCE/PCE in the response to Comment RWQCB-2.	Section 8.3.2, Appendix C
Expert–25	Page 13 GW Plume Delineation -First Paragraph	*At present not all locations indicate stable or decreasing; some are increasing and many had "no trend" which means there is insufficient information to state they are stable or*	Comment noted. The benzene plume is likely to be stable based not only on modeling, but also on: • Continued monitoring showing consistently low concentrations (ND to several ug/L) in the downgradient wells.	Section 8.3.2, Appendix C, Section 9.0

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		decreasing. Stable could be the norm for decades given the levels of TPH and the presence of LNAPLs. While in most cases the concentrations are not very high, there are a few locations where the concentrations of some COCs is [sic] *many times above the MCL. The proposed SSCG of maintaining a stable or decreasing plume would require more monitoring. Given the significant amount of TPH in the overlying soils (Figure 10B in Plume Delineation Report indicates a very thick zone contaminated with petroleum derived compounds, at depth (8-40 ft bgs)), it is likely that the petroleum derived COC plumes will last for decades, with a significant monitoring cost to the PRPs. These can also be a continuous source of soil vapors to the sub-slab region. While there is not sufficient evidence to indicate that there is much migration of COC vapors from sub-slab to indoor air (see below), it will remain a concern that needs to be monitored for decades.*	• The age of the source (in excess of ~45 years). Recently completed modeling described in Section 8.3.2 and Appendix C (Bioscreen) indicates that if targeted hotspot remediation is conducted (such as targeted groundwater remediation of hot spots(e.g. >100x MCL), SVE remediation of elevated benzene concentrations in the vadose zone, and LNAPL remediation), benzene levels may decrease to MCLs in ~100years.	
Expert–26	Page 13 CVOC sources -First Paragraph	*There are CVOCs (chlorinated VOCs, alledgedly* [sic] *from off-site activities) at relatively high concentrations in MW-01, which is not downgradient of Turco. May be from former OTC. However, many CVOCs found in sub-*	See response to Comment RWQCB-2.	Section 2.1, 8.3.1

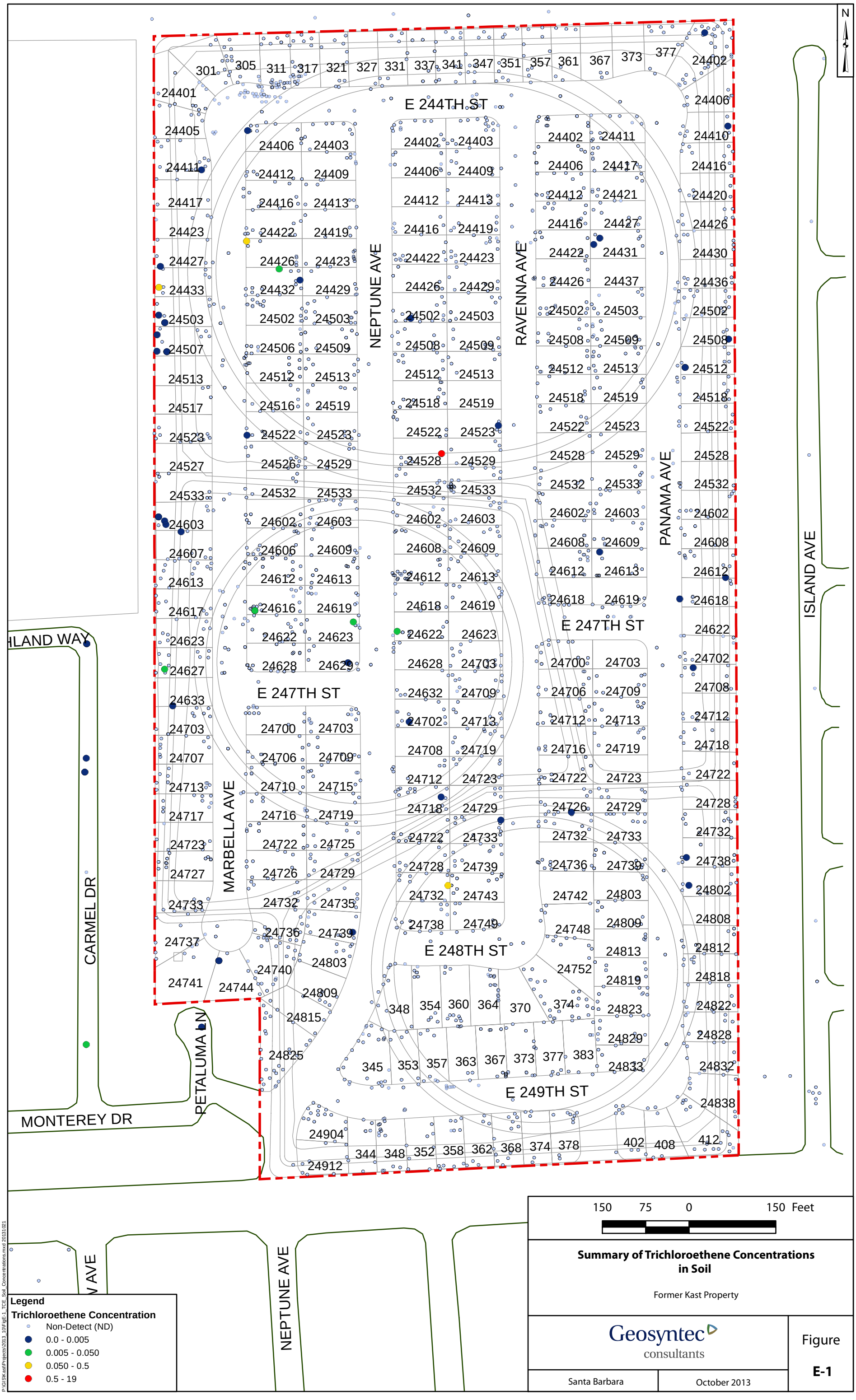
Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		slab soil samples at concentrations that appear to be too high for volatilization from groundwater 53 feet below (Bellflower aquifer). Figures 15A & B, 16 A & B (Plume Delineation Report) provide some sense of PCE & TCE contamination at shallow depths, which is difficult to explain as a result of GW transport from Turco or OTC. If these vapors are in equilibrium (or near equilibrium) with the soils in the shallow area, the concentrations in the soils are significant. As indicated by the SSCG report, one would not expect transport from off-site to on-site to be significant due to adsorption, dilution, biodegradation and other fate and transport processes. It is possible that cleaning of machinery and other operations on-site resulted in release of these CVOCs on-site. This cannot be ruled out.		
Expert–27	Page 13 CVOC sources -Second Paragraph	*Lack of maps for CVOCs hinder ability to better understand their distribution and thus sources and risks. There is an emphasis on only considering petroleum-based COCs, even though data is available for many other COCs. Most of the CVOC data is only presented in tables and not considered in some of the analyses, which is not*	See response to Comment RWQCB-2. SSCGs are presented for all COCs regardless of whether they are Site-related or not. CVOCs will be addressed in the RAP. Maps illustrating the distribution of PCE and TCE in groundwater have been added to the report	Section 2.1.2 Section 8.3.1 Appendix E. Section 9.4

Comment No.	Regulatory Comment Page Number and Section	Regulatory Comments	Response	Revised Section(s)
		helpful for determining risk, regardless of PRP. They are considered as part of the SSCGs, and must be considered in the remedial action plan.	(Appendix. E)	
Expert–28	Pages 13-14 Cleanup Goals and the "Maximal benefit" Criteria -First Paragraph	*State Water Board Resolution 92-49 governs the Regional Board in requiring responsible parties to remediate the site to levels that will result in meeting all water quality standards and are "consistent with maximum benefit to the people of the state." The current SSCG remains consistent with this so long as it seeks to enable unrestricted land use of the parcels and is consistent with, and preserves, the previous level of residential land use and the value derived there from subject to it being economically and technically feasible. Whether it achieves these standards depends, in part, upon addressing the concerns raised above in the technical review of the SSCG and HHSRE.*	See response to Comment RWQCB-1	Analysis of the technological and economic feasibility of proposed SSCGs presented in Section 9.0

Geosyntec consultants

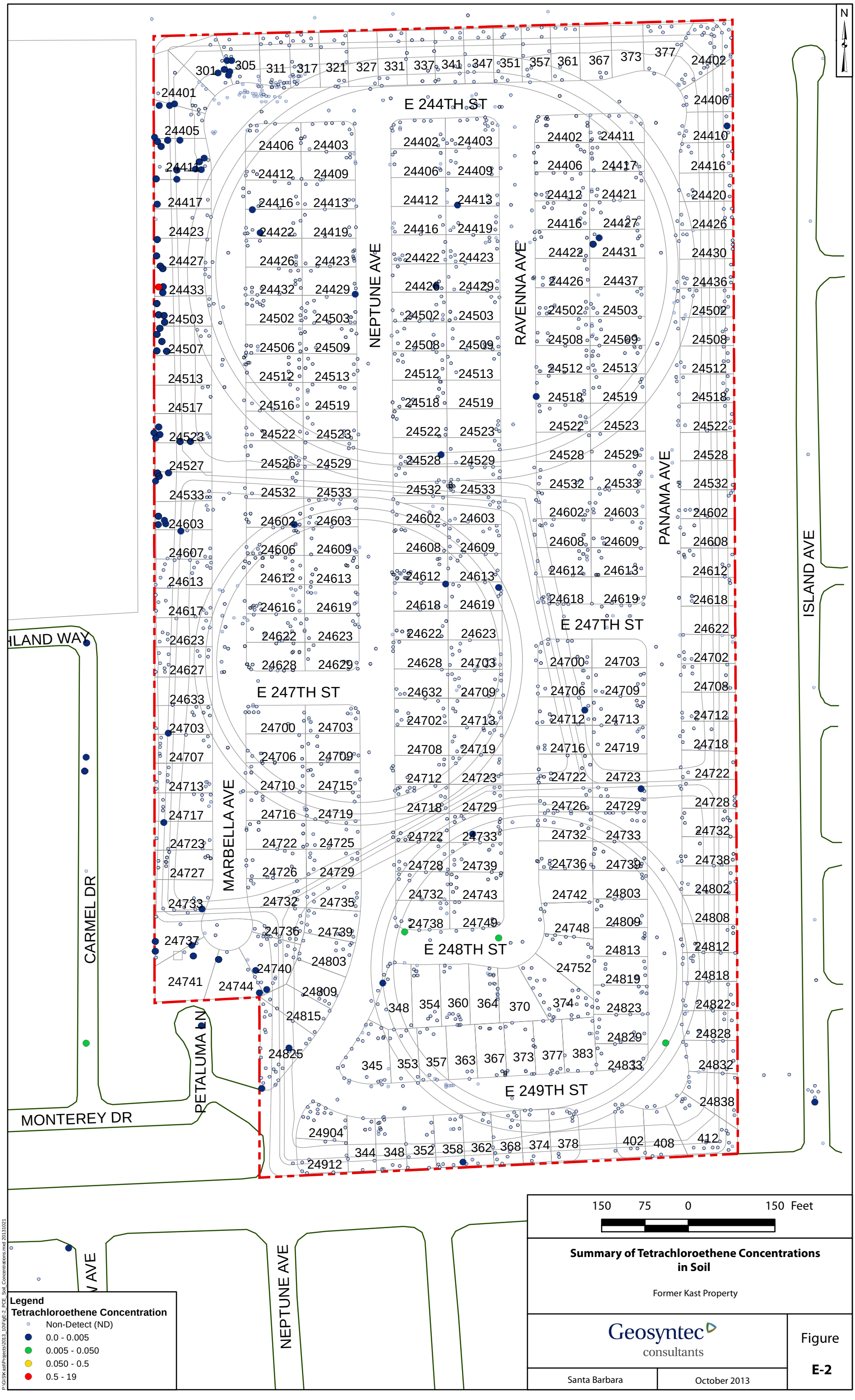
APPENDIX E

DISTRIBUTION OF SELECTED VOLATILE ORGANIC COMPOUNDS IN ON-SITE AND OFF-SITE AREAS (SOIL AND GROUNDWATER)



Summary of Trichloroethene Concentrations in Soil

Former Kast Property



Summary of Tetrachloroethene Concentrations in Soil

Former Kast Property

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EXPLANATION

Benzene Concentration (ug/L)

- Not Detected
- 0.1-10
- 10.1-100
- 100.1-500
- 500.1-1,000
- 1,000.1-3,000
- >3,000
- Not Sampled due to the presence of LNAPL
- Approximate Groundwater Flow Direction

Notes:
1) Groundwater monitoring wells with labels starting with "T" are approximate locations of Former Turco Facility wells. Wells starting with "F" are approximate locations of Former Fletcher Oil wells. Wells starting with "K" are Former KAST Property wells.
2) Concentration units are micrograms per Liter (ug/L)

URS

OCTOBER 2012
BENZENE CONCENTRATIONS
DETECTED IN SHALLOW GROUNDWATER

Proj. No.: 49194397	Date: September 5, 2013
Project: Former KAST Property	Figure: E-3

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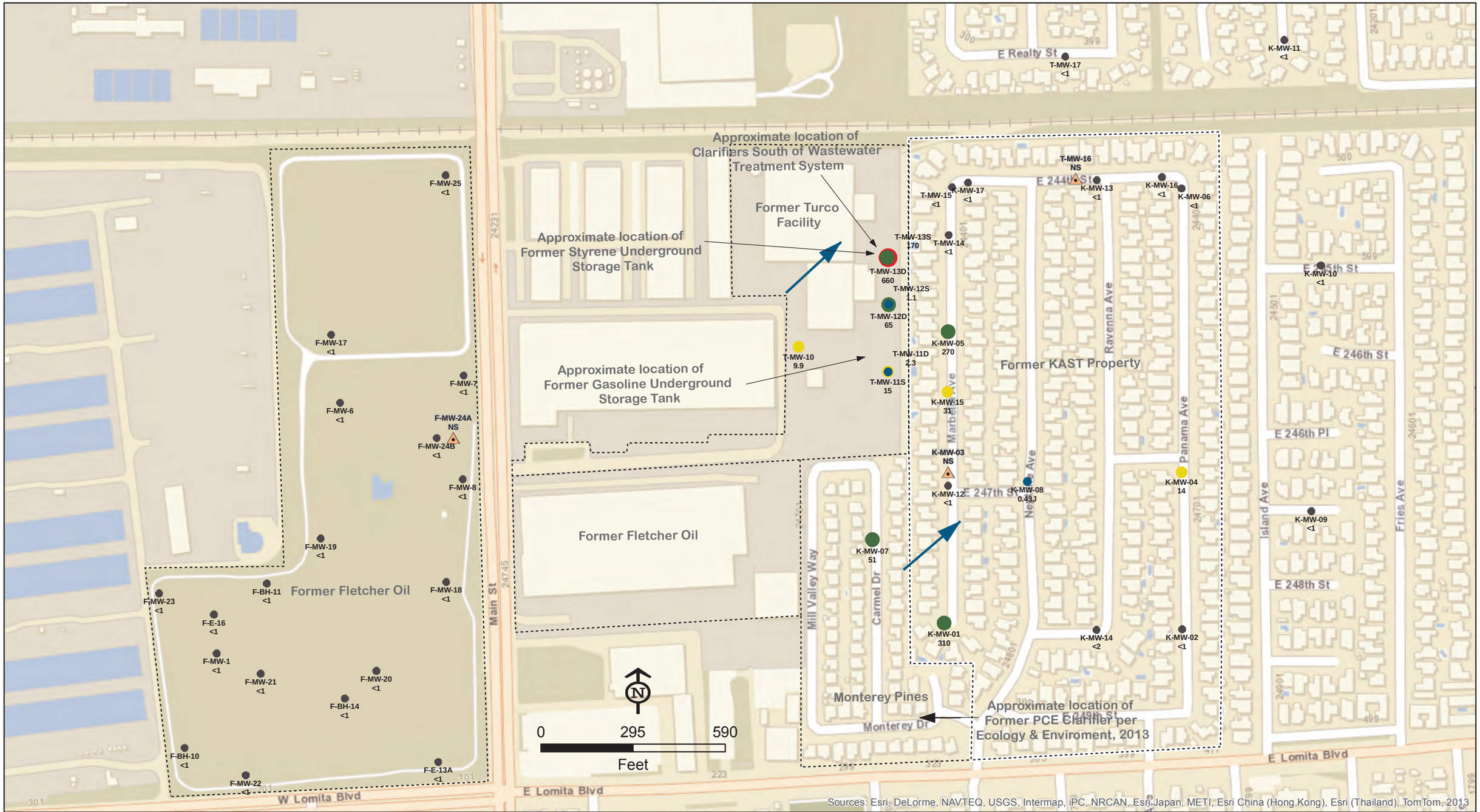

EXPLANATION

Trichloroethene Concentration (ug/L)

- ND
- 0.1 - 5.0
- 5.1 - 50
- 50.1 - 500
- > 500
- Not Sampled due to the presence of LNAPL
- Approximate Groundwater Flow Direction

Notes:
1) Groundwater monitoring wells with labels starting with "T" are approximate locations of Former Turco Facility wells. Wells starting with "F" are approximate locations of Former Fletcher Oil wells. Wells starting with "K" are Former KAST Property wells.
2) Concentration units are micrograms per Liter (ug/L)

URS

OCTOBER 2012
TRICHLOROETHENE CONCENTRATIONS DETECTED IN SHALLOW GROUNDWATER

Proj. No.: 49194397	Date: September 5, 2013
Project: Former KAST Property	Figure: E-4

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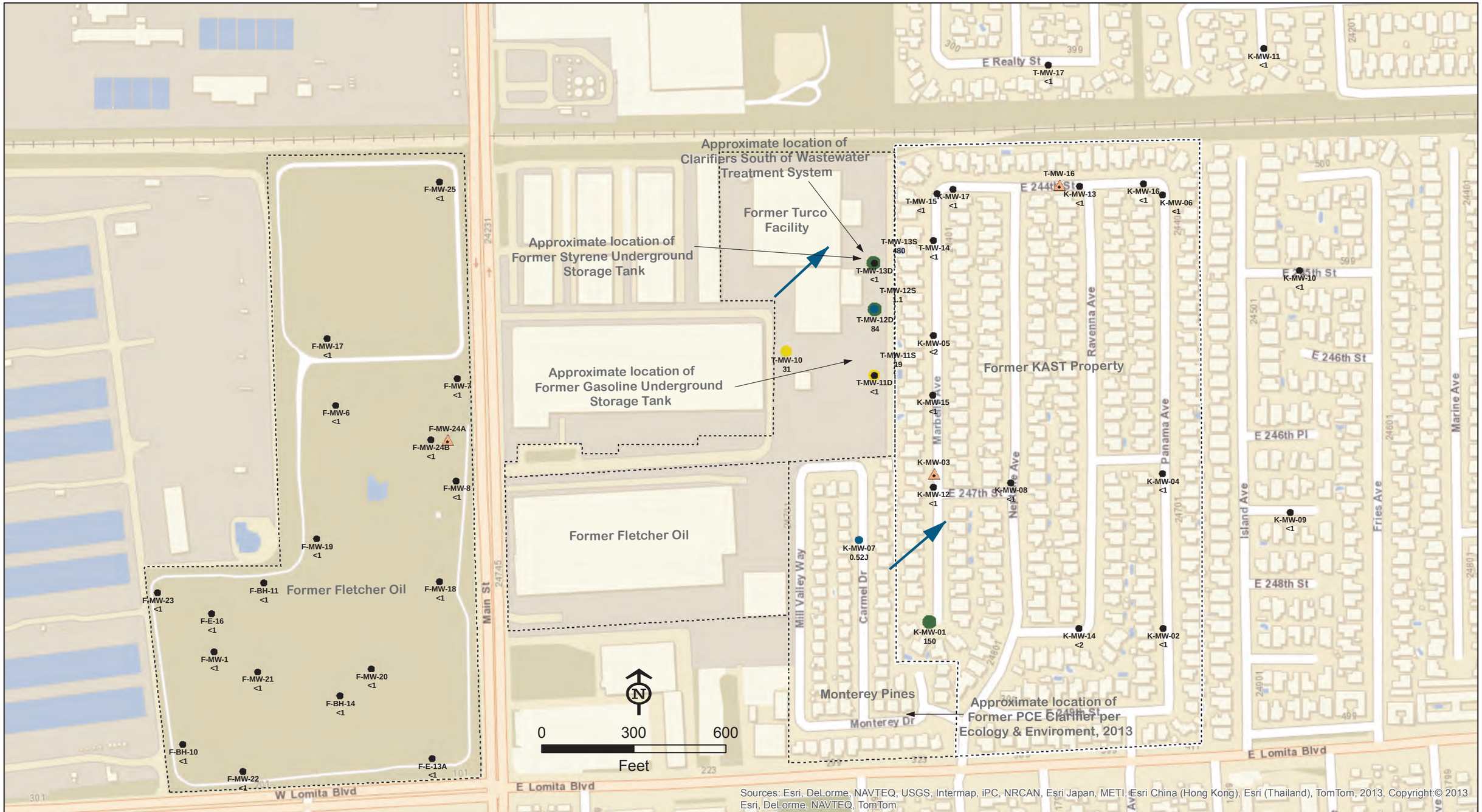

EXPLANATION

Tetrachloroethene Concentration (ug/L)

- ND
- 0.1 - 5
- 5.1 - 50
- 50.1 - 500
- > 500
- Not Sampled due to the presence of LNAPL
- Approximate Groundwater Flow Direction

Notes:
1) Groundwater monitoring wells with labels starting with "T" are approximate locations of Former Turco Facility wells. Wells starting with "F" are approximate locations of Former Fletcher Oil wells. Wells starting with "K" are Former KAST Property wells.
2) Concentration units are micrograms per Liter (ug/L)

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OCTOBER 2012
TETRACHLOROTHENE CONCENTRATIONS DETECTED IN SHALLOW GROUNDWATER

Proj. No.: 49194397	Date: September 5, 2013
Project: Former KAST Property	Figure: E-5

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EXPLANATION

Trichloroethene Concentration (ug/L)

- ND
- 0.1 - 5.0
- 5.1 - 50
- 50.1 - 500
- > 500
- Approximate Groundwater Flow Direction
- Not Sampled due to the presence of LNAPL

NOTES:
1) Groundwater monitoring wells with labels starting with "T" are approximate locations of Former Turco Facility wells. Wells starting with "F" are approximate locations of Former Fletcher Oil wells. Wells starting with "K" are Former KAST Property wells.
2) Concentration units are micrograms per Liter (ug/L)
3) Former Turco wells T-MW-2, T-MW-3, T-MW-4, T-MW-6 and T-MW-7 have been abandoned.

URS

MAXIMUM HISTORICAL TCE CONCENTRATIONS DETECTED IN SHALLOW GROUNDWATER

Proj. No.: 49194397	Date: September 5, 2013
Project: Former KAST Property	Figure: E-6

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Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

EXPLANATION

Tetrachloroethene Concentration (ug/L)

- ND
- 0.1 - 5.0
- 5.1 - 50
- 50.1 - 500
- > 500
- Approximate Groundwater Flow Direction
- Not Sampled due to the presence of LNAPL

NOTES:
1) Groundwater monitoring wells with labels starting with "T" are approximate locations of Former Turco Facility wells. Wells starting with "F" are approximate locations of Former Fletcher Oil wells. Wells starting with "K" are Former KAST Property wells.
2) Concentration units are micrograms per Liter (ug/L)
3) Former Turco wells T-MW-2, T-MW-3, T-MW-4, T-MW-6 and T-MW-7 have been abandoned.

URS

MAXIMUM HISTORICAL PCE CONCENTRATIONS DETECTED IN SHALLOW GROUNDWATER

Proj. No.: 49194397	Date: September 5, 2013
Project: Former KAST Property	Figure: E-7

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