CONESTOGA-ROVERS & ASSOCIATES

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TRANSMITTAL

DATE: August 10, 2009

REFERENCE NO.: 241501

PROJECT NAME: 461 8th Street, Oakland

TO: Jerry Wickham
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

RECEIVED
10:19 am, Aug 13, 2009
Alameda County
Environmental Health

Please find enclosed:
- ☐ Draft
- ☐ Originals
- ☐ Prints
- ☒ Final
- ☐ Other

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QUANTITY	DESCRIPTION
1	Work Plan for Groundwater Treatment by InSitu Chemical Oxidation

- ☐ As Requested
- ☐ For Your Use
- ☒ For Review and Comment
- ☐
- ☐

COMMENTS:
If you have any questions regarding the contents of the document, please call Peter Schaefer at (510) 420-3319.

Copy to: Denis Brown, Shell Oil Products US, 20945 S. Wilmington Avenue, Carson, CA 90810
Leroy Griffin, Fire Prevention Bureau, 250 Frank Ogawa Plaza, 3rd Floor, Suite 3341, Oakland, CA 94612
A.F. Evans Company, c/o Anye Spivey, 1000 Broadway, Suite 300, Oakland, CA 94507
Wells Fargo Bank, NA, Trustee of Havens, c/o John Ward, P.O. Box 63939, San Francisco, CA 94163
Leah Goldberg, Meyers Nave, 555 12th Street, Suite 1500, Oakland, CA 94607
Grover Buhr, Treadwell & Rollo *(electronic copy only)*

Completed by: Peter Schaefer Signed:

Filing: **Correspondence File**

Denis L. Brown
Shell Oil Products US
HSE – Environmental Services
20945 S. Wilmington Ave.
Carson, CA 90810-1039
Tel (707) 865 0251
Fax (707) 865 2542
Email denis.l.brown@shell.com

Mr. Jerry Wickham
Alameda County Health Care Services Agendy
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94205-6577

Subject: Former Shell Service Station
461 8th Street
Oakland, California
SAP Code 129453
Incident No. 97093399
ACHCSA Case No. RO0000343

Dear Mr. Wickham:

The attached document is provided for your review and comment. Upon information and belief, I declare, under penalty of perjury, that the information contained in the attached document is true and correct.

As always, please feel free to contact me directly at (707) 865-0251 with any questions or concerns.

Sincerely,

Denis L. Brown
Project Manager

WORK PLAN FOR GROUNDWATER TREATMENT BY INSITU CHEMICAL OXIDATION

FORMER SHELL SERVICE STATION
461 8th STREET
OAKLAND, CALIFORNIA

SAP CODE 129453
INCIDENT NO. 97093399
AGENCY NO. RO0000343

Prepared by:
Conestoga-Rovers & Associates

5900 Hollis Street, Suite A
Emeryville, California
U.S.A. 94608

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AUGUST 10, 2009
REF. NO. 241501 (11)
This report is printed on recycled paper.

TABLE OF CONTENTS

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1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) prepared this work plan on behalf of Equilon Enterprises LLC dba Shell Oil Products US (Shell) to detail plans for additional groundwater treatment by insitu chemical oxidation (ISCO). This plan supersedes the scope of work presented in CRA's February 6, 2009 *Work Plan for Groundwater Treatment by Insitu Chemical Oxidation*.

The site is a paved parking lot located at the southwest corner of the intersection of 8th Street and Broadway in a primary commercial area of Oakland, California (Figure 1). The former station layout included an underground storage tank complex and dispenser islands (Figure 2). While the subject site is currently used as a paid public parking lot, the current property owners have submitted development plans to construct a mixed-use site consisting of multi-storied commercial and residential units with a subsurface parking area.

2.0 SCOPE OF WORK

Soils and groundwater at the site are impacted by petroleum hydrocarbons. Total petroleum hydrocarbons as gasoline (TPHg) have been detected in groundwater at concentrations of up to 120,000 micrograms per liter (µg/L). Benzene, toluene, ethylbenzene, and xylenes (BTEX) have also been detected. Benzene has been detected at concentrations of up to 43,000 µg/L. Impacts to groundwater have been observed at wells to the southwest of the excavation area including S-5, S-6, S-13, S-17, S-18, S-20, S-21A, and S-22A. Groundwater flow is towards the southwest.

Between June 3 and June 10, 2008, Gettler-Ryan Inc. (GRI) of Dublin, California conducted excavation to remove hydrocarbon impacted soil to approximately 20 feet below grade (fbg) and installed an ISCO infiltration gallery. An area 20 feet by 50 feet was excavated to 20 fbg to remove residual source-impacted soil from beneath the former product piping and pump islands.

Between December 5, 2008 and January 9, 2009, two ISCO treatments of approximately 6,144 gallons of 20 percent sodium persulfate and 1,754 gallons of 10 percent hydrogen peroxide were applied to the excavation using the infiltration system. The ISCO treatment targeted contaminated soil that remained at the bottom of the excavation, but some treatment of groundwater adjacent to the excavation also occurred.

Between April 1 and April 5, 2009 ISCO treatments of approximately 2,982 gallons of 20 percent sodium persulfate and 544 gallons of 10 percent hydrogen peroxide and 330 gallons of 7 percent hydrogen peroxide were applied using monitoring wells S-23, S-21A, S-18, S-22A, S-13, S-20, and S-8.

The results of the groundwater monitoring to date indicate that significant removal of TPHg and BTEX occurred immediately downgradient of the infiltration area and up to 10 feet away from the infiltration area. In addition, benzene has decreased in 10 of the 16 monitoring wells since injections began. Most of the affected wells are adjacent to the excavation area or down gradient of the excavation area.

2.1 OBJECTIVES

The primary objectives of the proposed groundwater ISCO treatment are to further reduce concentrations of TPHg and BTEX in groundwater.

2.2 INJECTION AND MONITORING WELL LOCATIONS

Additional injections will be performed at wells S-21A, S-22A, and S-23, which are located adjacent to the excavation, and at wells S-13, S-18, and S-20, which are down gradient of the excavation. The locations of the excavation and down-gradient wells are shown on Figure 2.

2.2.1 HEALTH AND SAFETY PLAN (HASP)

Pursuant to Occupational Safety and Health Administration (OSHA) and Shell requirements, CRA prepared a HASP to protect site workers. The plan will be kept on site during field activities and will be reviewed and signed by each site worker. Air monitoring will be conducted using a photo-ionization detector (PID) during injection events. Appropriate personal protective equipment (PPE) will be used to ensure that the treatment chemicals do not come into contact with bare skin or the eyes during mixing or injection as it can produce irritation or burns. If frothing, bubbling, or steam production occurs as the oxidant solution is injected, injection will be slowed or halted until the reaction subsides and all risks are mitigated.

2.3 REAGENT INJECTION PROGRAM

The sodium persulfate dose to be used for additional groundwater ISCO treatment is based on the evaluation of groundwater data collected since completion of the past multiple ISCO injection events. CRA proposes to in inject up to 220 gallons of 10 percent hydrogen peroxide (H_2O_2) mixed with 387 gallons of 20 percent sodium persulfate into wells S-21A and S-22A. For wells S-13, S-18, S-20 and S-23, CRA proposes to inject up to 316 gallons of H_2O_2 mixed with 552 gallons of 20 percent sodium persulfate. Mixing of the reagents will take place immediately prior to injection of the material. Injections will be performed by gravity feed or under slight pressure. The rate of injection is anticipated to be between 2 to 10 gallons per minute (gpm). If bubbling, frothing, or off-gassing is observed, the rate will be slowed to reduce the reaction rate. If no frothing or bubbling is observed, the injection rate will be increased, if practical. Well S-18 is a 2 inch well that did not accept the oxidants in a timely manner in the previous injection attempt. To target this area, if necessary, CRA may pulse the oxidants into the well over the entire project duration to ensure enough of the reagents are introduced into the well.

2.4 MONITORING

2.4.1 GROUNDWATER MONITORING

Extensive groundwater monitoring has occurred for the ISCO injection events conducted to date. The monitoring data has shown, in general, that dissolved-phase TPHg and BTEX concentration increase shortly (one week) after the injection event, but subsequently decrease (one month after the injection event). As previously stated, TPHg and BTEX have been reduced by ISCO and no data indicates that the mobilization of TPHg and BTEX is a concern. As such, CRA proposes a reduction in the previous groundwater monitoring scope.

Groundwater monitoring will be conducted at injection wells S-13, S-18, S-20 S-21A, S-22A, and S-23 and at monitoring wells S-9, 1 month after the oxidant injection. Groundwater samples collected during these events will be analyzed for the following parameters/compounds:

- TPHg (EPA Method 8260B);
- BTEX (EPA Method 8260B);
- Sulfate (EPA Method 300 series);
- Dissolved Oxygen (DO) (field instrument);
- Oxygen Reduction Potential (ORP) (field instrument);
- Conductivity;
- Temperature; and
- Static water level.

As discussed in CRA's July 17, 2009 *In Situ Chemical Oxidation Pilot Test Report*, solubilization of metals is evident after each injection event, but the metals appear to precipitate shortly thereafter indicating that mobilization of metals is short-lived and not widespread. Given the observed behavior of metals in the subsurface, continued monitoring of total and dissolved metals is not necessary.

2.4.2 SOIL VAPOR MONITORING

Similar to groundwater monitoring, extensive soil vapor monitoring has occurred for the ISCO injection events. The data has shown that off-gassing is not of concern. Therefore, CRA proposes a soil vapor monitoring contingency plan. CRA will continue the Health

and Safety monitoring as described in Section 2.5. If any vapor or air monitoring data indicates soil vapors are approaching the commercial land use environmental screening levels, then CRA will collect soil vapor samples from soil vapor probes SVP-1 and SVP-2 in the neighboring basement. If samples are collected, they will be analyzed for TPHg using EPA Method TO-2 Modified and for BTEX by EPA Method TO-14A Modified.

2.5 HEALTH AND SAFETY MONITORING

Vapor and air monitoring will be conducted using a PID during injection events. Appropriate personal protective equipment (PPE) will be used to ensure that oxidant solutions do not come into contact with bare skin or the eyes, as they can produce burns. If frothing, bubbling, or steam production occurs as the oxidant is injected, the injection will be slowed or halted until the reaction subsides.

2.6 RESIDUALS MANAGEMENT

Any hydrogen peroxide or sodium persulfate not used during the activities described in this work plan will be disposed in accordance with applicable rules and regulations.

2.8 QUARTERLY GROUNDWATER MONITORING PLAN

Monitoring will take place at 3, 6, and 9 months after the final injection event. Analyses for DO, pH, ORP, sulfate, BTEX, and TPHg will be performed during each monitoring event. Since this corresponds with the existing quarterly monitoring program, all of the on-site wells will be analyzed for these parameters.

2.9 DATA EVALUATION AND REPORTING

Upon completion of the field injection, field and analytical data will be compiled and tabulated. The percent reduction of TPH as a result of the oxidation treatments will be calculated to assess the effectiveness of the tested oxidant. A report describing the tests conducted and the results obtained will be prepared and submitted to the ACHCSA 60 days following receipt of the final post-injection monitoring event analytical data. Periodic status updates will be provided in the ongoing quarterly groundwater monitoring reports for this site.

2.10 SCHEDULE OF ACTIVITIES

Pending work plan approval, we are tentatively scheduling the additional application of the chemical oxidants to the monitoring wells from August 24 through September 4, 2009.

All of Which is Respectfully Submitted,
CONESTOGA-ROVERS & ASSOCIATES

Peter Schaefer, CEG, CHG

Dan Lescure, PE

FIGURES

11/10/08

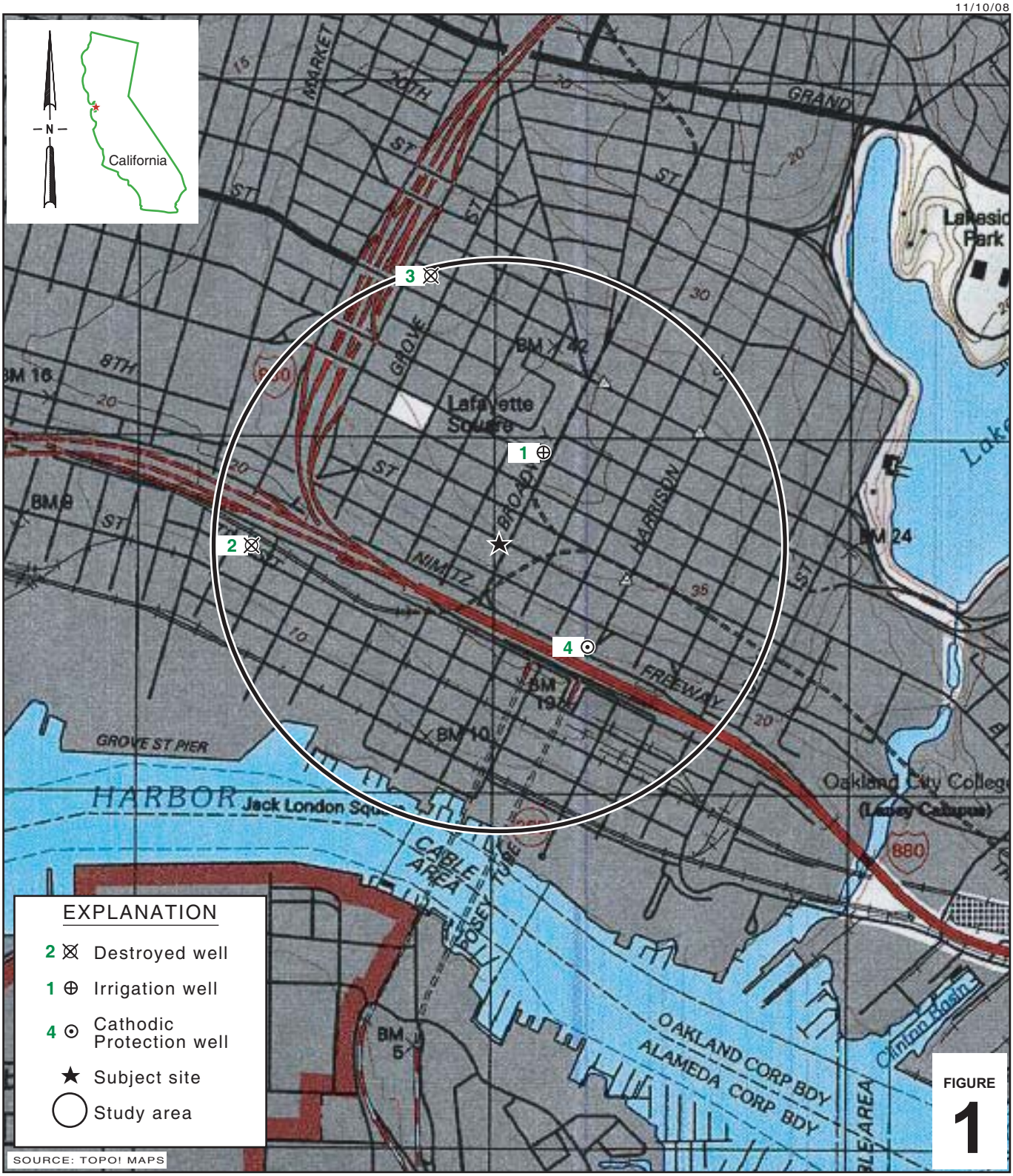

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FIGURE
1

0 1/8 1/4 1/2 1

SCALE (MILES)

Former Shell Service Station
461 8th Street
Oakland, California

CONESTOGA-ROVERS & ASSOCIATES

Vicinity Map

11/18/08

Site Plan

EXPLANATION

- B-28 — Soil boring location
- SVP-1 — Soil vapor probe location
- S-4 — Monitoring well location
- S-21B — Deeper monitoring well location
- OW-1 — Observation well location
- IP-1 — Injection point
- B-25/ VP-2 — Soil boring/vapor probe location
- S-1 — Destroyed well location
- STM — Storm drain line
- W — Water line
- SAN — Sanitary sewer line
- T — Telecommunications line
- G — Gas line
- E — Electrical line
- M.H. — Manhole
- C.B. — Catch basin
- FL = 16.50' — Flow line depth below ground surface

8TH STREET

7TH STREET

BROADWAY

Building

Building

Former Shell Station
461 8th St.

Former USTs

Former Fuel Lines

Former Dispenser Island (typ.)

Excavation Area

Driveway

Driveway

Driveway

Freight Elevator

S-1 S-10 S-8 S-23 S-16 IP-1 S-15 AS-1 S-21A IP-3 S-14 B-28 IP-2 S-12 OW-1 S-21B S-14R B-27/ VP-4 B-29 S-17 S-22B S-22A S-13 S-18 S-19 B-26/ VP-3 S-20 B-25/ VP-2 S-9 SVP-2 SVP-1 SVP-3 S-5 S-4 S-6

FL = 19.12'
FL = 17.59'
FL = 16.50'
FL = 13.12'
FL = 13.25'
FL = 13.80'
FL = 17.09'

0 20 40 80
Scale (ft)

N

FIGURE
2

Former Shell Service Station
461 8th Street
Oakland, California

CONESTOGA-ROVERS & ASSOCIATES

Base map modified from 6-25-08 Virgil Chavez Land Survey map.

I:\Shell\6-chars\2415--\241501-Oakland 461 8th\241501-FIGURES\241501 SITE PLAN.DWG