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February 14, 2014

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Mr. Paul Cho, P.G.
California Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, California 90013

Subject: Response to Comments – *Horizontal Biosparge System Construction and Pilot Test Work Plan, SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California*

Dear Mr. Cho:

This letter was prepared by CH2M HILL on behalf of SFPP, L.P. (SFPP), an operating partner of Kinder Morgan Energy Partners, L.P. (KMEP), in response to the Regional Water Quality Control Board, Los Angeles Region (RWQCB) comments (letter dated December 3, 2013) on the *Horizontal Biosparge System Construction and Pilot Test Work Plan, SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California* (CH2M HILL, 2013b; Biosparge System Work Plan). In the Biosparge System Work Plan, KMEP proposed to install two biosparge wells in 2014: one well in the southeastern area and one well in the south-central area. KMEP has since changed their approach and proposes to install one well in the south-central area for pilot testing in 2014. Expansion of the biosparge system to the southeastern area will be evaluated after sufficient pilot test data are collected over a 1-year period.

Response to Comments

The RWQCB requested that KMEP amend the Biosparge System Work Plan to address technical comments by February 15, 2014. Two comments were provided by the RWQCB. KMEP's responses to these comments are provided below.

Comment 1: Comment 1 of the RWQCB's letter stated the following:

No performance metrics were identified for Light Nonaqueous Phase Liquid (LNAPL) mass removal. Performance metrics for the proposed technology assessment should be identified to adequately achieve the objective of the pilot test. Pre-test characterization and post-test analysis using the performance metrics should be conducted to evaluate the performance of LNAPL mass removal in treatment zone by the proposed remedial system. The following performance metrics, but is not limited to, should be considered:

- *Core testing program and soil testing program included core photography (American Society of Testing and Materials [ASTM] D5079), pre fluid saturation (American Petroleum Institute [API] RP40), free product mobility (Modified ASTM D425/API RP40), and soil testing (United States Environmental Protection Agency [EPA] Method 8260B and 8015)*
- *Change in LNAPL mass*
- *Change in mass discharge*

Response 1: KMEP will use existing data collected as part of recent investigations, and will collect additional data at the same locations and depths as the prior investigations to assess the performance of the pilot test at meeting the LNAPL objectives, goals, and performance metrics described in the report titled, *Conceptual Site Model and Proposed Alternate Interim Remedy for Soil, Groundwater, and LNAPL* (LNAPL CSM; CH2M HILL, 2013a). The LNAPL objectives, goals, and performance metrics from this report are summarized in Table 1.

TABLE 1
LNAPL Objectives, Goals, and Performance Metrics from the LNAPL CSM

No.	Item	Concern	Objective	Goal	Performance Metric
1	LNAPL Saturation	LNAPL occurs in wells and above residual saturation at the smear zone	Reduce LNAPL saturation	Recover LNAPL mass with existing TFE wells and reduce LNAPL mass with biosparge system via volatilization	Limited or infrequent LNAPL thickness in wells
2	LNAPL Chemistry Phase	LNAPL is the source of dissolved plume COPCs, which are primarily VOCs (BTEX, TPH, MTBE, TBA)	Change chemistry phase of LNAPL	Remove volatile fraction of LNAPL with horizontal biosparge wells	Dissolved-phase and vapor-phase hydrocarbons do not pose a human health threat without use of active remediation
3	Dissolved Plume	Containment of dissolved plume COPCs (BTEX, TPH, MTBE, TBA)	Hydraulically contain plume and switch to NSZD when concern Nos. 1 and 2 are addressed	Achieve stable or shrinking plume and stable or declining concentrations	Concentrations of dissolved-phase hydrocarbons meet NSZD criteria

Notes:

COPC – chemical of potential concern; VOC – volatile organic compound; BTEX – benzene, toluene, ethylbenzene, and xylenes; TPH – total petroleum hydrocarbons; MTBE – methyl tertiary butyl ether; TBA – tertiary butyl alcohol; NSZD – natural source zone depletion; TFE – total fluids extraction

LNAPL saturation (Item No. 1) and LNAPL chemistry (Item No.2) objectives and goals will be assessed by using the data from the following two prior investigations, repeating the investigations, and then comparing the changes in LNAPL saturation and LNAPL chemistry after the pilot biosparge system has been in operation for 1 year.

- LNAPL Characterization (CH2M HILL, 2012a).** KMEP performed an LNAPL-specific investigation in October 2011 to characterize LNAPL in the uppermost groundwater zone and the top of the Bellflower aquitard in the south-central, southeastern, and southern offsite areas. One of the objectives of this investigation was to evaluate the vertical distribution of LNAPL in the uppermost groundwater zone in the south-central and southeastern areas. In part, this was performed by advancing a cone penetrometer testing/laser-induced fluorescence (CPT/LIF) tool at five locations (CPTLIF-1 through CPTLIF-5) into the top of the Bellflower aquitard to assess lithology and vertical LNAPL distribution. Soil samples from the LNAPL smear zone near the water table also were collected and analyzed at offsite laboratories for chemistry (TPH and VOCs) and fluid

(water and LNAPL) saturation to evaluate LNAPL mobility and recoverability. The LIF data showed that the LNAPL was limited to within a narrow vertical interval near the water table (the smear zone). The fluid saturation data showed that this LNAPL was at or near residual saturations and not mobile. Additional details of this investigation are presented in the report titled, *Results of LNAPL Characterization in Uppermost Groundwater Zone and Top of Bellflower Aquitard* (CH2M HILL, 2012a). Details of this investigation were used for the development of the LNAPL CSM (CH2M HILL, 2013a).

- **Soil Investigation (CH2M HILL, 2012b).** KMEP performed a soil boring investigation in September 2012 to assess the vertical extent of impacted soil in the south-central and southeastern areas. Borings were positioned in known release areas and areas with elevated concentrations of dissolved-phase hydrocarbons. Samples were collected throughout the vadose zone and into the LNAPL smear zone. The soil investigation included the drilling of seven soil borings in the south-central area (SB-1 to SB-7) and two soil borings in the southeastern area (SB-8 and SB-9) to facilitate the collection of discrete-depth soil samples for lithologic logging and laboratory analysis. One additional boring in Holifield Park was advanced to the top of the Bellflower aquitard and converted to a permanent monitoring well (GMW-O-24). Additional details of this investigation are presented in the report titled, *Results of Soil Boring Investigation* (CH2M HILL, 2012b). Details of this investigation were used for development of the LNAPL CSM (CH2M HILL, 2013a).

KMEP believes that sufficient data were collected in the south-central area during the LNAPL characterization and soil investigation to establish “pre-pilot test” conditions. Therefore, no additional site characterization data will be collected before biosparge well construction or pilot testing activities. KMEP is proposing to repeat the data collection protocol that was implemented during these investigations after pilot testing the south-central biosparge well for a period of approximately 1 year. The additional data will serve as “post-pilot test” data to assist with biosparge system performance (mass removal) evaluations. Four CPT/LIF locations and seven soil borings are proposed at co-located areas near the initial four CPT/LIF borings (CPTLIF-1 to CPTLIF-4) and initial seven soil borings (SB-1 to SB-7) in the south-central area, as shown in Figure 1. Figure 2 presents a cross sectional layout of the south-central biosparge well in relation to nearby monitoring and extraction wells, and previous/future CPT/LIF and soil borings. Analytical results from the soil investigation, along with results from the LNAPL characterization, are shown in Figure 3 (Cross Section A-A’). The sampling and analysis program will be consistent with the prior investigations and will include the following elements.

CPT/LIF Field Program

- Collect LNAPL sample from one existing monitoring or extraction well in the south-central area.
- Apply the LNAPL sample to the LIF tool—the ultraviolet optical screening tool (UVOST) by Dakota Technologies, Inc.—to assess the responsiveness of the tool to the site-specific LNAPL, and qualitatively assess the LNAPL type as compared to the library of UVOST responses held by the developer.
- Advance a paired CPT/LIF tool via direct-push at four locations down into the top of the Bellflower aquitard to assess lithology and vertical LNAPL distribution within the

uppermost groundwater zone (three locations at the south-central area and one offsite and south of the south-central area [southern offsite area]).

- Collect grab soil samples at two depths within the LNAPL smear zone at the four CPT/LIF locations based on screening of the LIF responses.
- Analyze the LNAPL sample and eight soil samples at an offsite laboratory for TPH using EPA Method 8015 and VOCs using EPA Method 8260B.
- Photograph the intact soil cores collected across the LNAPL smear zone at the four CPT/LIF locations under white and ultraviolet (UV) light.
- Based on review of LIF data, analytical results, and photographs, select and submit soil core subsamples to an offsite laboratory for pore fluid saturation (PFS) (water and LNAPL) analysis.
- Based on the LIF data and results of the PFS data from the initial soil core subsamples, analyze additional soil core subsamples for free product mobility using centrifuge at three different pressures.

Soil Investigation Field Program

- Using direct-push methods, advance seven soil borings in the south-central area to facilitate the collection of discrete-depth soil samples every 5 feet from 15 feet below ground surface (bgs), to the top of the water table, and into the smear zone (approximately 30 to 40 feet bgs). Similar sample depths will be selected to match the sample depths of the previous investigation.
- At least three subcore samples within each 5-foot soil core will be collected using an EnCore or Terra Core sampling device. One of these three samples will be submitted to the laboratory for chemical analysis based on the sample with the highest field headspace photoionization detector (PID) reading from co-located soil samples. The three EnCore or Terra Core samples will be selected from the intervals that have the highest initial PID readings, or have visual evidence of hydrocarbon staining. If organic vapors are not detected in the field with the PID during the headspace readings, then only one subcore sample within the 5-foot core will be analyzed.
- Analyze the soil samples for TPH using EPA Method 8015 and VOCs using EPA Method 8260B.

After the post-pilot test data collection effort is complete, the data will be compared both qualitatively and statistically to determine biosparge system performance and estimate mass removal rates. Due to the lithologic heterogeneities and resulting variations in LNAPL saturation, it is anticipated that not all LNAPL saturations and soil concentrations measured after the biosparge pilot test will be lower than those measured during the prior investigations. This inherent variation in LNAPL saturation due to lithologic heterogeneities will be evaluated when comparing the two sets of data.

The success of the biosparge pilot test is not contingent upon the degree of mass removal determined from the two data sets. Instead, the degree of mass removal and chemistry phase change will be used to assess the efficiency of the horizontal biosparge system at accomplishing

these goals. Further operation and expansion of the biosparge system would then be designed based on these data and other data collected during the pilot test as described in the Biosparge System Work Plan (CH2M HILL, 2013b).

Dissolved plume and NSZD (Item No. 3; see Table 1) objectives and goals will be assessed by using data collected during the routine groundwater monitoring program, supplemental electron acceptor chemistry data collected during the groundwater monitoring program, and the NSZD testing and monitoring program to be implemented as described in Section 6.3 of the LNAPL CSM (CH2M HILL, 2013a). As described in the LNAPL CSM, NSZD testing and monitoring will be performed to evaluate the potential future use of this technology as a stand-alone remedy once the concerns for Item Nos. 1 and 2 are addressed with the fully implemented biosparge system. This NSZD testing and monitoring will include the following, as described in the Biosparge System Work Plan:

- **Groundwater Zone Testing.** Collection of groundwater samples from key monitoring wells located upgradient and downgradient of the plume center in the south-central area. Samples also will be collected from wells located in the plume center and plume edge. Samples will be analyzed for VOCs, TPH-gasoline (TPH-g), TPH-diesel (TPH-d), and electron acceptor chemistry (biodegradation indicator parameters) including dissolved oxygen, nitrate, sulfate, iron, alkalinity, and others. The frequency of monitoring will be annual or potentially semiannual, and will likely occur during routine semiannual sampling at the site.
- **Vadose Zone Testing.** Installation and collection of soil vapor samples from multidepth soil vapor monitoring probes completed to the top of the water table at or near the source area (for example, within the plume core, upgradient, or downgradient). Multiple screen intervals will be required in order to establish the soil gas profiles necessary to evaluate biodegradation rates in the vadose zone. Soil vapor samples will be analyzed for VOCs using EPA Method 8260 or TO-15, TPH-g using EPA Method TO-3, and fixed gases (carbon dioxide, oxygen, and methane) using ASTM D1946.

Comment 2: Comment 2 of the RWQCB's letter stated the following:

Provide LNAPL distribution in treatment zone in relationship to the proposed horizontal biosparge wells.

Response 2: The LNAPL distribution in the biosparge system treatment zone was previously presented in Figures 3 and 4 of the Biosparge System Work Plan (CH2M HILL, 2013b). The distribution of LNAPL is also presented in Figures 1 and 2 of this response letter. The interpreted extent of LNAPL is based on previous investigations and routine groundwater monitoring activities that are conducted on a semiannual basis.

Schedule

Approval to begin construction of the biosparge well was provided by the RWQCB in an e-mail to CH2M HILL and KMEP on December 12, 2013. KMEP anticipates commencing construction activities in the second quarter of 2014. Pilot testing will commence once the biosparge well and new soil vapor monitoring probes are completed and formal approval from the RWQCB is granted.

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Should you require any further information, please do not hesitate to contact Dan Jablonski/CH2M HILL at (213) 228-8271 or Stephen Defibaugh/KMEP at (714) 560-4802. We look forward to your response.

Sincerely,

CH2M HILL, Inc.



Dan Jablonski
Project Manager



Mark Wuttig, PG 6820
Senior Project Manager

Attachments:

References

Figures

- 1 Proposed Horizontal Biosparge Well Location
- 2 Conceptual Horizontal Biosparge Well Completion Diagram
- 3 Soil Boring Cross Section A-A'

Distribution

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References

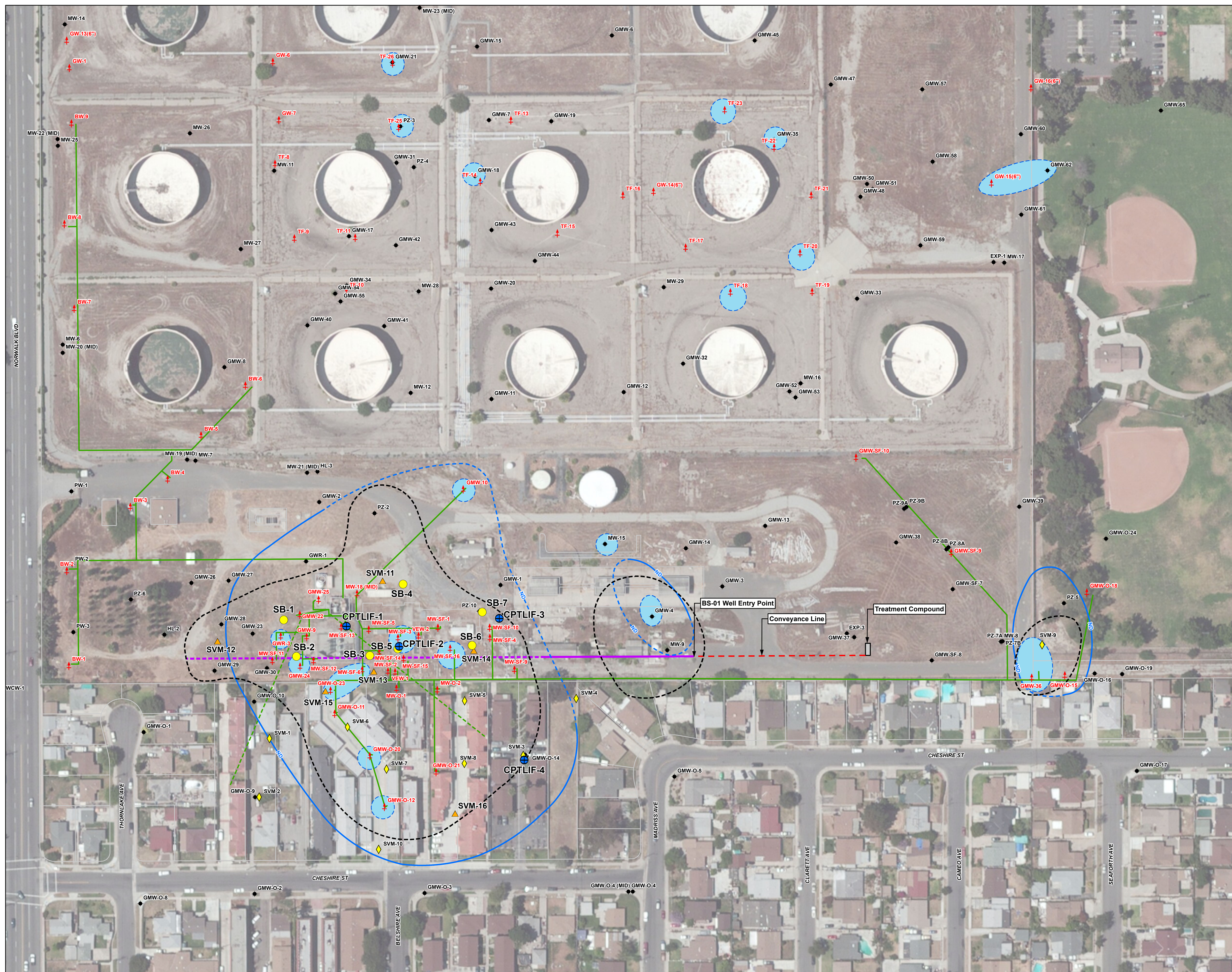
CH2M HILL. 2012a. *Results of LNAPL Characterization in the Uppermost Groundwater Zone and Top of Bellflower Aquitard, SFPP Norwalk Pump Station, Norwalk, California.* February 8.

CH2M HILL. 2012b. *Results of Soil Boring Investigation, SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California.* December 5.

CH2M HILL. 2013a. *Conceptual Site Model and Proposed Alternate Interim Remedy for Soil, Groundwater, and LNAPL, Defense Fuel Support Point, Norwalk, California.* September 3.

CH2M HILL. 2013b. *Horizontal Biosparge System Construction and Pilot Test Work Plan, SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California.* November 18.

Figures



- EXPLANATION**
- GMW-5 ◆ Monitoring Well and designation
 - VE-1 † Vapor extraction, groundwater extraction, total fluids, or free product extraction well used for site remediation
 - ◆ Proposed Groundwater Monitoring Well
 - ▲ Proposed Nested Soil Vapor Probe
 - ◆ Soil Vapor Monitoring Probe Location
 - Soil Boring Location
 - CPTLIF Boring Location
 - Estimated extent of detected dissolved benzene in groundwater, April 2013 (concentration dependent on laboratory reporting limit); dashed where inferred
 - Proposed Horizontal Biosparge Well (dashed line depicts approximate lateral extent of well screen)
 - Conveyance Line
 - Inferred Historical Extent of LNAPL Zone (Smear Zone) from LNAPL Characterization Work Plan (AMEC Geomatrix, 2010)
 - KMEP Remediation Piping Layout (above ground and below ground)
 - Horizontal Vapor Extraction Well Piping
 - Estimated extent of measurable light nonaqueous phase hydrocarbons (LNAPL, free product) on groundwater April 2013; dashed where inferred
 - Proposed Treatment Compound

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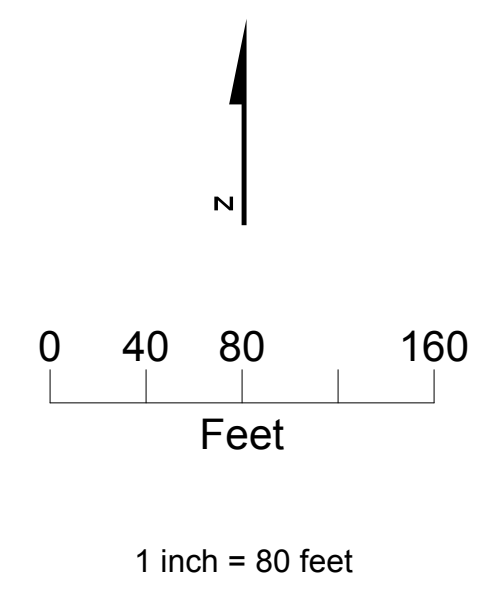


FIGURE 1
Proposed Horizontal Biosparge Well Location
 SFPP Norwalk Pump Station
 Norwalk, California

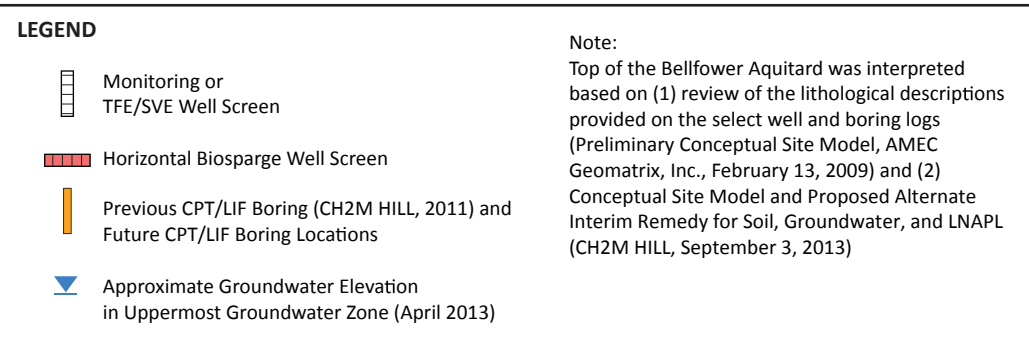
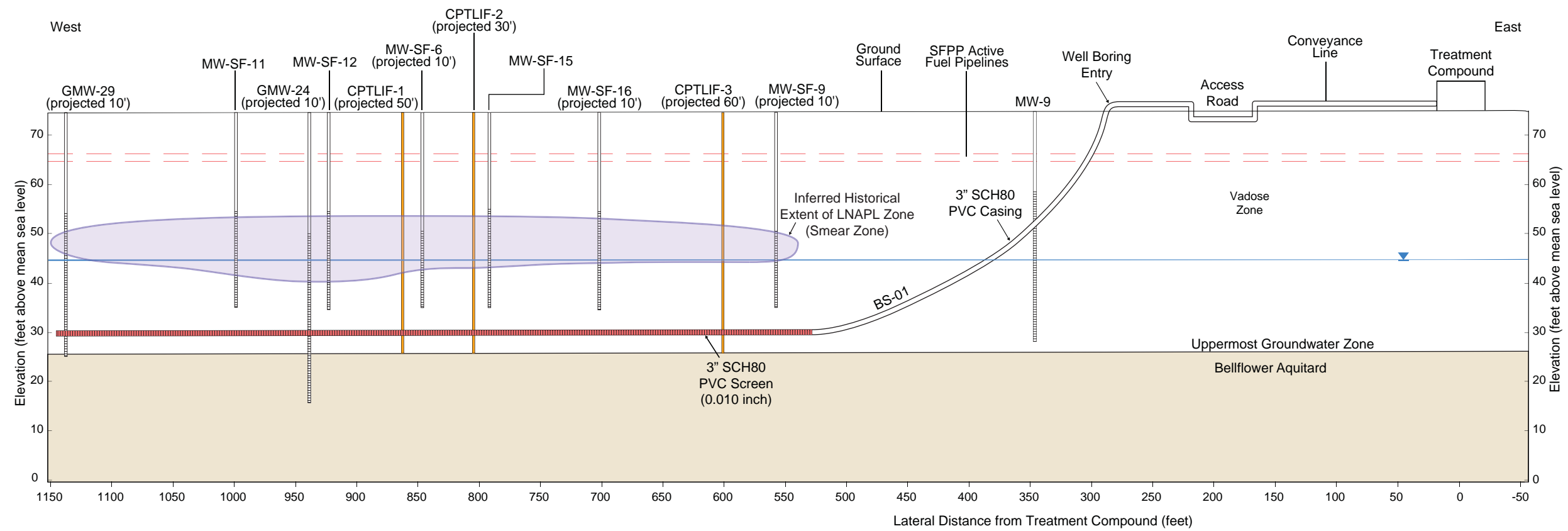
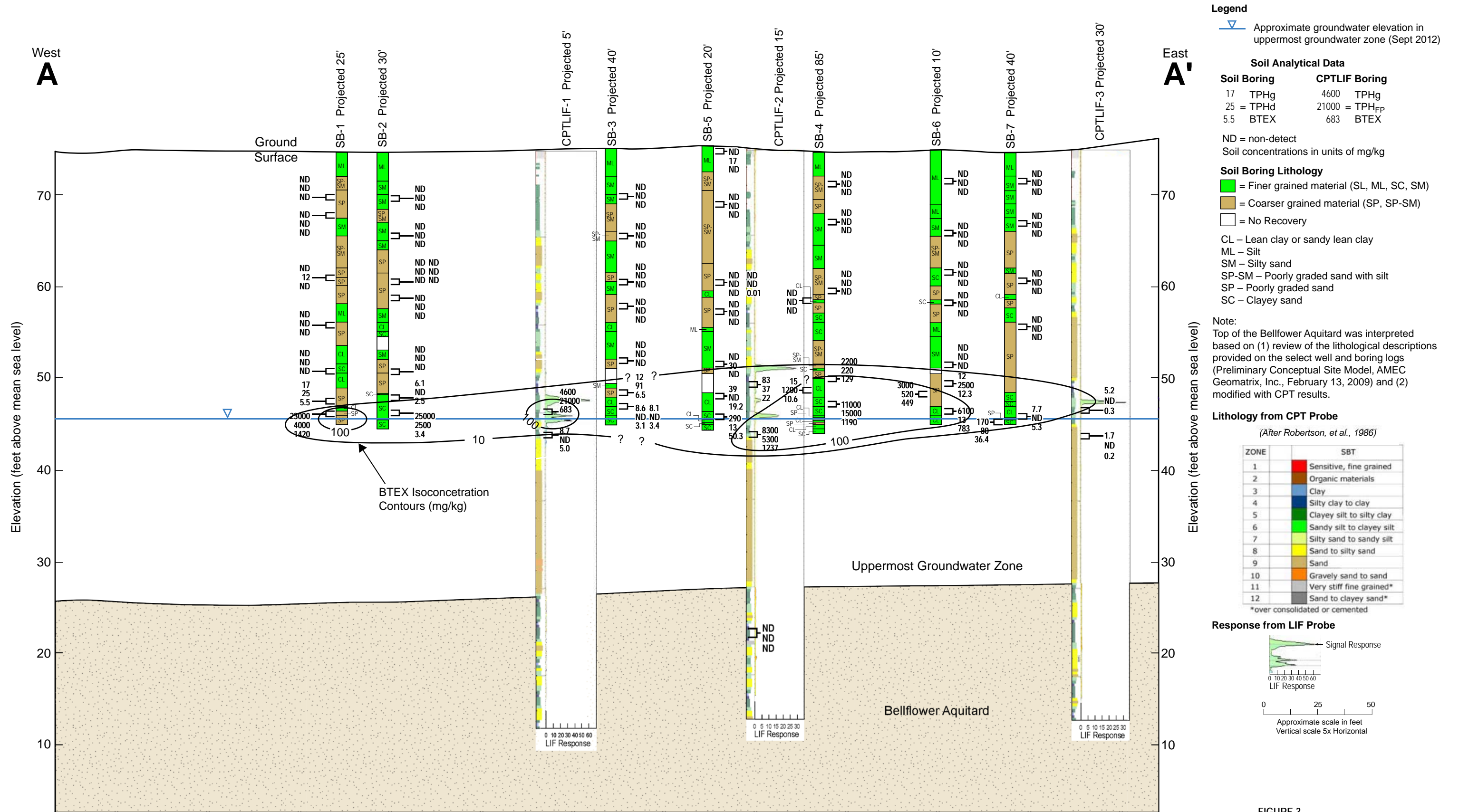


FIGURE 2
 Conceptual Horizontal Biosparge Well Completion Diagram
 SFPP Norwalk Pump Station
 Norwalk, California



Note: Cross section modified from Figure 5 in LNAPL Characterization Work Plan (AMEC Geomatrix, 2010)

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FIGURE 3
Soil Boring Cross Section A-A'
SFPP Norwalk Pump Station
Norwalk, California