Roya C. Kambin
Project Manager
Marketing Business Unit

Chevron Environmental Management Company
6101 Bollinger Canyon Road
San Ramon, CA 94583
Tel (925) 790-6270
RKLG@chevron.com

April 10, 2012

Mr. Keith Nowell
Alameda County Health Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

RECEIVED

8:50 am, Apr 12, 2012

Alameda County
Environmental Health

RE: Direct Oxygen Injection Pilot Test
1629 Webster Street, Alameda, California
Fuel Leak Case No.: RO0000450

Dear Mr. Nowell,

I declare under penalty of perjury that to the best of my knowledge the information and/or recommendations contained in the attached report is/are true and correct.

If you have any questions or need additional information, please contact me at (925) 790-6270.

Sincerely,

Roya Kambin
Union Oil of California – Project Manager

Attachment
Direct Oxygen Injection Pilot Test

2033 North Main Street
Suite 340
Walnut Creek
California 94596
Tel 925.274.1100
Fax 925.274.1103
www.arcadis-us.com

Mr. Keith Nowell
Alameda County Environmental Health Department
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

ENVIRONMENT

Subject:
Direct Oxygen Injection Pilot Test
Former 76 Service Station No. 0843
1629 Webster Street
Alameda, California,

Date:
April 10, 2012

Contact:
Katherine Brandt

Phone:
510.596.9675

Email:
Katherine.Brandt
@arcadis-us.com

Our ref:
B0047584.2012

Dear Mr. Nowell:

This letter is related to the Revised Remedial Action Plan (RAP) Contingency Plan prepared by ARCADIS on June 30, 2011 (Attachment 1). The Revised RAP Contingency Plan proposed biosparge to address the generation of hexavalent chromium (Cr(VI)) as a result of the injection of ozone identified in the original RAP prepared by Antea Group on March 18, 2011 (Antea, 2011[1]).

ARCADIS, on behalf of Chevron Environmental Management Company, for itself and as Attorney-in-Fact for Union Oil Company of California (hereinafter “EMC”), proposes the following revisions to the Revised RAP Contingency Plan to phase in the implementation of the biosparge remedy at the site:

- Install two sparge wells (TSP-2 and TSP-3) using well construction details provided in the Revised RAP (Attachment 1).
- Oxygen will be injected directly into TSP-2 and TSP-3 targeting the wells on site with the highest methyl tert-butyl ether (MTBE) and petroleum hydrocarbons, i.e., MW-7, MW-8, and MW-11.
- Results of the initial oxygen injections will be provided in a Remediation Pilot Study Results Report, as requested by Alameda County Department of Environmental Health (ACDEH).

The remaining sections provide an overview of the oxygen injection plan.

[1] Antea, 2011. *Remedial Action Plan*, 76 Service Station No. 0843/2349 1629 Webster Street, Alameda, CA. March 18

Direct Oxygen Injection Overview

As discussed in the Revised RAP Contingency Plan, aerobic biodegradation readily oxidizes petroleum hydrocarbons and MTBE (Attachment 1). As part of this pilot, concentrated (up to 99 percent) oxygen will be directly added to the subsurface using oxygen canisters and by attaching a quick-connect fitting to the top casing of an injection well. Injecting pure oxygen versus sparging air (with 79 percent nitrogen) allows more oxygen to be added to the subsurface in a shorter time period, prevents clogging of the formation with inert nitrogen gas, and allows for complete dissolution and utilization of all applied gas, which increases dissolved oxygen (DO) concentrations and promotes native microbial populations to aerobically metabolize available substrate. Additional sinks of oxygen include scavenging chemical reactions with the aquifer matrix and reduced species in groundwater, as well as potential advection downgradient from the injection site. Direct oxygen injection is being proposed as part of the phased implementation at the site due to the following reasons:

- Faster implementation of the remedial option (injection infrastructure construction not necessary), and
- Oxygen, within atmospheric air, has limited solubility in groundwater. The injection of pure oxygen into the heterogeneous subsurface will entrain oxygen into the aquifer pore spaces and slowly dissolve into the groundwater. The result will be consistent DO concentrations equivalent to that of biosparging.

Sparge Point Construction

Sparge wells TSP-2 and TSP-3 will be constructed as proposed in the Revised RAP Contingency Plan (Attachment 1). Proposed locations for TSP-2 and TSP-3 are located near previously proposed sparge points TSP-2 and TSP-8, respectively (Antea, 2011; Attachment 1), approximately 10 feet from monitoring wells MW-7, MW-8, and/or MW-11. Because oxygen will be injected using a quick connect fitting attached to the sparge well casing, subsurface connections will not be installed as previously proposed.

Proposed sparge well locations and construction details are shown on Figures 1 and 2, respectively. Prior to installing sparge wells, appropriate permits will be obtained. Underground Service Alert will be notified at least 48 hours before proposed drilling activities to identify public utilities in the vicinity of the proposed borings. Prior to borehole installation, each well location will be cleared to a minimum depth of eight feet one inch bgs with an air knife to identify potential underground utility conflicts.

Investigation-derived waste including all soil cuttings and equipment decontamination water will be containerized in 55-gallon Department of Transportation (DOT)-approved drums for off-site disposal.

Initial Direct Oxygen Injection Test

During the initial injection test, oxygen will be injected into newly installed sparge wells TSP-2 and TSP-3 to target monitoring wells which continue to contain elevated concentrations of MTBE. Oxygen will be injected by connecting regulated oxygen canisters to the sparge point. Initial injection volumes were estimated based on the following equation for a conceptualized cylinder:

$$V_{inj} = \pi * z_{sat} * ROI^2 * \theta$$

Where: V_{inj} = injection volume (scf)
z_{sat} = saturated interval (ft) = 28
ROI = target radius of influence (ft) = 10
θ = total porosity of soil = 0.30

An estimated 2,500 standard cubic feet (scf) will be applied to TSP-2 and TSP-3 simultaneously during the initial injection event. DO and groundwater elevation measurements will be recorded in monitoring wells MW-7, MW-8, and MW-11 prior to beginning the test and during the test at a minimum frequency of every 1,000 scf injected to assess injection response. DO will be measured and recorded approximately every 5 feet along the saturated screen interval of each dose response well. Injection response is defined as a measurable and sustainable increase from baseline DO concentrations during the course of injections.

The pressure at the sparge points will be monitored to verify that entry pressure exceeds the minimum injection pressure of approximately 10 pounds per square inch (psi) and does not exceed the fracture pressure of the formation (approximately 25 psi).

If DO concentrations increase in the dose-response wells after only a fraction of the total volume of oxygen has been injected, the remainder of the planned volume will be injected to determine if maximum response has been achieved. If a plateau is observed (i.e., initial increase in DO concentrations followed by limited to no increase in response to additional injection volume), injection volumes planned for subsequent events may be reduced accordingly.

If no measurable increase in DO is observed following the initial 2,500 scf injection volume, oxygen-enriched air will be injected by installing an in-line air compressor to the injection manifold. If no response is observed in nearby monitoring wells following a full day of injections (either using oxygen cylinders alone or with entrained air) it may be because of channeling that has been noted at the site previously. Monitoring following the test will show if distribution of oxygen was achieved.

Subsequent Injection Events

Following the initial injection event, DO will be measured along the saturated screen interval weekly in site monitoring wells which have had an observed increase in DO concentrations resulting from pilot test injections. If DO concentrations have decreased to near baseline levels during weekly observations, an additional injection event will be implemented. The scope of subsequent injection events will be dependent on results of the initial injection event. The pilot study will not exceed two quarters of injections.

Proposed Groundwater Monitoring Plan

Prior to implementing injection activities, baseline groundwater samples and measurements will be collected from all site monitoring wells as proposed in the Revised RAP Contingency Plan (Attachment 1).

Monitoring wells will be sampled quarterly for all parameters as proposed in the RAP. The proposed schedule and parameters for groundwater sampling is included as Table 1.

The Revised RAP Contingency Plan proposed biosparge to address the concern of Cr(VI) generation resulting from the previously proposed ozone injections. As outlined in the Revised RAP Contingency Plan (Attachment 1), oxygen does not generate strongly oxidizing conditions capable of causing naturally occurring metals to enter the dissolved phase. Monitoring for the full suite of parameters, although no longer applicable given the proposed remedial strategy, will be continued for four quarters following implementation of the pilot test. At that time, sampling for metals other than those used as biogeochemical indicators (iron and manganese) will be reevaluated.

Project Schedule

Pilot study status updates will be provided in quarterly groundwater monitoring reports. A Remediation Pilot Study Results Report will be provided nine months following the initial injection event. The report will include an assessment of oxygen distribution, sustained residence time, and MTBE concentration trend response to the periodic injections. The Remediation Pilot Study Results Report will also discuss the success or challenges of the pilot study and include recommendations regarding further treatment using direct oxygen injection or an alternative to direct oxygen injection for this site.

Closing

If you have any questions or comments regarding the contents of this document, please contact Ms. Roya Kambin of Chevron at 925-790-6270 or by e-mail at RKambin@Chevron.com. Alternatively, you may contact Ms. Katherine Brandt of ARCADIS at 510.596.9675 or by email at Katherine.Brandt@arcadis-us.com.

Sincerely,

ARCADIS U.S., Inc.

Katherine Brandt
Project Manager

David W. Lay, P.G., C.P.G.
Principal Geologist

PROFESSIONAL GEOLOGIST
DAVID LAY
No.8545
STATE OF CALIFORNIA

Attachments:
Figure 1 – Proposed Monitoring Well Locations
Figure 2 – Sparge Point Construction Detail

Table 1 – Proposed Monitoring Program

Attachment 1 – Revised RAP Contingency Plan (ARCADIS, 2011)[2]

[2] ARCADIS, 2011. Revised Remedial Action Plan Contingency Plan, 76 Service Station No. 0843/2349 1629 Webster Street, Alameda, CA. June 30.

Copies:
Shawn Burnell, ARCADIS
Roya Kambin, Union Oil of California
Sam and Michelle Koka 802 Pacific Avenue, Alameda, CA 94501

Figures

CITY: PETALUMA, CA DIV/GROUP: ENV DB: J. HARRIS LD: J. HARRIS PIC: J. VOGELEY PM: K. ABBOTT TM: K. ABBOTT LYR:(Opt)ON=*;OFF=*REF*
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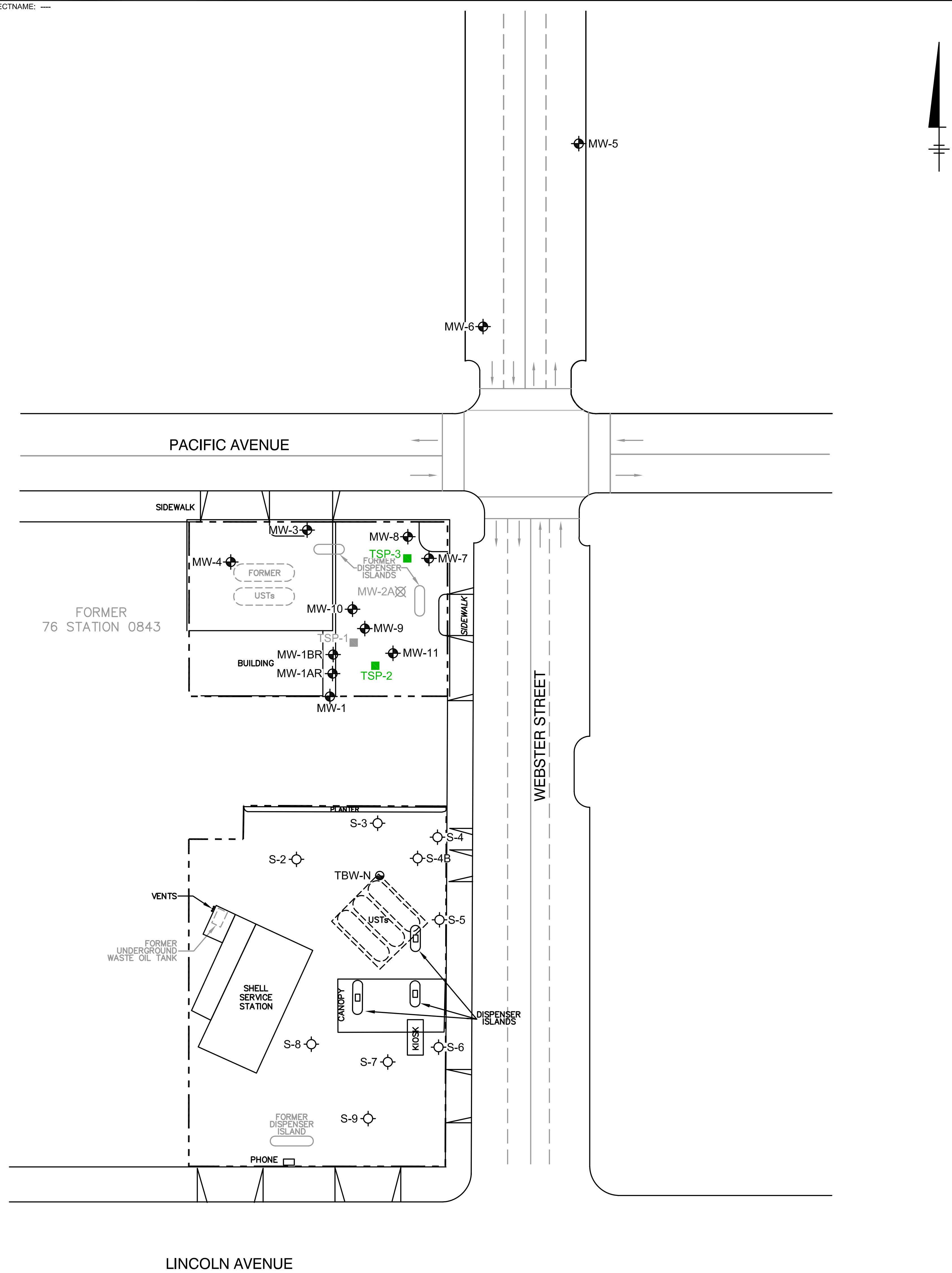


LEGEND

- PROPERTY BOUNDARY
- MW-1 FORMER 76 STATION MONITORING WELL
- S-9 SHELL SERVICE STATION MONITORING WELL
- TBW-N SHELL TANK BACKFILL MONITORING WELL
- MW-2A ABANDONED WELL
- TSP-1 CURRENT SPARGE WELL LOCATION
- TSP-2 PROPOSED SPARGE WELL LOCATION

0 50' 100'
GRAPHIC SCALE

NOTES:

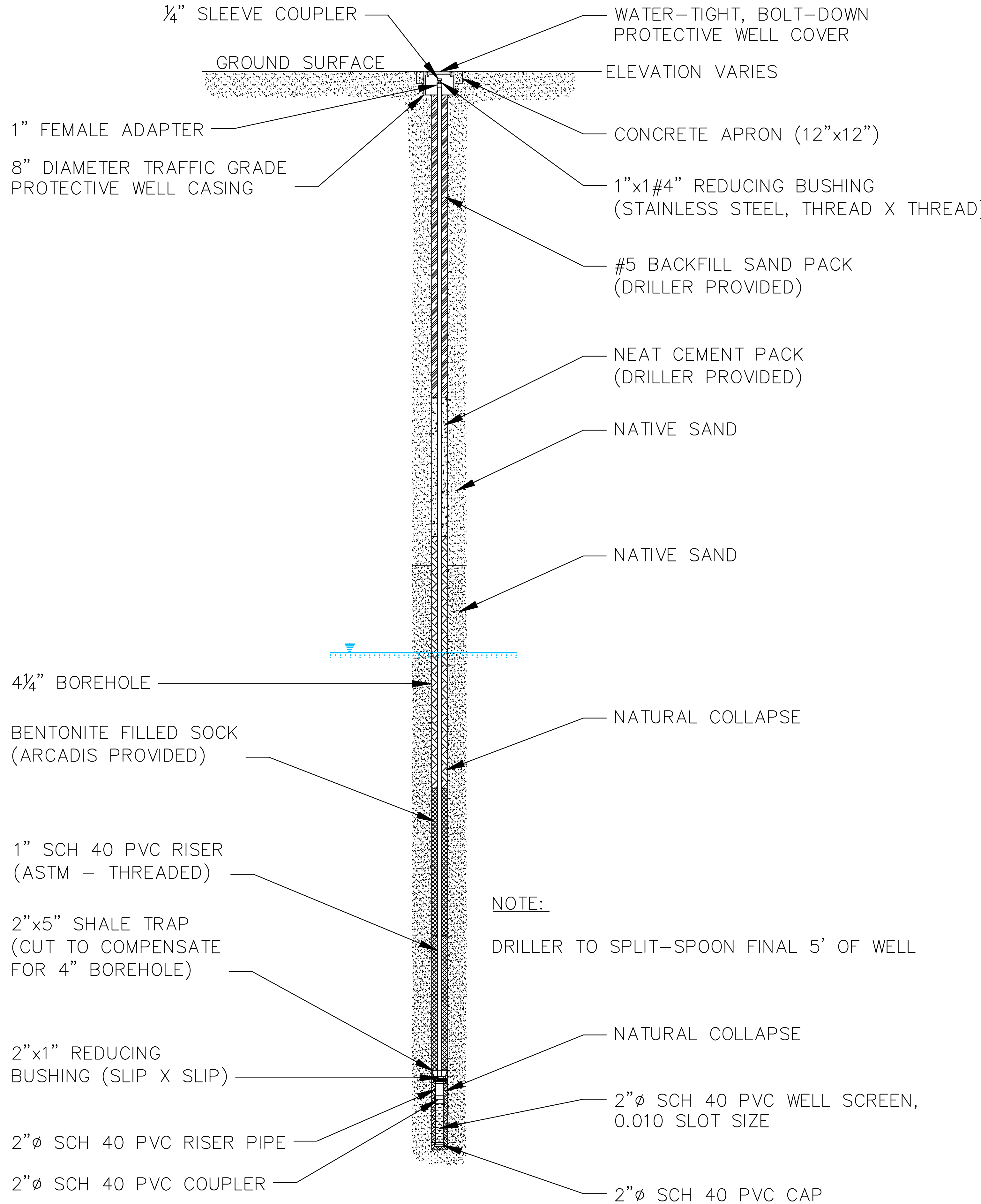
1. BASE MAP PROVIDED BY TRC, DATED AUGUST 2010, AT A SCALE OF 1"=60'. SHELL SERVICE STATION DATA PROVIDED BY CRA.
2. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

UNION OIL
FORMER FACILITY NO. 0843
1629 WEBSTER STREET
ALAMEDA, CALIFORNIA

SITE PLAN WITH PROPOSED SPARGE POINTS

ARCADIS

FIGURE
1



NOT TO SCALE

UNION OIL
FORMER FACILITY NO. 0843
1629 WEBSTER STREET
ALAMEDA, CALIFORNIA

SPARGE WELL CONSTRUCTION DETAIL

ARCADIS

FIGURE
2

CITY: PETALUMA, CA DIV/GROUP: ENV/CAD DB: S. KOWALCZYK LD: J. HARRIS
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Table

Table 1
Proposed Monitoring Program
Former 76 Service Station No. 0843 (2349)
1629 Webster Street, Alameda, CA

	MONITORING PARAMETERS								
Monitoring Well	**Dissolved Oxygen (DO) 1**	**pH, electrical conductivity, temperature**	**TPH-GRO by USEPA method 8260B**	**Total and Dissolved Iron (200.7/200.8)**	**Total and Dissolved Manganese (200.7/200.8)**	**BTEX by 8260B**	**MTBE and TBA by 8260B**	**Hexavalent Chromium by USEPA 7199**	**Total Chromium by USEPA 200.8/6010B**
MW-1	X	X	X	X	X	X	X	X	X
MW-1AR	X	X	X	X	X	X	X	X	X
MW-1BR	X	X	X	X	X	X	X	X	X
MW-3	X	X	X	X	X	X	X	X	X
MW-4	X	X	X	X	X	X	X	X	X
MW-5	X	X	X	X	X	X	X	X	X
MW-6	X	X	X	X	X	X	X	X	X
MW-7[1]	X (see note 1)	X	X	X	X	X	X	X	X
MW-8[1]	X (see note 1)	X	X	X	X	X	X	X	X
MW-9	X	X	X	X	X	X	X	X	X
MW-10	X	X	X	X	X	X	X	X	X
MW-11[1]	X (see note 1)	X	X	X	X	X	X	X	X

Notes:

1 Dissolved oxygen will be measured in monitoring wells MW-7, MW-8, and MW-11 at a frequency of monthly for the first quarter, and quarterly thereafter.
All other wells and parameters will be sampled quarterly.

TPH-GRO Total petroleum hydrocarbons as gasoline
BTEX benzene, toluene, ethylbenzene, and xylenes
MTBE methyl tert-butyl ether
TBA tert-butyl ether
USEPA United States Environmental Protection Agency

ARCADIS

Attachment 1

Revised RAP Contingency Plan (ARCADIS, 2011)

2033 North Main Street
Suite 340
Walnut Creek
California 94596
Tel 925.274.1100
Fax 925.274.1103
www.arcadis-us.com

Ms. Barbara Jakub
Alameda County Environmental Health Department
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

ENVIRONMENT

Subject:
Revised Remedial Action Plan Contingency Plan
Former 76 Service Station No. 0843 (2349)
1629 Webster Street
Alameda, California,

Date:
June 30, 2011

Contact:
Katherine Brandt

Phone:
510.596.9675

Email:
Katherine.Brandt@arcadis-us.com

Our ref:
B0047584

Dear Ms. Jakub:

This letter is in response to the request for additional information by Alameda County Environmental Health Department (ACEHD) in a letter to ConocoPhillips (COP) dated April 6, 2011 related to the Remedial Action Plan prepared by Antea Group on March 18, 2011. The additional information requested by ACEHD was a contingency plan to address the potential generation of Hexavalent Chromium (Cr(VI)) as a result of the addition of ozone into the subsurface to remediate petroleum hydrocarbon constituents.

ARCADIS has recently transitioned to lead consultant in support of remedial activities for the subject site. ARCADIS, on behalf of Union Oil of California, proposes the following actions to effectively implement an active remedy at the site while also addressing concerns associated with potential generation of Cr(VI). The proposed approach will be implemented in phases based on observations.

- Initial remedy to incorporate air sparging (biosparging) with monitoring of indicator parameters
- If biosparge treatment alone is ineffective after two quarters based on indicator parameters, ozone will gradually be introduced to the sparged air.
- Ozone sparging will be phased in pending observations following injections of air into sparge wells (biosparging).
- Remaining sparge wells TSP-2 through TSP-10 will be installed using slotted PVC well screen to allow for greater distribution of air in the subsurface, resulting in more effective distribution of air and ozone in the subsurface and subsequently more effective remedial treatment.

The remaining sections provide an explanation of chromium oxidation processes resulting from the addition of strong chemical oxidants such as ozone, but not typically generated from a biosparge system. Also, a biosparge remedial approach with the potential for phasing in ozone is discussed along with a Cr(VI) contingency plan. Lastly, updated well construction details are also included.

Chromium Chemistry in Presence of Ozone/Oxygen

Addition of strong chemical oxidants such as ozone can cause naturally occurring metals (chromium, barium, lead, e.g.) to enter the dissolved phase. For example, trivalent chromium (Cr(III)), typically in a solid state, can be oxidized to the more soluble Cr(VI) when in the presence of strongly oxidizing conditions caused by ozone. This can result in a temporal increase in Cr(VI) concentrations in the treatment zone. Alternatively, ferrous iron and manganese cations can be oxidized to form ferric oxide and manganese oxide precipitates, reducing dissolved concentrations of iron and manganese. Dissolved ferric iron can abiotically react with Cr(VI) to reduce Cr(VI) back to Cr(III). It is the combination of removing the dissolved iron and directly oxidizing Cr(III) to Cr(VI) that generates elevated Cr(VI) concentrations in groundwater.

Unlike oxygen, strong chemical oxidants are not typically present in natural systems, primarily because of their abiotic reactivity. Oxygen can only facilitate petroleum hydrocarbon oxidation when biologically mediated by naturally occurring aerobic bacteria. Biogeochemical site data shows that oxygen reduction is already occurring in site groundwater (depleted concentrations present in wells with elevated contaminants of concern (COC) concentrations such as MW-7 and MW-8). The proposed biosparge approach is consistent with ongoing biogeochemical processes at the site, so by only adding air to the system metals mobilization is not likely to occur.

Hexavalent Chromium Attenuation

Hexavalent chromium liberated from the ozone sparge pilot study is attenuating; most likely resulting from the aquifer’s return to pre-pilot reducing conditions following ozone was consumption. As precipitated ferrous iron reduces to dissolved ferric iron it is available to convert Cr(VI) back to Cr(III). Total chromium is typically a measurement of both Cr(III) and Cr(VI) present in a groundwater sample while dissolved chromium represents the concentration of Cr(VI) in a groundwater sample. Attenuation is observed by comparing site monitoring wells MW-10 (20 feet from sparge point TSP-1 and TSP-2) and downgradient monitoring wells MW-7 and MW-8, approximately 60 to 65 feet downgradient of TSP-1. Increases in dissolved Cr(VI) concentrations were not observed at MW-10 during pilot activities, but instead were observed the next time samples were analyzed for Cr(VI) (approximately nine months following the termination of ozone sparge pilot activities). Assuming an average groundwater velocity of approximately 0.5 feet per day, an equivalent increase in Cr(VI)concentrations would have been observed at MW-7 or MW-8 three to four months following termination of pilot study activities. However, Cr(VI) concentrations have remained below the detection limit of 2 µg/L in both downgradient wells MW-7 and MW-8 (Antea, 2011b). The lack of detectable concentrations in downgradient monitoring wells indicate Cr(VI) is attenuating as redox conditions return to background conditions downgradient of the treatment area.

Phased Biosparge/Ozone Sparge Approach

The following provides a detailed summary of the proposed phased approach summarized above.

- Begin air injections (biosparge) into the installed sparge wells (Appendix A).
- If reductions in the concentrations of site COCs have not been demonstrated following two quarters of biosparge implementation, ozone sparging will gradually be phased in, starting at a rate of approximately 0.05 lbs/day (10-percent of ozone injection rate during pilot study implementation).
- After ozone sparging has begun, the initial startup sampling frequency will be reinstated. The system will be operated to mitigate Cr(VI) generation. If Cr(VI) is generated and persists in groundwater, ozone sparging will be stopped and if phased back in will be at lower dosing than when Cr(VI) was generated.

Chromium Contingency Plan

- If Cr(VI) persists above the environmental screening level (ESL) of 11.0 µg/L following treatment of site COCs, a soluble carbon source such as dilute molasses can be injected to promote reduction of oxidized metal species. The intent of adding an soluble carbon source would be to alter the redox conditions of the aquifer and dissolve the precipitated iron which, as discussed above, will provide assimilative capacity to treat Cr(VI).

- If chromium mitigation is necessary, a mitigation plan will be submitted, and will include details on the implementation of the technology and a proposed monitoring plan to prevent further migration of secondary impacts.

Proposed Groundwater Monitoring Plan

Prior to implementing biosparge activities, baseline groundwater samples and measurements will be collected from all site monitoring wells as proposed in the RAP.

Following biosparge system startup, dissolved oxygen (DO) will be closely measured at site monitoring wells to assess influence from nearby sparge wells. Monitors wells in which influence is observed (increases in DO of 3-4 mg/L) will be sampled for all parameters as proposed in the RAP at a frequency of weekly for the first month, monthly for the first quarter, and quarterly thereafter. Even though dissolved metal concentrations are not expected to increase using a biosparge remedy, monitoring for the full suite of parameters will continue for four quarters of sampling following implementation. At that time, sampling for metals other than those used as biogeochemical indicators (iron and manganese) will be reevaluated. The proposed schedule and parameters for groundwater sampling under both biosparging and ozone sparging conditions are included as Table 1.

Sparge Well Design

Existing sparge point (TSP-1) was constructed to a depth of 36 feet below ground surface (ft bgs) with a two-foot ceramic gas diffuser tip placed from 33 to 35 ft bgs. Ozone sparged into TSP-1 achieved limited distribution due to head loss encountered at the ceramic sparge tip. Short-circuiting of air through preferential pathways from TSP-1 likely led to observations of bubbling 20 feet away at MW-10. This observation was not indicative of influence, and cannot be correlated with a radius of influence equal to 20 feet. Other indications of influence, such as increases in dissolved oxygen, treatment of COCs and increases in dissolved chromium concentrations, were not observed until two quarterly sampling events following the ozone injection pilot study, in MW-10 directly downgradient of TSP-1. Therefore, these observations suggest groundwater influenced by the ozone pilot study has travelled downgradient from TSP-1 down to monitoring well MW-10.

Nine additional sparge wells (TSP-2 through TSP-10) will be installed at locations as proposed in the RAP using an assumed 20-foot radius of influence (Antea, 2011), but ceramic sparge tips will not be used. Influence of sparge wells around TSP-1, such as proposed wells TSP-2 through TSP-4, will be evaluated to assess the need for an additional sparge point in place of TSP-1.

Sparge wells will be constructed using one-inch diameter, schedule 80 PVC casings set in the boreholes from ground surface to their respective screened intervals. The screened intervals will be two foot-long sections of two-inch diameter, 0.010-inch slotted pipe placed approximately 35 ft bgs. A bentonite filled sock will be placed above the well screen, hydrated by groundwater, and native material will be allowed to collapse around the riser pipe and well screen in the rest of the borehole. Proposed sparge well construction details are shown on Figure 1.

This improved sparge well design will allow for easier development of wells and will reduce head loss allowing for increased distribution of injected air or ozone. The resulting increase in distribution can reduce overall remedial timeframes by allowing for increased contact with COC mass during system operation.

Certification Statement

"I certify under penalty of law that this document, including all attachments and supplemental information, was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment."

Executed on the 30 day of June at 11:00 a.m.

_____________ (Signature)

Project Manager (Title)

If you have any questions or comments regarding the contents of this document, please contact Katherine Brandt of ARCADIS at 510.596.9675 or by e-mail at katherine.brandt@arcadis-us.com.

Sincerely,

ARCADIS U.S., Inc.

Katherine Brandt

Katherine Brandt
Project Manager

Kathleen Abbott
Senior Geologist

PROFESSIONAL GEOLOGIST
KATHLEEN M. ABBOTT
NO. 8622
STATE OF CALIFORNIA

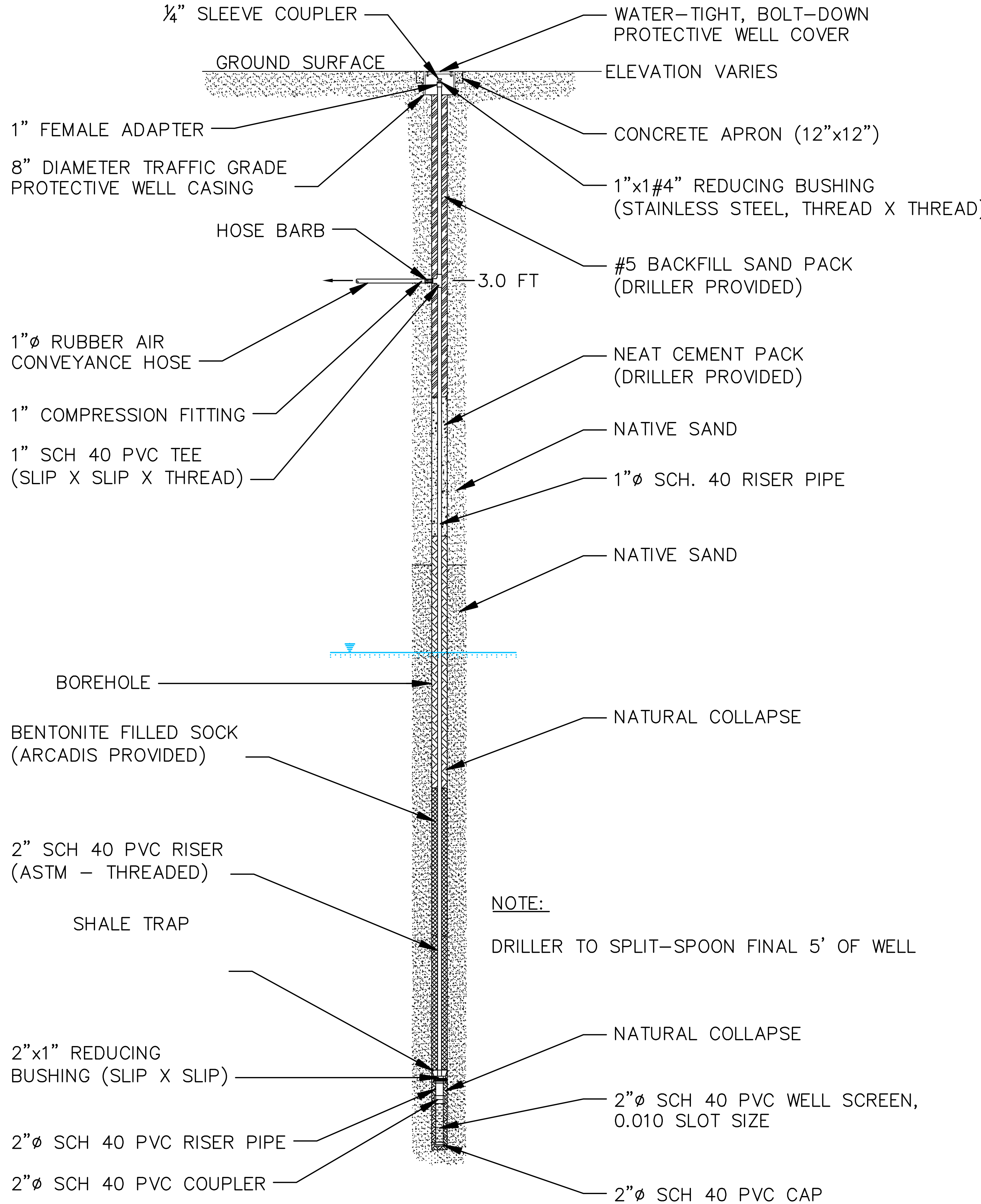
Copies:
Aaron Svitana, ARCADIS
Shawn Burnell, ARCADIS
Roya Kambin, Union Oil of California

Attachments:
Figure 1 – Typical Air Sparge Well Construction Detail
Table 1 – Performance Monitoring Parameters for Biosparging and Ozone Sparging
Appendix A - Antea Group – Figure 3 – Site Plan with Current Monitoring Wells, Sparge Points and Remedial System Locations

References:

Antea, 2011a. *Remedial Action Plan*, 76 Service Station No. 0843/2349 1629 Webster Street, Alameda, CA. March 18

Antea, 2011b. *Second Quarter 2011- Quarterly Groundwater Monitoring Report*,76 Service Station #0843, 1629 Webster Street, Alameda, CA. June 10.



NOTE:

DRILLER TO SPLIT-SPOON FINAL 5' OF WELL

NOT TO SCALE

FORMER 76 SERVICE STATION NO. 0843 (2349)
1629 WEBSTER STREET
ALAMEDA, CALIFORNIA
REVISED REMEDIAL ACTION PLAN ADDENDUM

SPARGE WELL CONSTRUCTION DETAIL

ARCADIS

FIGURE
1

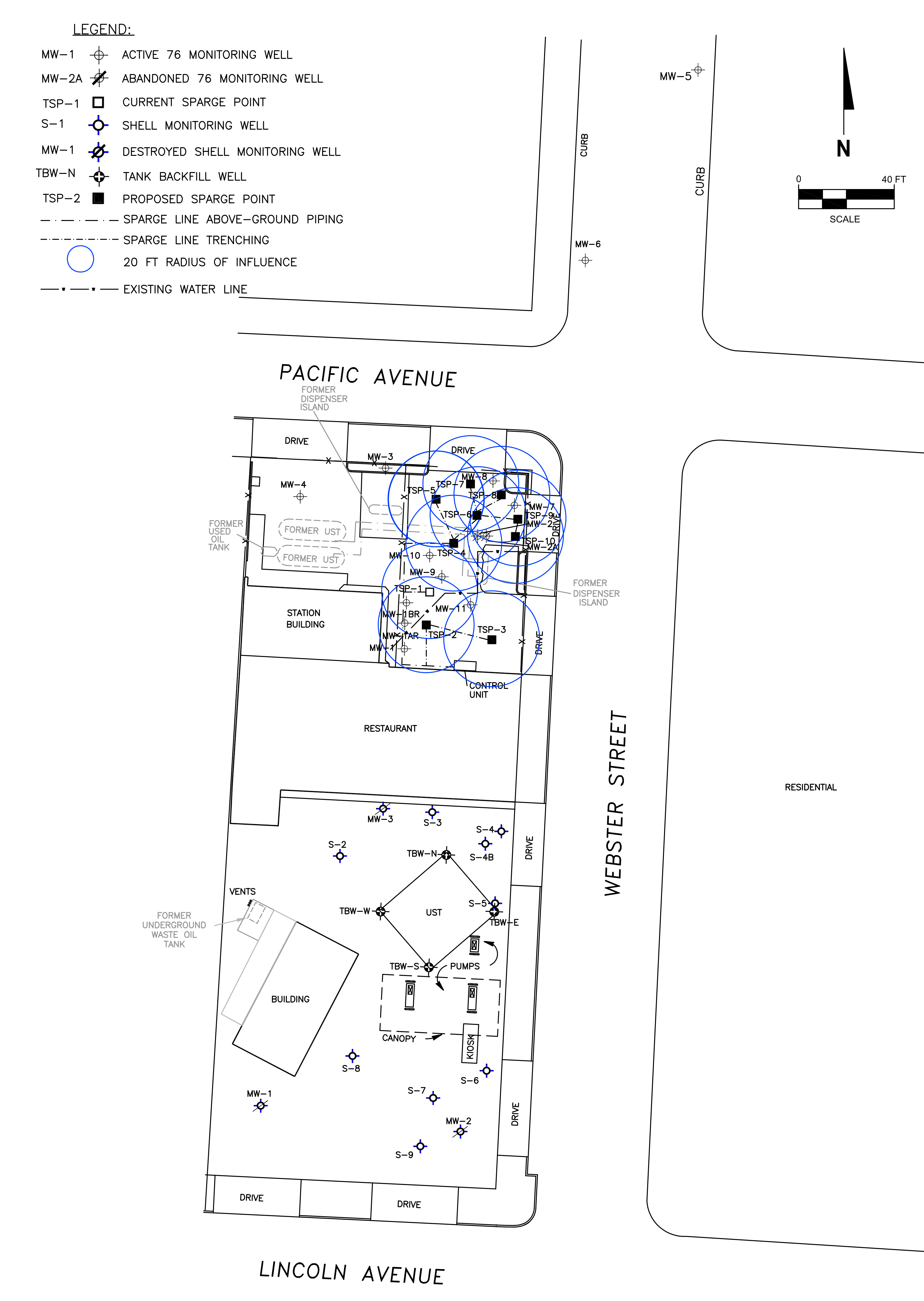
Table 1
Performance Monitoring Parameters for Biosparging and Ozone Sparging
Revised Remedial Action Plan Contingency Plan
Former 76 Service Station No. 0843 (2349)
1629 Webster Street, Alameda, CA

		MONITORING PARAMETERS								
Remediation Technology	**Frequency**	**Dissolved Oxygen (DO)**	**pH**	**TPH-GRO by USEPA method 8260B**	**Total and Dissolved Iron (200.7/200.8)**	**Total and Dissolved Manganese (200.7/200.8)**	**BTEX by 8260B**	**MTBE and TBA by 8260B**	**Hexavalent Chromium by USEPA 7199**	**Total Chromium by USEPA 200.8/6010B**
Biosparge	Daily during first week of injections	X								
	Varies[1]	X	X	X	X	X	X	X		
Ozone	Daily during first week of injections	X								
	Varies[1]	X	X	X	X	X	X	X	X	X

Notes:

1 Sampling frequency will vary after implementation of remedy. Sampling frequency will include weekly for the first month, monthly for the first quarter, and quarterly thereafter. Weekly and monthly sampling will only be conducted at wells in which influence is observed (increases in DO of 3-4 mg/L)

TPH-GRO Total petroleum hydrocarbons as gasoline
BTEX benzene, toluene, ethylbenzene, and xylenes
MTBE methyl tert-butyl ether
TBA tert-butyl ether



PLAN ADAPTED FROM A SURVEY BY MORROW SURVEYING
DATED FEBRUARY 2009.

FIGURE 3
SITE PLAN WITH CURRENT MONITORING WELLS, SPARGE POINTS & PROPOSED REMEDIAL SYSTEM LOCATIONS
FORMER 76 STATION NO. 0843
1629 WEBSTER ROAD
ALAMEDA, CALIFORNIA

PROJECT NO.	PREPARED BY	DRAWN BY
C102349217	AB	JH
DATE	REVIEWED BY	FILE NAME
02/25/11	JBB	76-0843-S

anteagroup