Hooshang Hadjian
2108 San Ramon Valley Blvd.
San Ramon, CA 94583

Mr. Dilan Roe
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California
ACHCSA Case No. 304

RECEIVED
By Alameda County Environmental Health at 4:13 pm, Mar 28, 2013

Dear Mr. Roe:

I, Mr. Hooshang Hadjian, have retained Pangea Environmental Services, Inc. (Pangea) as the environmental consultant for the project referenced above. Pangea is submitting the attached report on my behalf.

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

Sincerely,

Hooshang Hadjian

March 18, 2013

VIA ALAMEDA COUNTY FTP SITE

Ms. Dilan Roe
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: **Corrective Action Plan Addendum**
Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California
ACEH Case No. 304

Dear Ms. Roe:

On behalf of Mr. Hooshang Hadjian, Pangea Environmental Services, Inc. has prepared this *Corrective Action Addendum* for the subject site. This report was requested by your email dated June 20, 2012. The UST Cleanup Fund also recommended a re-evaluation of the remedial approach for the site in the 5-Year Review dated March 28, 2012. The objective of the proposed remediation is to provide additional removal of secondary source material. Additional secondary source removal can be conducted cost effectively using existing wells and underground remediation piping.

To help facilitate secondary source removal, Pangea respectfully requests your approval of the proposed bioremediation at your earliest convenience. The UST Cleanup Fund placed this site in the CAP/REM category and allocated a budget of $75,000 for the fiscal year 2012/2013. With prompt agency approval Pangea can commence implementation of the CAP Addendum during this fiscal year. If you have any questions or comments, please call me at (510) 435-8664 or email briddell@pangeaenv.com.

Sincerely,
Pangea Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

cc: Mr. Hooshang Hadjian, 2108 San Ramon Valley Blvd, San Ramon, CA 94583
Mr. Jim Lange, 6500 Dublin Blvd., Suite 202, Dublin, CA 94568
SWRCB Geotracker (electronic copy)

CORRECTIVE ACTION PLAN ADDENDUM

Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California

March 18, 2013

Prepared for:

Mr. Hooshang Hadjian
2108 San Ramon Valley Blvd
San Ramon, CA 94583

Prepared by:

Pangea Environmental Services, Inc.
1710 Franklin Street, Suite 200
Oakland, California 94612

Written by:

REGISTERED PROFESSIONAL ENGINEER
ROBERT G. CLARK-RIDDELL
No. C 049629
Exp. SEPT 2014
CIVIL
STATE OF CALIFORNIA

FOR

Morgan Gillies
Project Manager

Bob Clark-Riddell, P.E.
Principal Engineer

CORRECTIVE ACTION PLAN ADDENDUM

Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California

March 18, 2013

INTRODUCTION

On behalf of the Mr. Hooshang Hadjian, Pangea Environmental Services, Inc. has prepared this *Corrective Action Addendum (CAP Addendum)* for the subject site (Figure 1). This report was requested by an Alameda County Environmental Health (ACEH) email dated June 20, 2012. The UST Cleanup Fund also recommended a re-evaluation of the remedial approach for the site in the 5-Year Review dated March 28, 2012. The objective of the proposed remediation is to provide additional removal of secondary source material. Additional secondary source removal can be conducted cost effectively using existing wells and underground remediation piping. Presented below are the site background, agency comments, Pangea response to agency comments, remedial objectives, and CAP Addendum. For clarity and ease of ACEH review, Pangea includes and modifies the prior workplan information.

SITE BACKGROUND

The Dublin Auto Wash retail gasoline station is located at the southwest corner of Dublin Boulevard and Village Parkway in Dublin, California (Figure 1). Currently, there are three 10,000-gallon underground storage tanks (USTs) and a carwash at the site. Land use immediately surrounding the station is commercial.

Summary of Previous Environmental Work

Chevron Release – 1988 to 1996

The first environmental investigation at the site was performed in early 1988 when Chevron Products Company (Chevron), the previous owner/operator, hired EA Engineering, Science, and Technology, Inc. (EA), to conduct a soil vapor investigation at the site. The results of the soil gas survey indicated elevated levels of hydrocarbons beneath the site, especially around the southern pump island. Subsequently, groundwater monitoring wells were installed and quarterly groundwater monitoring began. In February 1989, one 5,000-gallon and two 10,000-gallon underground storage tanks (USTs) were excavated and removed from the site and replaced with three new USTs. A soil vapor extraction (SVE) system was operated between March 1992 and April 1996, removing approximately 15,000 pounds of hydrocarbons. Between 1994 and 1996, additional groundwater monitoring wells were installed and added to the quarterly monitoring program. A December 1996 Risk Based Corrective Action (RBCA) report concluded that the site is a "Low Risk" soil and groundwater petroleum release site, and ACEH subsequently approved SVE system shutdown.

New Release – February 1997

In February 1997, a leak in a stainless steel product line flex hose was discovered and reported to ACEH. The leak location was immediately south of the north-westernmost dispenser (dispenser No. 2). During June 1997 testing, the secondary piping failed a pressure test. Subsequently, a new product delivery system was installed to replace the existing lines. During the system modifications in July 1997, Parker Environmental Services collected soil samples via hand auger at locations B-1 through B-4. About 31 cubic yards of soil were removed from the release area to a depth of 8 feet bgs. The results of subsequent groundwater monitoring events in December 1998 and March 1999 indicated free product was present in well MW-3. The detection of free product in MW-3 (up to 0.1 feet thick) corresponds to the historically lowest groundwater elevation observed during site monitoring activities, when the depth to groundwater in well MW-3 was 12.92 feet in December 1998.

Gettler-Ryan, Inc. (GRI), a subcontractor of Chevron, monitored the eight existing groundwater monitoring wells at the site until the first quarter of 2003. In 2003, SOMA began performing groundwater monitoring at the site on behalf of Mr. Hadjian. SOMA noted groundwater apparently flowed from offsite wells MW-4 and MW-5 toward the site in the approximate southeast direction, while groundwater at the eastern portion of the site apparently flowed in the northeast direction. SOMA believed the groundwater flow direction may have been affected by the 18" diameter vitrified clay pipe (VCP) sewer line running beneath the southern portion of Dublin Boulevard immediately north of the site. Information provided by Gettler-Ryan indicated that the top of the sanitary sewer line was approximately 16 feet below grade surface (bgs), while the depth to water in nearby wells MW-1 and MW-3 has ranged from approximately 11 to 13 ft bgs.

In 2003, SOMA also conducted further characterization and remediation activities at the site. SOMA advanced seven shallow soil borings using hand augers (B-1 through B-8), nine soil borings using a Geoprobe™ direct push rig, and one soil boring using a drill rig equipped with hollow stem augers. Initially, the Geoprobe borings were intended to be used for cone penetrometer testing (CPT) to log the borings; however, due to subsurface conditions the borings were logged using electric conductivity sensors. The direct push borings included collection of discrete depth groundwater samples to assess the vertical extent of contamination.

SOMA's investigation confirmed that contaminant concentrations were highest near the northern central portion of the site, and concluded that the 18" diameter sewer line located immediately north of the site is intercepting groundwater contamination. Fill material around the sewer line could be acting as a preferential pathway for the contamination conveyance to the east and then southeast, the sewer flow direction. SOMA also found contamination in deeper groundwater. SOMA concluded that there are three relatively higher permeability zones on the site acting as water bearing zones – Shallow (10 – 15 to 19 – 23 feet bgs), Middle (19 – 23 to 32 – 36 feet bgs), and Deep (32 – 36 to 43 – 47 feet bgs) – with an Upper Shallow zone (at approximately 2 to 6 feet bgs) noted in a few of the borings. In several locations, an insufficient amount of water was present in the potential water bearing zones, so no groundwater samples were obtained by SOMA. Since wells EA-1, EA-2, EA-3, and MW-1 are screened across the various water bearing zones at the site,

SOMA recommended that these wells be destroyed to prevent them from acting as vertical conduits for the migration of the contaminants. SOMA also recommended that wells be installed in the Shallow, Middle, and Deep zones at the site to determine the groundwater flow directions in the various zones.

In November 2004, Pangea Environmental Services, Inc. (Pangea) of Oakland, California, assumed the lead role as consultant for Mr. Hadjian. During first, second and fourth quarters of 2005 and the first quarter 2006 groundwater monitoring events free product was again observed in well MW-3.

In February 2005, Pangea prepared a soil and groundwater investigation workplan, which included an evaluation of local and regional geology and hydrogeology, a review of soil and groundwater sampling data from the site (including detailed cross sections), a conduit study, and a sensitive receptor survey to assess potential impacts to wells and surface water bodies. The closest water supply well was identified approximately 1,900 feet southwest of the site, and was not considered to be potentially impacted by site contamination. The adjacent flood control channel is the only nearby surface water body that could potentially be impacted by site contamination. The workplan recommended installing borings along the sanitary sewer line in Dublin Boulevard and destruction of select wells screened across multiple water-bearing zones. The workplan also recommended installation of new monitoring wells within the multiple water-bearing zones and implementation of interim remediation using vacuum extraction to remove groundwater and free product from selected site wells. During subsequent correspondence, ACEH requested installation of a soil boring (SB-2) downgradient of the 1997 release.

During workplan implementation in March through May 2006, Pangea installed fourteen monitoring wells (MW-3A, MW-6A, MW-6B, MW-7AA, MW-7A, MW-7B, MW-7C, MW-8A, MW-9A, MW-9C, MW-10A, MW-10C and MW-11C) to help define the vertical and lateral extent of groundwater contamination. Pangea abandoned wells EA-1, EA-2, EA-3 and MW-3 to reduce the risk of vertical contaminant migration and improve the quality of monitoring data. Pangea drilled three soil borings (SB-1, SB-1A and SB-2) to help evaluate subsurface conditions downgradient of the 1997 release and north of the site, and the potential for contamination migration along the 18-inch sanitary sewer line in Dublin Boulevard. Soil borings SB-1 was located near the intersection of Dublin Boulevard and Village Parkway and boring SB-1A was located approximately 3 ft south of SB-1. Results are detailed in the August 11, 2006 Site Investigation Report prepared by Pangea.

Site Remediation of New Release

In July 2006, Pangea conducted vacuum extraction from well MW-3A and MW-7AA using a vacuum truck. The vacuum extraction was conducted to provide cost-effective removal of source area material and additional information about subsurface conditions. The results of the vacuum extraction led Pangea to recommend conducting *short-term feasibility testing/source removal* on key site wells (MW-3A, MW-7AA, MW-7A, MW-6A) detailed in the August 11, 2006 *Site Investigation Report.* ACEH approved the proposed feasibility testing and requested a corrective action plan (CAP) in a letter dated November 9, 2007. The ACEH letter also approved discontinuance of groundwater monitoring of C-zone wells, because monitoring data suggested the C-zone was not impacted.

In November 2007, Pangea conducted a five-day dual-phase extraction (DPE) test (and interim remediation event) to evaluate the effectiveness of DPE as remedial technique and to provide additional source removal. On December 9, 2008, Pangea submitted an *Interim Remediation Report and Corrective Action Plan* (CAP) describing DPE testing and proposing short-term dual phase extraction (DPE) as the most appropriate and cost-effective technique for site remediation. In a letter dated January 16, 2009, ACEH approved short-term DPE for additional source removal to help facilitate case closure.

In July 2009, Pangea installed two dual-phase extraction (DPE) wells to facilitate implementation of the approved DPE corrective action plan (CAP). Wells DPE-1 and DPE-2 were constructed of 4-inch diameter and screened from 9 to 14 feet bgs. Details of the DPE well installation are described in Pangea's *Remediation Well Installation Report* dated December 16, 2009.

To remediate the small localized impact area, DPE was conducted between September 15, 2010 and November 15, 2010 until low contaminant removal rates were observed. The DPE system operated for a total of about 1,189 hours (approximately 50 days). Laboratory analytical data indicates that the system removed a total of approximately 443 lbs TPHg and 3.8 lbs benzene in vapor phase, and 0.4 lbs TPHg, 0.01 lbs benzene and 0.25 lbs MTBE in aqueous phase. The vapor-phase removal rates during DPE ranged from approximately 2.6 to 20 lbs/day TPHg and 0.01 to 0.34 lbs/day benzene. The groundwater extraction rate was initially 1.2 gallons per day (gpd) and 0.24 gpd at the end of short-term DPE. The DPE system was shutdown on November 15, 2010 due reduced removal rates and commencement of the winter rainy season and for cost control. DPE operation was very costly due to high energy costs, because PG&E could not provide electrical service before the rainy season and PG&E required very costly re-engineering of the existing electrical service ($20,000 or more). The utilized DPE equipment required diesel fuel and a diesel generator to power the vacuum pump and required propane as supplementary fuel for the oxidizer.

AGENCY COMMENTS AND REQUEST FOR CAP ADDENDUM

Pangea presented a bioremediation workplan in the *Groundwater Monitoring Report and Bioremediation Workplan* dated July 19, 2011. The workplan proposed low-cost bioremediation involved biosparging using existing subsurface conduits and introduction of a bio-organic catalyst (BOC). In an email dated, June 20, 2012 (Appendix A), ACEH requested a CAP Addendum to (1) support implementation of 'air sparging' implementation the use of air sparging and (2) provide data on the effectiveness of the proposed bio-organic compound. The ACEH letter also reiterated Pangea's statement in the workplan that dual phase extraction (DPE) efforts implemented in 2010 apparently contributed to increased and persistent hydrocarbon concentrations in slightly deeper wells MW-3A and MW-6A located further from the source area and near the adjacent sanitary sewer.

ACEH Comment on Air Sparging

ACEH's June 20, 2012 email provided the following comment: **"**Pangea's *Interim Remediation Report and Corrective Action Plan (CAP)* dated December 9, 2008 concluded that air sparging (AS) alone is not considered to be a preferred remedial method, stating that AS alone could cause lateral migration of contaminants within the thin water-bearing lenses at the site and could also potentially result in increases to indoor air inhalation hazards for the onsite and adjacent buildings." To facilitate further review and evaluation by ACEH of the proposed biosparging technique, ACEH required submittal of a CAP addendum to support AS implementation.

Pangea Response: Pangea's workplan did not propose 'air sparging' but rather proposed 'biosparging'. Pangea's CAP also stated that AS can be performed at *low flow* rates to allow groundwater oxygenation without causing lateral migration of hydrocarbons, in a process considered 'biosparging'. Traditional AS is generally performed at higher air flow rates to strip hydrocarbons from groundwater and saturated soil for capture by SVE or DPE. Biosparging, however, involves air injection at much lower flow rates to provide oxygen to stimulation biodegradation of hydrocarbons. This is especially applicable to this site, since hydrocarbons are apparently present within fine-grain materials surrounded by coarse-grain materials. Low flow air sparging (biosparging) is a cost effective technique to provide oxygen via coarse-grain materials to stimulate hydrocarbon degradation of residual contamination that slowly diffuses out of the fine-grained materials. Therefore, with lower air flow rates the potential for causing contaminant migration via biosparging is significantly minimized.

Pangea also notes that the secondary source area is now much smaller than during CAP preparation, when impact was present in well MW-7AA located closer to the site building. Site impact is now primarily limited to wells MW-3A and MW-6A located adjacent Dublin Blvd and more distant from site buildings. The smaller impact area and greater distance to potential onsite receptors reduces the potential concern associated with potential migration of hydrocarbons induced by biosparging or other site remedial action.

Finally, any hydrocarbons mobilized by air injected at low flow rates would be mobilized in the presence of oxygen to help biodegrade the hydrocarbons. Site monitoring can be performed to evaluate hydrocarbon mobilization, and to allow mitigation measures to reduce or eliminate hydrocarbon mobilization.

Based on successful biosparging at other sites, Pangea proposes biosparging for this site.

ACEH Comment on Bio-Organic Catalyst

ACEH's June 20, 2012 email also provided the following comment: "Pangea proposes to augment the biodegradation provided by the biosparging system with a bio-organic catalyst product called NONTOX™ – TPH Eliminator. Pangea states that they are using this 'relatively new and understudied product' at another site, and therefore in order to evaluate the use of the product at the subject site, please include data on the effectiveness of the product in the CAP Addendum."

Pangea Response: Regulatory approval for the use of BOC has been received from the following agencies: San Francisco Regional Water Quality Control Board (2 sites), San Francisco Department of Public Health-Local Oversight Program, and Alameda County Environmental Health. For two sites, BOC is used with water flushing for distribution and biosparging for added distribution and dissolved oxygen supply. For two other sites, dual phase extraction is used to help pull BOC across residual source area and to capture BOC.

Pangea is currently using NONTOX™ for an Oakland site at 1230 14th Street under oversight by ACEH. Recent data for NONTOX use at that site is included in the *Groundwater Monitoring and Remediation Report-Second Half 2012* dated February 27, 2013 (please refer to report in ACEH files or on Geotracker database). The remedial approach at this site involving DPE, AS and NONTOX™ has apparently significantly improved site conditions. BOC injection apparently increased hydrocarbon removal achieved by DPE by approximately 100 percent for *vapor*-phase removal, and more dramatically for *aqueous*-phase removal: influent concentrations to the water treatment system increased about 4-fold for benzene, 10-fold for TPHg. In addition, no hydrocarbon migration has been observed at the site.

Pangea is also currently using NONTOX™ to enhance DPE efforts for a site at 2799 Clayton Road, Concord, significantly improving site conditions without any observed hydrocarbon migration. Data for this Concord site is presented in the *Groundwater Monitoring and Remediation Report-Second Half 2012* dated December 10, 2012 (please refer to report on Geotracker). At this site, BOC injection apparently increased hydrocarbon removal achieved by DPE by approximately 10 fold for *vapor*-phase removal (3.8 lbs/day to >20 lbs/day), and more dramatically for *aqueous*-phase removal. Following the initial use of BOC in early March 2012, influent concentrations to the water treatment system increased as follows: from 13 µg/L to 330 µg/L benzene (>100-fold increase), 180 µg/L to 280,000 µg/L TPHg (>1,000-fold increase), and 770 µg/L to 480,000 µg/L TPHd (~1,000-fold increase). After several BOC injection episodes, influent concentrations continue to significantly increase following BOC use, although not quite as dramatically. In addition, no hydrocarbon migration has been observed at the site.

Based on the success at these sites, our CAP Addendum incorporates DPE (and DPE enhanced with BOC) as a contingent approach if deemed necessary to address ACEH concerns.

REMEDIAL OBJECTIVE

The objective of the proposed remediation is to provide additional removal of secondary source material in a very cost effective manner. Additional remediation can be conducted cost effectively using existing wells and underground remediation piping. Residual impact may be migrating through the adjacent preferential pathway (sanitary sewer backfill). To date, only limited remediation has been completed at the site. Prior DPE was discontinued after approximately 50 days of operation due to commencement of the rainy season and significant fuel cost to power the DPE equipment (as detailed in site background).

REMEDIAL APPROACH FOR CAP ADDENDUM

Consistent with the July 19, 2011 workplan, Pangea proposes to perform enhanced biosparging. In response to ACEH concerns, Pangea has modified the workplan as follows:

- Biosparging – Pangea will commence remediation using biosparging *alone*.

- Revised Monitoring Program – During biosparging, Pangea will implement a revised monitoring program for key wells to evaluate for potential hydrocarbon migration. The revised program includes quarterly rather than semi-annual monitoring, and monitors for migrating hydrocarbons and NONTOX components. Also note that Pangea proposes biosparging in only two key wells (MW-3A and MW-6A), now using well MW-7A for migration monitoring rather than biosparging. If any hydrocarbon migration is observed during biosparging, biosparging will be discontinued and contingent short-term DPE may be recommended.

- Limited NONTOX Volume to Enhance Biosparging – Following lack of observed hydrocarbon migration during monitoring, Pangea will inject a small volume (1 gallon) of NONTOX to enhance biosparging efforts. Note the proposed NONTOX volume of 1 gallon is significantly lower than the previously proposed injection amount.

- Contingent Short-Term DPE – Following any observed hydrocarbon migration during enhanced biosparging, NONTOX use will be discontinued. If necessary to address any significant hydrocarbon migration or to provide additional source removal, contingent short-term DPE (or enhanced DPE) would be performed.

The proposed CAP Addendum approach is detailed below. For clarity and ease of ACEH review, Pangea includes and modifies the prior workplan information.

Biosparging

To target residual impact in select wells (MW-3A and MW-6A), Pangea proposes biosparging using existing subsurface piping as a cost effective remedial technique. Figures 2 and 3 illustrate the approximate extent of TPHg and benzene impact in groundwater, respectively, based on recent monitoring. Figure 4 illustrates that the estimated primary influence area for enhanced biosparging in wells MW-3A and MW-6A targets residual hydrocarbon impact in site groundwater.

Biosparging Technique

Biosparging is a technique used to stimulate degradation of residual contaminants that slowly diffuses out of fine-grained materials at a given site. Biosparging can cost effectively remediates petroleum hydrocarbons and MTBE from saturated soil and groundwater, and can even help remediate vadose zone soil (a process called bioventing). Biosparging involves the injection of compressed air at low flow rates (generally 1 to 2 cubic feet per minute per injection point) into the saturated zone to oxygenate groundwater and thereby stimulate contaminant biodegradation by microbes present in the subsurface. The low air flow rate is designed to oxygenate groundwater within the well and/or surrounding formation while minimizing the potential for causing any significant migration of contaminants in the vapor phase.

Biosparging wells are typically constructed with well screens starting approximately 5 to 10 feet below the water table. The submerged well screen allows the injection of air directly into the formation for a greater influence area. Biosparging can be conducted into groundwater monitoring wells screened at shallower depths, but this approach provides a more limited influence area and primarily oxygenates the well water and relies on the diffusion of dissolved oxygen from the well into the surrounding soil. Biosparging in existing monitoring wells is also more dependent upon the groundwater velocity at a site.

Biosparging is very cost effective since the remedial approach only involves procurement of a small to medium-sized air compressor to inject air into the subsurface, and use of existing or new wells screened into the water table at appropriate depths. This approach is even more cost effective at this site because we can utilize existing subsurface piping to the proposed wells.

Site Biosparging Approach

Pangea proposes to perform biosparging using existing piping to wells MW-3A and MW-6A. Given a groundwater depth of approximately 10 to 11 ft bgs, well MW-6A well screen interval of 15 to 20 ft bgs is ideally suited for biosparging. The submerged well screen will allow injected air to move and diffuse laterally within the shallow groundwater-bearing materials. Screened from 10 to 17 ft bgs, well MW-3A is also amenable to biosparging but the air injection will be more localized around the well because the well casing and shallower filter pack may not provide lateral air injection into surrounding soil: biosparging in MW-3A

will rely more on oxygen diffusion from MW-3A into the well vicinity. (Pangea no longer proposes biosparging in well MW-7A: well MW-7A will be used to monitor for potential hydrocarbon migration).

To conduct biosparging at this site, Pangea will procure and install a small air compressor and associated controls in the existing equipment compound. Air valves and meters will be used to regulate air flow rates into wells MW-3A and MW-6A. Tubing will be installed from the air compressor to the sparge wells within the existing remediation piping, and air diffusers will be installed in each well to optimize oxygenation of the water within the well casing to total well depth. Single-phase electrical service will be obtained from the nearby service on the nearby vacuum island associated with the carwash facilities.

Pangea anticipates performing operation and maintenance (O&M) visits at the site on a weekly basis initially and monthly thereafter. Pangea will monitor the air flow rates and air pressures required to perform low flow air injection in the biosparge wells. Groundwater and migration monitoring is described below.

Enhanced Biosparging (using Bio-Organic Catalyst)

Bio-Organic Catalyst Background

To augment the biodegradation provided by the biosparging system, Pangea proposes to use a relatively new bio-organic catalyst product called NONTOX™-TPH Eliminator. NONTOX™ is a low-cost, innovative and 'green' product with potential applicability for a wide range of sites impacted by petroleum hydrocarbons. Pangea is currently using NONTOX™ at one site and has proposed use at other sites. If successful, this remedial technology may be able to help control remediation costs across the state of California where reimbursement from the UST Cleanup Fund is increasingly limited.

"NONTOX™-TPH Eliminator" is a highly concentrated bio-organic catalyst (BOC) in liquid form designed to accelerate the biodegradation rates of petroleum hydrocarbons. Petroleum hydrocarbons are decomposed, eventually degrading to carbon dioxide and water as end products. NONTOX™ is non-toxic, 100% biodegradable, and safe to human, animals and plant life. NONTOX™ is mostly water, proteins, and enzymes derived from plant and mineral sources. NONTOX™ works in concert with indigenous bacteria. NONTOX™ behaves similar to a surfactant and forms small bubbles when agitated by air injection (or shaking of product within a jar or treatment cell). NONTOX™ is primarily comprised of enzymes derived from yeast. NONTOX™ has been used effectively on open water spills of petroleum crude oil. Product literature for NONTOX™ is included in Appendix B.

Site Approach for Enhanced Biosparging

For this site, NONTOX™ will be injected into existing wells and dispersed further into the subsurface using the existing biosparge system. The NONTOX™ should help biodegrade the recalcitrant the longer-chain TPHg molecules in site groundwater and adsorbed to site soil. NONTOX™ reportedly decreases surface tension to help distribute the blend of oxygen and enzymes/proteins. The small bubbles formed by the NONTOX™

reportedly forms tiny bubbles should help transport oxygen throughout the subsurface. Bringing the enzymes, oxygen and contaminants together is the key to accelerated biodegradation achieved by NONTOX™. In summary, biosparging will help agitate the NONTOX™ to create bubbles and help 'activate' the surfactant qualities of the BOC, bringing together the NONTOX™ enzymes, oxygen and contaminants for enhanced biodegradation. Due to the relatively low cost of NONTOX™ and the use of the existing wells and planned biosparging system, this technique is very cost effective for this site.

Limited Injection Volume

NONTOX™ will be injected into wells MW-3A and MW-6A. Pangea will initially inject approximately 1 gallon of NONTOX™ into each of these 2 wells, followed by flushing/dispersion with approximately 10 gallons of water. Assuming no hydrocarbon migration observed during monitoring, Pangea will inject 1 additional gallon of NONTOX™ into each well and flush with water on a quarterly basis. Pangea plans to perform a total of approximate 4 to 6 quarterly NONTOX™ injection events. This yields a total injection of 8 to 12 gallons of NONTOX™.

Monitoring of Remedial Effectiveness and Hydrocarbon Migration

To evaluate the effectiveness of biosparging and enhanced biosparging, Pangea will implement the monitoring program presented below in Table A. The program involves monitoring of biosparge/injection wells MW-3A and MW-6A, and nearest shallow wells MW-7AA, MW-7A, and MW-9A. Baseline monitoring will be performed before commencement of biosparging. As schedule allows, baseline and quarterly monitoring will be performed in conjunction with routine groundwater monitoring.

Table A - Biosparge and Enhanced Biosparge Monitoring Program

Wells	Hydrocarbons[1]	DO/ORP	Field Observations[2]	2-Propanol	CTAS
Remediation Wells (MW-3A & MW-6A)	Baseline & Quarterly	Baseline & Quarterly	Quarterly	Quarterly	---
Observation Wells (MW-7AA, MW-7A & MW-9A)	Baseline & Quarterly	Baseline & Quarterly	Quarterly	Quarterly	If 2-Propanol detected or hydrocarbon migration suspected
Purge 3 well casings before sampling 1 = TPHg/BTEX/MTBE by EPA Method 8015m/8021 2 = Visual observation for bubbles/foaming and reduced surface tension within grab groundwater samples DO = Dissolved oxygen using field meter (down well, pre- and post-purge readings) ORP = Oxidation-reduction potential using field meter (above well, pre- and post-purge readings) 2-Propanol by EPA Method 8260 CTAS = Non-ionic foaming agents (cobalt thiocyanate active substances [CTAS]) using Standard Method SM5540BD					

As shown in Table A, Pangea will monitor for the presence of NONTOX™ using visual indicators (pale amber water color and foam/bubbles in shaken sample), since makes water cloudy and acts like a surfactant.

Decreased viscosity on a plate glass sample is also indicative of BOC presence. Pangea will also submit groundwater samples for analysis for 2-propanol, a component of NONTOX™ as previously identified by an analytical laboratory. In the event 2-propanol or elevated hydrocarbon concentrations are detected in observation wells, Pangea will also analyze groundwater samples from observation wells for non-ionic foaming agents. Prior analytical testing of NONTOX™ reported elevated concentrations of non-ionic foaming agents for this product.

Contaminant concentration reduction is the best indicator of biosparging effectiveness. Pangea anticipates that contaminant concentrations in site monitoring wells will decrease as a result of biosparging. The above quarterly monitoring is proposed to evaluate biosparging effectiveness and potential hydrocarbon migration.

Contingent Short-Term DPE

Short-Term DPE

If any hydrocarbon migration is observed during biosparging or enhanced biosparging, those techniques will be discontinued and contingent short-term DPE may be recommended. Short-term DPE is expected to be an effective technique for site remediation, since approximately 50 days of DPE in 2010 provided sound hydrocarbon removal and improved site conditions, especially for source are wells MW-7AA and DPE-2. As shown on Figure 5, the estimated influence area for enhanced DPE on wells MW-3A and MW-6A targets residual hydrocarbon impact in site groundwater. For cost control, DPE may be performed using a vacuum truck or brief rental of DPE equipment. Short-term DPE would be performed for 5 to 30 days depending on hydrocarbon removal rates.

Well MW-3A is screened from 10 to 17 ft bgs, while well MW-6A is screened from 16 to 20 ft bgs. To the extent practical, remediation would use the existing underground piping to these wells, and the existing aboveground piping, equipment compound, and electrical service. Temporary aboveground piping with traffic ramps may also be used to control cost.

DPE will induce vapor and water flow primarily from the more permeable soil units, encouraging contaminant volatilization and diffusion from the surrounding fine-grained materials as the subsurface is dewatered. Based on the amount of water produced during prior DPE (from 0.24 to 1.2 gpd), Pangea will select cost effective storage and disposal of extracted groundwater. Extracted water will be disposed offsite via vacuum truck or via temporary storage in an aboveground tank prior to permitted discharge permit to the sanitary sewer (Dublin San Ramon Services District). Pangea plans to use a vacuum truck or rent trailer-mounted equipment with an existing permit from the BAAQMD. The equipment will likely include a 20 hp liquid-ring vacuum pump with a catalytic oxidizer.

DPE Enhanced With NONTOX

If short-term DPE is performed at this site, Pangea recommends enhancing DPE with NONTOX. Pangea has effectively used this approach at other site (including with oversight by ACEH), as referenced above. During prior DPE at the site, less remedial effectiveness was observed in wells MW-3A and MW-6A compared to MW-7AA and DPE-2. The effectiveness of historic DPE remediation may have been partially limited by residual hydrocarbons sorbed to fine-grain saturated soil; BOC use should help desorb residual hydrocarbons for capture by DPE and help accelerate natural attenuation of residual hydrocarbons via biosparging. Use of the desorbing agent should help decrease the duration of active DPE and provide greater cost effectiveness.

If implemented at this site, Pangea would perform enhanced DPE as follows:

- Add about 2 gallons of hydrocarbon-desorbing agent (NONTOX) into wells MW-3A and MW-6A approximately 48 hours before DPE startup. To help distribute the BOC into the subsurface, Pangea will add a larger volume of water (about 20 gallons) into each well on an approximate 1:10 ratio of BOC to water.
- Perform initial short-term DPE lasting approximately 1-3 days, while monitoring recovery of hydrocarbons and NONTOX.
- Repeat NONTOX addition and 3-day DPE for approximately 2 to 4 additional events, until hydrocarbon recovery rates no longer increase following NONTOX use and subsequent extraction via DPE.

Monitoring of DPE and observation wells would be performed using methods included above in Table A. Groundwater extracted from DPE wells would be analysed for petroleum hydrocarbons (TPHg/BTEX/MTBE) at startup and daily to document hydrocarbon removal rates during DPE. At the completion of DPE, Pangea would monitor groundwater from DPE and observation wells for residual NONTOX and other parameters in Table A.

Reporting

Site remediation activities will be summarized in quarterly reports. The reports will present tabulated remediation data, evaluate remedial performance, and include recommendations for future site activity.

Schedule

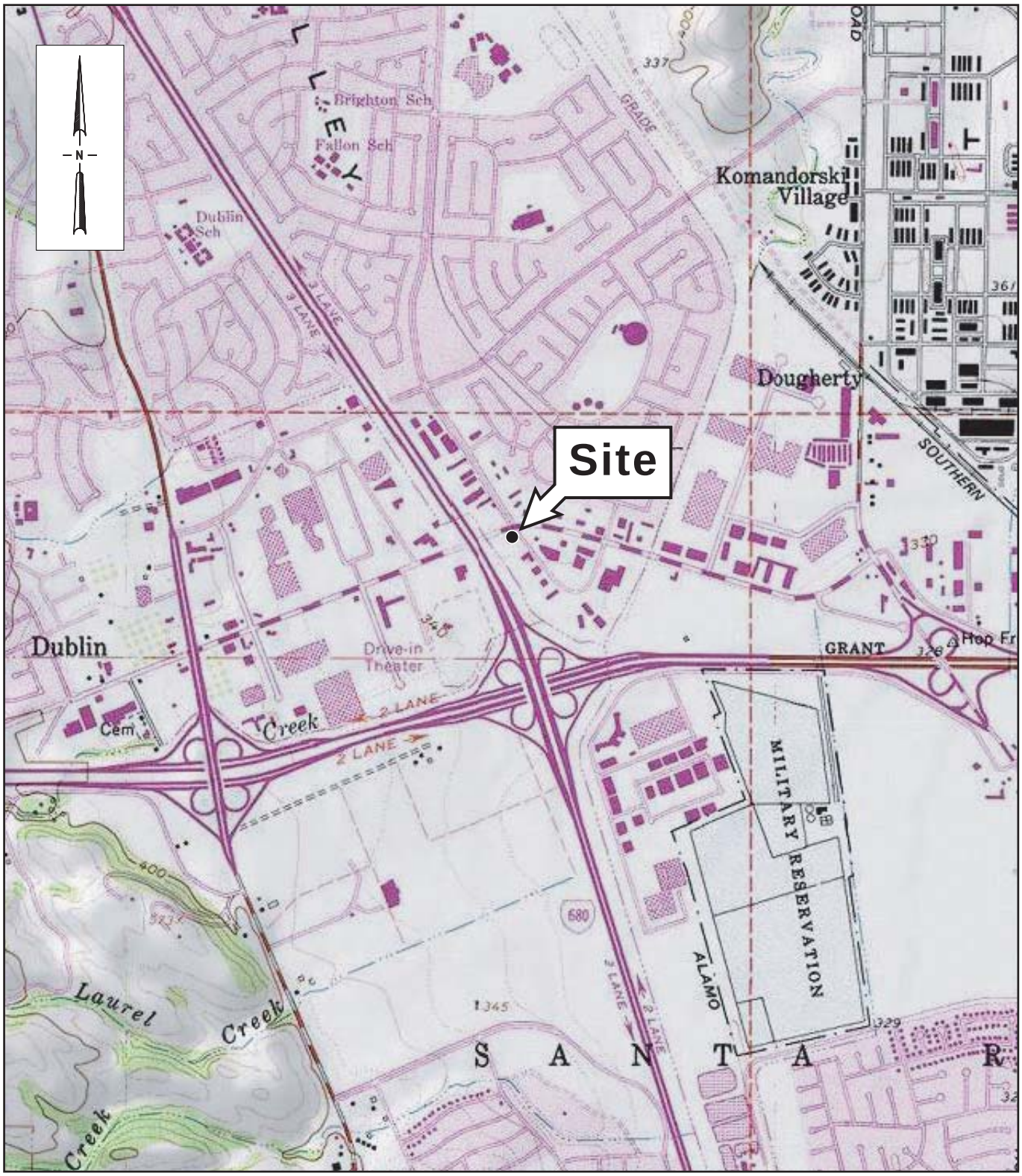
To help facilitate secondary source removal, Pangea respectfully requests your approval of the proposed bioremediation at your earliest convenience. The UST Cleanup Fund placed this site in the CAP/REM category and allocated a budget of $75,000 for the fiscal year 2012/2013. With prompt agency approval Pangea can commence implementation of the CAP Addendum during this fiscal year.

ATTACHMENTS

Figure 1 – Vicinity Map
Figure 2 - Extent of TPHg in Shallow Groundwater
Figure 3 - Extent of Benzene in Shallow Groundwater
Figure 4 - Estimated Biosparging Influence in Shallow Groundwater
Figure 5 - Estimated DPE Influence in Shallow Groundwater (Contingency)

Appendix A – Agency Correspondence
Appendix B – Product Information for Bio-Organic Catalyst

2/17/2005



SOURCE: TOPO! MAPS

0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

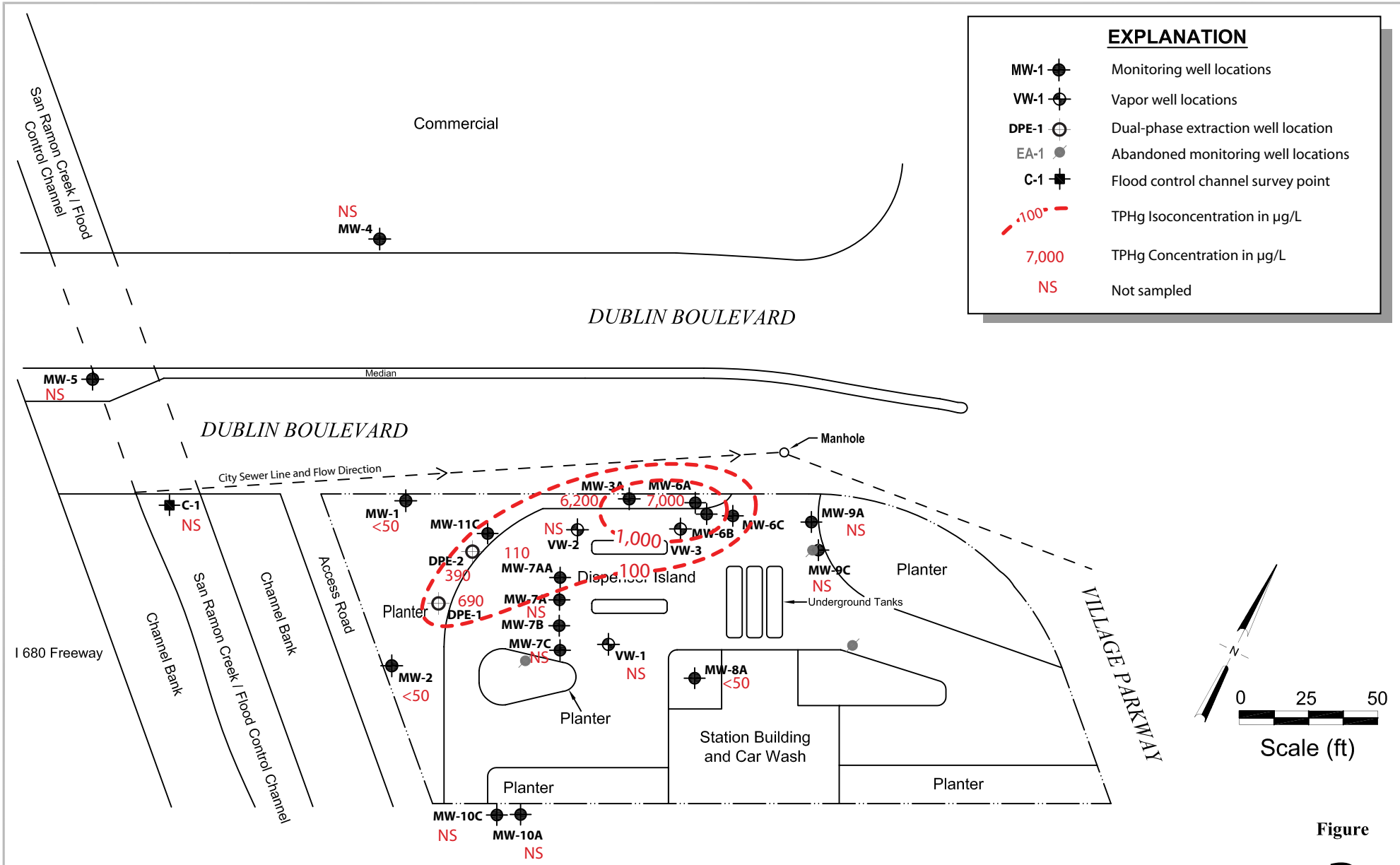
Figure 1

Dublin Auto Wash

7240 Dublin Boulevard
Dublin, California

PANGEA

Site Location Map



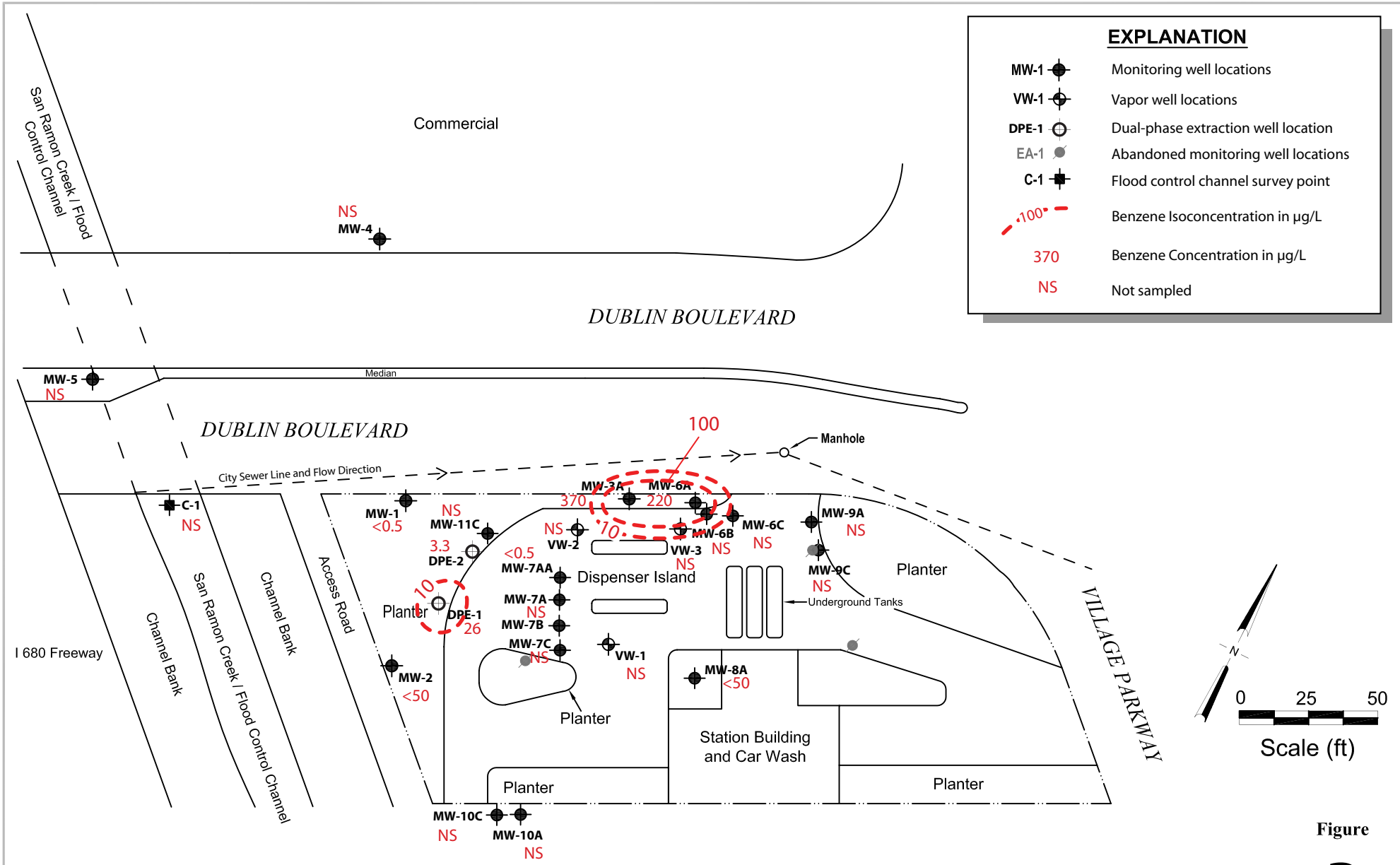
Figure

2

Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California

PANGEA

Extent of TPHg in Shallow Groundwater
August 25, 2012



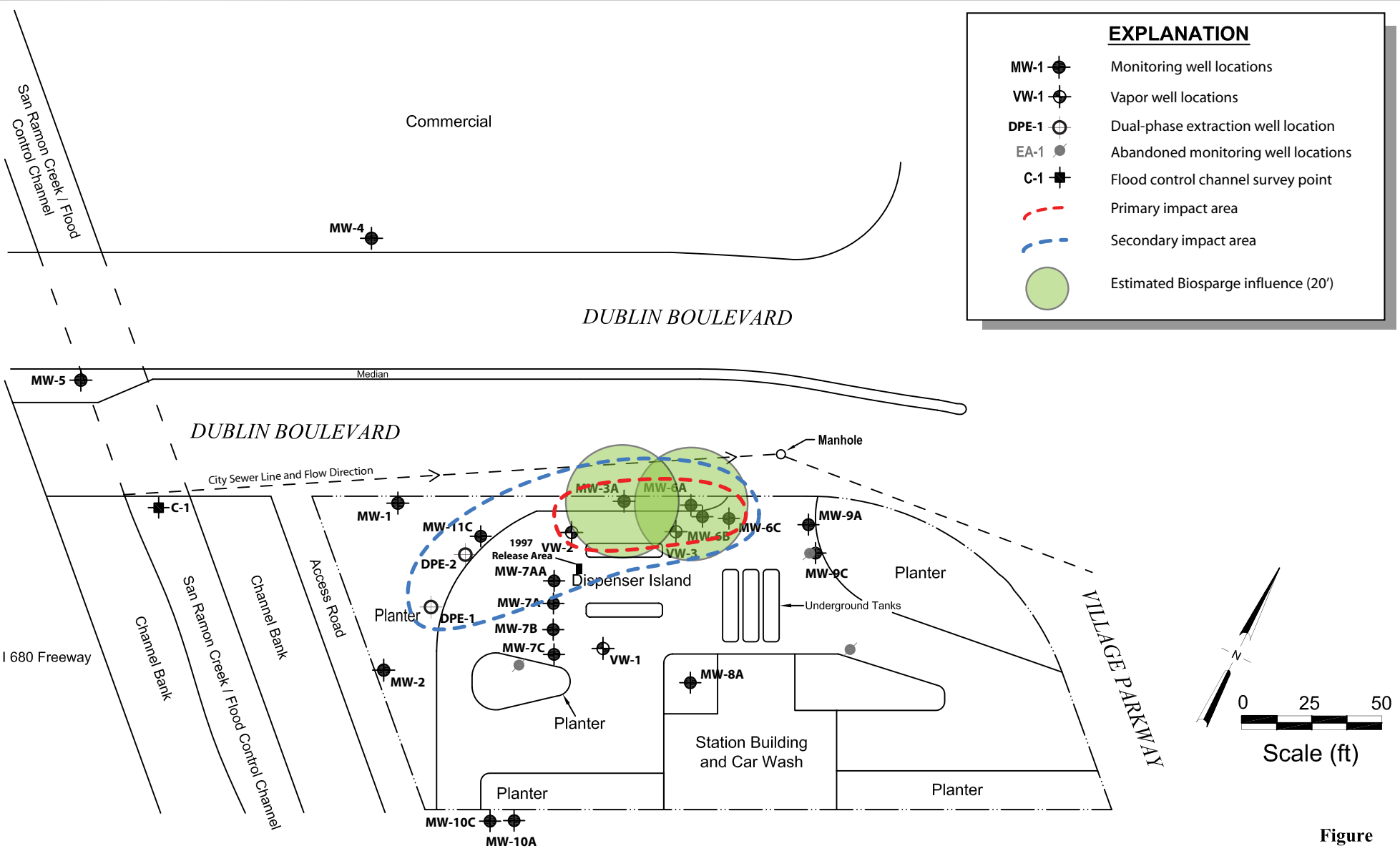
Figure

3

Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California

PANGEA

Extent of Benzene in Shallow Groundwater
August 25, 2012



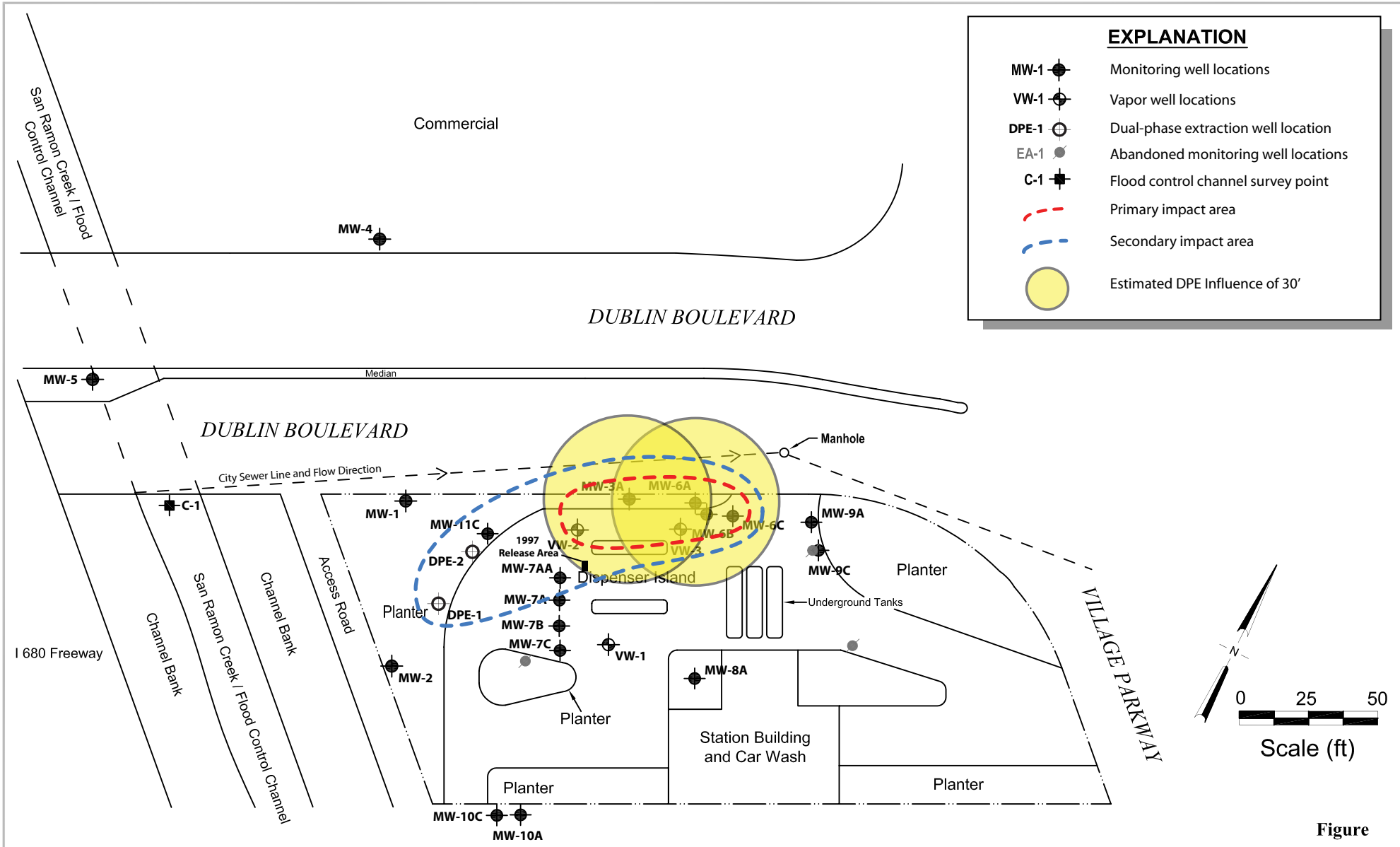
Figure

4

Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California

PANGEA

Estimated Biosparge in Shallow Groundwater



Figure

5

Dublin Auto Wash
7240 Dublin Boulevard
Dublin, California

PANGEA

Estimated DPE in Shallow Groundwater (Contingency)

APPENDIX A

Regulatory Correspondence

From: Roe, Dilan, Env. Health
To: "Bob Clark-Riddell"
Cc: "ellielange@aol.com"
Subject: RE: ACEH #304 - 7240 Dublin Blvd, Dublin
Date: Wednesday, June 20, 2012 3:05:00 PM

Bob:

I have been reviewing the case files for the subject site and the proposed bioremediation workplan for continued site investigation presented in Pangea's Groundwater Monitoring Report and Bioremediation Workplan – Second Quarter 2011 dated July 19, 2011. In the workplan, Pangea states that the dual phase extraction (DPE) efforts implemented at the site in 2010, apparently contributed to increased and persistent hydrocarbon concentrations in slightly deeper wells MW-3A and MW-6A located further from the source area and near the adjacent sanitary sewer, and proposes to perform low-flow air sparging (AS) as a low-cost remedial alternative.

However, in the evaluation of remedial alternatives presented in the Interim Remediation Report and Corrective Action Plan (CAP) prepared by Pangea and dated December 9, 2008, and approved by ACEH CAP, Pangea concludes that AS is not considered to be a preferred remedial method for this site and could cause lateral migration of contaminants within the thin water-bearing lenses at the site and could also potentially result in increases to indoor air inhalation hazards at building on and adjacent to the site. Therefore, as discussed during our phone conversation this afternoon, in order to facilitate further review and evaluation by Alameda County Environmental Health (ACEH) of the proposed biosparging technique, you will be required to submit an addendum to the CAP to support AS implementation. Additionally, Pangea proposes to augment the biodegradation provided by the biosparging system with a bio-organic catalyst product called NONTOX – TPH Eliminator. Pangea states that they are using this "relatively new and understudied product" at another site, and therefore in order to evaluate the use of the product at the subject site, please include data on the effectiveness of the product in the CAP Addendum.

I will follow this email up with a formal directive letter regarding the submittal of a CAP addendum and associated compliance dates, as well as my technical comments based on my review of recently submitted groundwater monitoring reports and DPE remediation summary reports. Please forward this email to the Responsible Parties, Mr. Hooshang Hadjian and Mr. Mark Inglis (Chevron) and copy me so that I have their addresses in my files for all future correspondence.

Regards,

Dilan Roe, P.E.
Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502
510.567.6767; Ext. 36767
QIC: 30440
dilan.roe@acgov.org

APPENDIX B

Product Information for Bio-Organic Catalyst

NONTOX™

Petroleum Hydrocarbon Remediator:

The cleaning and remediation of petroleum hydrocarbon contaminated water and soils is a fundamental environmental challenge that impacts most industries and transportation systems, including shipping. NONTOX™ is a specially formulated bio-organic catalytic composition which greatly accelerates remediation rates, at very low relative cost compared to traditional remediation technologies.

NONTOX™ provides a superior cleaning capability when used to wash petroleum hydrocarbon based contaminates, and then allows for their subsequent accelerated remediation, so that the cleaning/remediation process is combined together into a synergistic and complementary procedure.

NONTOX™ is a highly concentrated bio-organic catalyst composition formulated to provide an instant protection from auto ignition risks from petroleum hydrocarbon spills and wastes, and greatly accelerates biodegradation of these hazardous compounds in both water and soil applications.

Benefits:

- Immediate protection from auto ignition of petroleum hydrocarbons
- Able to provide superior cleaning of oil coatings and wastes
- Accelerates biodegradation rates of petroleum hydrocarbons
- Reduces costs associated with soil and water remediation procedures
- Provides treatment to most petroleum hydrocarbon contamination
- Helps in the precipitation of metals in wastewater discharges
- Acts quickly to effectively remove highly soluble elements
- Limits the formation of anoxic "dead zones"

USDA
Approved
Safe
Non-Toxic
Biodegradable

Biodegradation certified by the TUV Rhineland Institute for Environmental Protection and Energy Technology for Republic of Germany.

General Description

NONTOX: PETROLEUM HYDROCARBON REMEDIATION/CLEANING

- Is a biocatalytic system in a liquid concentrate form that stimulates and accelerates natural biological reactions. When combined with fresh or salt water and o xygen, the product will cause crude oil, jet fuel, diesel oil and other organic substances to rapidly decompose, eventually biodegrading them to carbon dioxide and water as end products.

- It is non-toxic and safe to humans, animals, marine life and plant life. It is 100% biodegradable.

- Works in concert with indigenous bacteria. No cultured or foreign bacteria are introduced into the ecosystem.

- Is nonflammable. It will reduce fire hazards by increasing flash points and autoignition threshold points in substances such as gasoline or fuel oil.

- Eliminates obnoxious odors associated with crude oil, petroleum derivatives and other organic molecules that are proceeding through the natural decomposing process.

- Is fully compatible with most types of application equipment now in use. The product may be easily applied by hand or power sprayers, helicopter, airplane or floating equipment. Its application requires no special safety equipment.

TARGETED HYDROCARBON CONTAMINANTS

In this case, the hydrocarbon compounds found in water, soil and air are the selected targets of NONTOX. This would include such petroleum derived products as crude oil, drilling muds, creosote, kerosene, coal tars, gasoline, diesel, bunker fuels, lubricating and hydraulic fluids. Other contaminant groups would include aliphatic and aromatic hydrocarbons, poly nuclear aromatic hydrocarbons, chlorinated aliphatic compounds, chlorinated aromatic compounds and chlorinated and non-chlorinated phenols.
It has been shown that the product has unique features in odor elimination of such gases as hydrogen sulfide, ammonia, mercaptan and other noxious odors emanating from anaerobic decomposition. The odor degradation activity happens in a very short period and effectively eliminates volatilization of light chain organic molecules, such as the BTEX group of petrochemicals, into the atmosphere.

TREATMENT METHODOLOGY

The product is fully compatible with most types of application equipment now in use. NONTOX may be easily applied with hand or power sprayers, standard educator tubes, helicopters, airplane or floating equipment. No special nozzles or hoses are required. Each

treatment site may differ in its requirements and modality of treatment. Factors that can influence the tactical use of NONTOX are:
Redo Potential Temperature Availability of Nutrients Nature and Concentration of Contaminants pH Heavy Metals Should these variables complicate the application and treatment procedures, the NONTOX works well with other commonly accepted treatment modalities such as venting, injection aeration, aeration lagoons and enoculants for removal of heavy metals.

Water or Beach Spills

Reducing the danger of oil reaching beaches and shore structures is best achieved by spraying the oil slick perimeter with a diluted solution of 10 gallons of NONTOX mixed with 150 gallons of sea water or fresh water for each 40,000 square feet of surface area to be treated. If the slick has a heavy consistency, it is recommended that a 1:15 diluted NONTOX solution is applied over a three-day period, using one-third of the mixed solution each day. For best results, the product should be applied at a high pressure – generally above 500 psi.

TECHNICAL DATA

Bacterial Proliferation

The successful biodegradation of petroleum is dependent on two factors: 1) having the bio-organic catalyst reduce the petroleum to a form, which can be readily assimilated, by bacteria and 2) stimulating the proliferation of naturally occurring nonpathogenic heterotrophic bacteria. NONTOX to significantly increase beneficial bacterial activity in bay water by 12,857% and ocean water by 14,333%.

Accelerated Bioremediation

Independent laboratory studies from specialists in petroleum technology have quantified the ability of NONTOX to dramatically reduce petroleum contaminants.
showing a 90% reduction in Jet-A, Diesel-2 and Heavy Duty Lube Oil within 96 hours. While treatment time required may vary dependent on conditions previously noted, the mode of action is the same. NONTOX is a unique biocatalytic system that accelerates natural biological reactions with hydrocarbon products in water.

METAL CONTAMINANT PRECIPITATION

Another benefit of NONTOX use is its ability to break the matrix that suspends metals.

FLAMMABILITY REDUCTION

Open cup flash points and auto ignition temperature tests quantify the ability of NONTOX to render petroleum products nonflammable and dramatically increase their auto ignition temperatures. NONTOX alters the molecular structure that dramatically reduces

flammability and the elimination of volatile organic compounds (VOCs) and their odors. The importance of this feature cannot be overstated in terms of shipboard safety and survivability. In addition, the use of other ecologically incompatible materials, such as AFFF Foam, may be significantly reduced.

SAFETY PROFILE

Extensive independent laboratory testing utilizing accepted standards for dermal and ocular effects on animal and human subjects have been performed. Phytotoxicity, bacteria community and internal aquatic organism safety studies are well documented.

OTHER POSSIBLE APPLICATIONS

- Initial Actions for Fire Fighting, i.e. cover the fire hazard with a layer of AFFF and flash point reducing product.

- Fuel or Oil Tank Cleaning

- Engine / Generator Wipe down

- Galley Drain Line Unclogging

- CHT Tank Cleaning / Degreasing

- Flight Deck Cleaning (should be able to hose it over the side).

- Trough Cleaning