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February 19, 2015 Reference No. 632327D

Mr. Mark Detterman, PG, CEG
Alameda County Environmental Health
1131 Harbor Way Parkway
Alameda, CA 94502

RECEIVED
By Alameda County Environmental Health at 2:22 pm, Feb 23, 2015

Re: Amended SGMP and Memo Regarding
Mass and Hydrocarbon Migration Calculations
Former Chevron Service Station 90019
210 Grand Avenue, Oakland, CA 94610
ACEH Fuel leak Case Case RO137

Dear Mr. Detterman:

Enclosed are the amended SGMP (SMP) and Memo Regarding Mass and Hydrocarbon Migration Calculations as requested in your Decemeber 23rd email correspondence. Please contact CRA if you have any questions or require any additional information.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Nathan Allen , PG

NA/aa/1
Encl.

SGMP
Memo Regarding Mass and Hydrocarbon Migration Calculations

Alexis Coulter
Project Manager
Marketing Business Unit

Chevron Environmental Management Company
6101 Bollinger Canyon Road
San Ramon, CA 94583
Tel (925) 790-6441
acoulter@chevron.com

Alameda County Environmental Health (ACEH)
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Former Chevron Service Station No. 90019
210 Grand Avenue
Oakland, CA

I have reviewed the following Memo Regarding Mass and Concentration Migration Calculations and Soil and Groundwater Management Plan dated February 19, 2015.

This information in these documents is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by Conestoga Rovers and Associates, upon whose assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13267(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Sincerely,

Alexis Coulter
Project Manager

Attachment: Memo Regarding Mass and Concentration Calculations and Soil and Groundwater Management Plan

SOIL AND GROUNDWATER MANAGEMENT PLAN
Former Chevron Service Station 90019
210 Grand Avenue
Oakland, Alameda County, California

February 19, 2015

SOIL AND GROUNDWATER MANAGEMENT PLAN
FORMER CHEVRON SERVICE STATION 90019
210 Grand Avenue
Oakland, Alameda County, California

February 19, 2015

Prepared by:

Conestoga-Rovers & Associates
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PROFESSIONAL GEOLOGIST
NATHAN SCOTT ALLEN
No. 9075
STATE OF CALIFORNIA

Nathan Allen, PG 9075

TABLE OF CONTENTS

APPENDICES

SOIL AND GROUNDWATER MANAGEMENT PLAN
FORMER CHEVRON SERVICE STATION 90019

1. INTRODUCTION

Conestoga-Rovers & Associates (CRA) prepared this soil and groundwater management plan (SGMP) at the request of Chevron Environmental Management Company (CEMC) for the property located at 210 Grand Avenue, Oakland, Alameda County, California (the "Site"). The Site may contain petroleum hydrocarbon-impacted soil or petroleum hydrocarbon-impacted groundwater associated with Chevron U.S.A. Inc. operations (Covered Soil and Covered Groundwater, respectively). This SGMP provides information about CEMC's environmental assessment of the Site and outlines the process for working with CEMC to address Covered Soil and/or Covered Groundwater related to excavation or dewatering activities necessary for on-site construction activities. A contact sheet is provided as Attachment A.

2. SITE CONDITIONS

2.1 SITE DESCRIPTION

The Site is shown on (Figures 1 and 2). The Site is located on Assessor's Parcel Number (APN) 010-768-06, owned by the City of Oakland (Figure 1). The site was formally a Chevron-branded service station located on the northwest corner of the intersection of Grand Avenue and Bay Place (Figure 1). The majority of the site is currently occupied by a paved parking lot for the Downtown Oakland Senior Center; however, the eastern portion of the site is now covered by the southbound lanes of Bay Place (Figure 2). The date the site was first developed as a service station is unknown; however, based on historical aerial photographs, the site appears to have included a service station as early as 1946 with a triangular building in a Y-shaped configuration. In 1992, the property was acquired by the City of Oakland, and the existing parking lot was constructed over the western portion of the site in the mid-1990s. Bay Place was expanded over the eastern portion of the site. Montecito Avenue was closed at Bay Place and its southernmost portion, between Bay Place and Grand Avenue, was incorporated into the Veteran's Memorial Building property (existing senior center) and converted to a parking lot and landscaping. No structures are present on the original service station property.

2.2 ENVIRONMENTAL INVESTIGATION SUMMARY

Environmental investigations and assessments have been ongoing since 1989 when monitoring wells were installed. Investigations to date include: installing monitoring wells MW-1 through MW-9; advancing one soil boring, quarterly to semi-annual groundwater monitoring; confirmation soil sampling during UST removal; and a soil vapor survey. Monitoring wells MW-4 and MW-5 remain onsite, well MW-6 is offsite in a landscaped area to the west, and wells MW-7 through MW-9 are in Grand Avenue to the south and southwest. Monitoring wells MW-1 through MW-3 have been destroyed due to construction or soil excavation. Well locations are shown on Figure 2. Soil and groundwater remedial actions have consisted of extensive over-excavation of hydrocarbon-bearing source area soil (approximately 1,700 cubic yards) in 1990, 1991, and 1996; groundwater extraction (approximately 2,500 gallons) in 1993;

the placement of Oxygen Releasing Compound®(ORC) in well MW-5 from 1998 to 2004; and oxygen injection into well MW-5 in 2009.

In a letter dated July 17, 2014, the Alameda County Environmental Health Department (ACEH) requested preparation of this SGMP.

2.3 CONTAMINANTS AND MEDIA OF CONCERN

The primary contaminants of concern which may be encountered at the site are petroleum fuel hydrocarbons and their constituents, known to be present in soil, groundwater and soil vapor. Both soil and groundwater at the site currently meet the criteria for closure under the Low Threat Underground Storage Tank Case Closure Policy. The identified remaining hazard to future site occupants is potential exposure to hydrocarbons through soil vapor intrusion of future buildings. If the site is redeveloped and/or if the land use changes, the case must be reviewed by the ACEH.

3. ROLES AND RESPONSIBILITIES

This section outlines the process for requesting CEMC's assistance in identifying and managing Covered Soil and/or Covered Groundwater.

3.1 NOTIFICATION

CEMC requests that the City of Oakland, or the current property owner(s), provide CEMC with advance notice of plans to conduct construction activities that may encounter Covered Soil and/or Covered Groundwater. If potentially impacted soil and/or groundwater is observed during necessary construction activities and a CEMC-authorized representative is not on site, CEMC should be notified as early as possible to allow CEMC to provide consultation on the profiling and eventual disposal or reuse of any Covered Soil and discharge or disposal of any Covered Groundwater. CEMC may be reached at (800) 338-5434.

3.2 PROFILING AND MANAGEMENT

This SGMP was prepared as a prerequisite to obtaining a "no further action" letter (NFA) for the Site from Alameda County Environment Health (ACEH). Issuance of an NFA means that no further corrective action is required for the Site. Accordingly, absent the identification of conditions that were not considered prior to issuance of the NFA or redirection from ACEH, it is reasonable to presume that material excavated from the Site may be reused on the Site. Profiling is intended to ensure that reuse of excavated materials on-site is consistent with the NFA determination.

After discovery that potentially impacted soil and/or groundwater have been observed during Site construction activities, samples of the soil and/or groundwater (either in situ or from a segregated stockpile) should be collected by the property owner for profiling purposes. Soil and/or groundwater samples must be collected by the methods described in Appendix B or equivalent, and the results submitted to the ACEH. If, based on a review of the profiling results, ACEH prohibits excavated Covered Soil from being reused on the Site and/or the Covered

Groundwater discharged to land or to sewer due to the presence of petroleum hydrocarbons, CEMC will coordinate with the property owner regarding the proper off-site disposal of that excavated soil and/or groundwater. Chevron U.S.A. Inc., or the current property owner(s), should ensure that any excavated Covered Soil is stockpiled in a separate location from non-impacted soil to allow for proper soil profiling, management, and disposal.

Appendix A:
Contact Sheet

APPENDIX A:
CONTACT SHEET

Chevron Environmental Management Company

Ms. Alexis Fisher
Project Manager
P.O. Box 6012
San Ramon, California 94583-0712
(800) 338-5434

Consultant

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Owners/Contacts

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PO Box 285
Houston, Texas 77001
(800) 338-5434

Regulatory Oversight

San Francisco Bay RWQCB
Attn: Ms. Cherie McCaulou
1515 Clay Street, Suite 1400
Oakland, California 94612
(510) 622-2300

Alameda County Environmental Health
Attn: Mr. Mark Detterman
1131 Harbor Bay Parkway, Suite 250
Alameda, California, 94502
(510) 567-6876

Appendix B:
Soil and Groundwater Profile Sampling and Analytical Methods

Segregated Impacted Soil Stockpile Sampling:

Collect a minimum of a 4-point composite sample per 500 cubic yards of material stockpiled using EPA Methodology SW-846 in the sampling and analysis techniques.

Analyses:

(8015) TPH quantified in the following ranges with contingencies for 96 hour fish bioassay if the following levels are observed:

1. TPHd ≥ 10,000 mg/kg
2. TPHg ≥ 5,000 mg/kg

- (8260) BTEX – TCLP benzene if the total benzene meets or exceeds 10 mg/kgs.
- (6010/6020) Total Lead and contingency analysis for the following
    - STLC analysis if initial total lead meets or exceeds 50 mg/kg
    - TCLP analysis if initial total lead meets or exceeds 100 mg/kg
    - (8270) “organoleads” if initial total lead value meets or exceeds 13 mg/kg.

Impacted Water Sampling:

For liquid sampling, only one sample is needed if the collected water is observed to be a homogenous mixture in the same container(s). If there are multiple containers and it cannot be determined that all containers contain the same homogenous mixture (such as drums), collect an additional sample from each non-homogenous container.

Analyses:

- (8015) Total TPH quantified in the following ranges with contingencies for 96 hour fish bioassay (ONLY IF the following initial total results are observed):
    - TPHd ≥ 10,000 mg/L
    - TPHg ≥ 5,000 mg/L
- (8260) BTEX
- (6010/6020) Total Lead, with contingency analysis as follows:
    - (8270) “organoleads”, only if the initial total lead value meets or exceeds 13 mg/L.
- pH
- Flash point

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MEMORANDUM

To:	Mark Detterman	Ref. No.:	632327D
From:	David Herzog	Date:	February 19, 2015
cc:	Alexis Coulter		
Re:	Mass and Concentration Migration Calculations		

On September 26, 2014, Conestoga-Rovers & Associates (CRA) submitted the *Hydrocarbon Transport Model and Soil and Groundwater Management Plan* to the Alameda County Environmental Health Department (ACEH), which included a transport model predicting the migration of petroleum hydrocarbons from the site. The transport model specifically evaluates the mass of TPHg, benzene, and ethylbenzene in groundwater that migrates from the site into an adjacent storm drain utility trench, and then migrates along that utility line to Glen Echo Creek west of the site and predicts the resulting constituent concentrations entering the creek. In correspondence dated December 23, 2014, the ACEH requested further detail of the calculations used to make the migration prediction in order to evaluate the results. The following provides further detail of the migration calculations used.

Figure A below, which was included in CRA's September 26, 2014 report, provides an overall conceptual model showing the extent of the hydrocarbon plume onsite intersecting the storm drain utility trench and the location of Glen Echo Creek west of the site. Also shown in Figure A is the average groundwater flow direction toward the west at a gradient of 0.025, and the groundwater gradient vectors that are parallel and perpendicular to the storm drain line at gradients of 0.02 and 0.004, respectively.

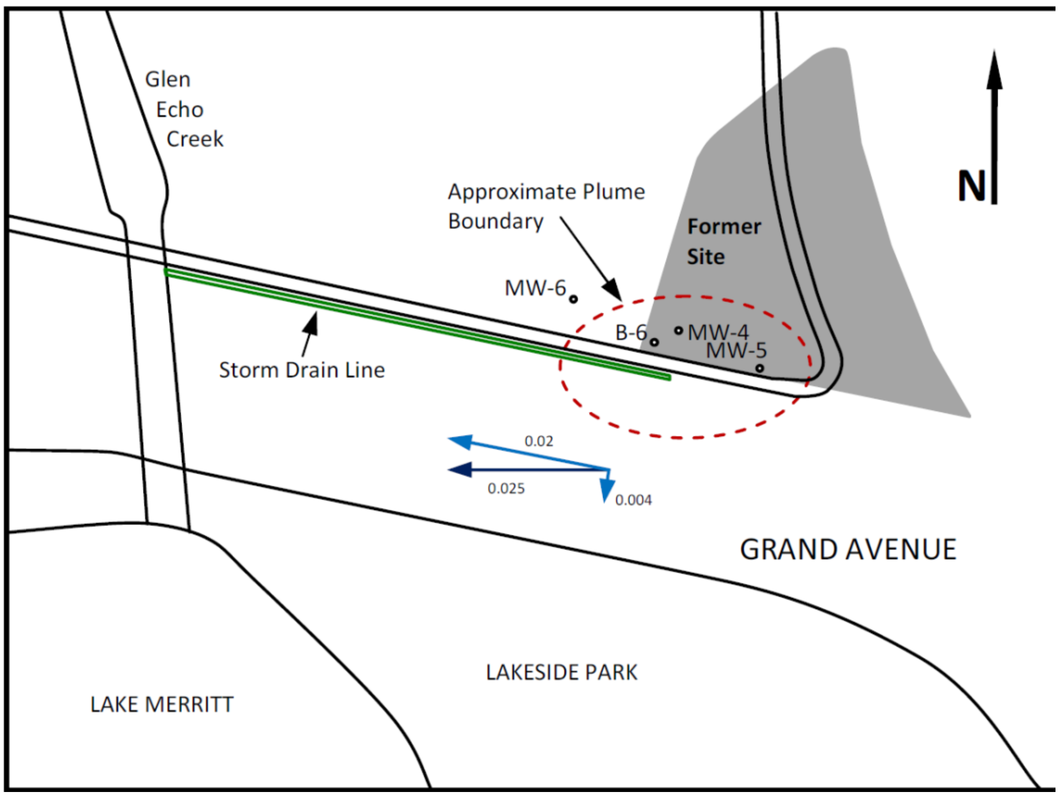

Figure A – Conceptual model for hydrocarbon migration along storm drain line.

Figure B provides further detail of the hydrocarbon plume intersecting the storm drain utility trench. CRA evaluated the hydrocarbon plume entering the trench along a rectangular interception area shown in figure B.

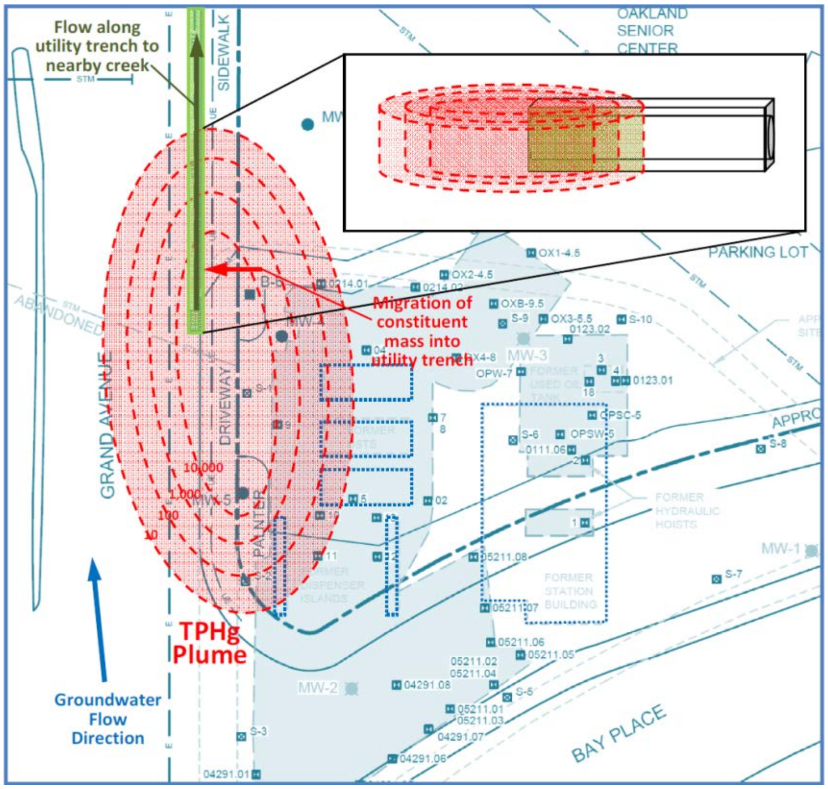

Figure B – Conceptual model showing plume intersecting trench wall.

CRA used the following equation (1) to evaluate the mass flux (M) of TPHg, benzene, and ethylbenzene entering the trench across this area.

$$M = CV \quad (1)$$

Where:

C is the average concentration within the plume intersection area

V is the volume of water entering the trench across the plume intersection area

The volume of water entering the trench is defined as the cross sectional area of groundwater intersecting the trench within the soil pore space (porosity) times the rate that the constituent plume is migrating perpendicular to the trench. The rate that the plume is migrating is the plume velocity (V_p), and CRA used the following equations for calculate plume velocity[1].

$$V_p = V_s/R \quad (2)$$

$$V_s = Ki/n_e \quad (3)$$

$$R = 1+(\rho_b f_{oc} K_{oc})/\phi \quad (4)$$

Where:

V_p is plume velocity (ft/day)
V_s is groundwater seepage velocity (ft/day)
R is retardation factor (unitless)
K is hydraulic conductivity (gravelly sand and fine gravel (0.1 cm/sec)
i is hydraulic gradient (vector gradient 0.004 perpendicular and 0.02 parallel to trench)
n_e is effective porosity (gravelly sand and fine gravel 0.25 [25%])
ρ_b is dry bulk density of soil (gravelly sand 1.50 g/cm^3; fine gravel 1.682 g/cm^3)
f_{oc} is soil fraction organic carbon content (0.006 [0.6%] in native soil; 0% in trench backfill)
K_{oc} is organic carbon partitioning coefficient
(TPHg 5,000 cm^3/g; benzene 59 cm^3/g; ethylbenzene 360 cm^3/g)
ϕ is porosity (gravelly sand and fine gravel 0.35 [35%])

TABLE A – PLUME VELOCITY CALCULATIONS

	V_s (ft/day)	R	V_p (ft/day)
Gravelly Sand – Native soil adjacent to utility trench			
TPHg	4.535	129.57	0.035
Benzene	4.535	2.52	1.7996
Ethylbenzene	4.535	10.26	0.442
Fine Gravel – Utility trench backfill			
TPHg	227	1.00	227
Benzene	227	1.00	227
Ethylbenzene	227	1.00	227

Plume velocity calculations are presented in Table A.

1 Kuo, J., 1999, Practical Design Calculations for Groundwater and Soil Remediation: CRC Press LLC, Boca Raton, F

As shown in Table A, the plume velocity in the trench backfill is the same as the seepage velocity because the fine gravel used to backfill the utility trench is assumed clean with no organic carbon content. CRA used the contoured intervals of each TPHg, benzene, and ethylbenzene plume to calculate the area of each intervals intersection with the trench as illustrated in Figure B. The height of each area was set at 3 feet for the calculations; although, any constant value used for height would not change the results. CRA used the following equation (5) to calculate the volume of water entering the trench per day across the extent of each plume.

$$V_w = LH\phi V_p \quad (5)$$

Where:

- V_w is the volume of water
- L is the intersection length along the trench of each contoured plume interval
- H is the plume trench intersection height
- ϕ is porosity (gravelly sand and fine gravel 0.35 [35%])
- V_p is plume velocity (ft/day)

Table B presents the utility trench intersection lengths for TPHg, benzene, and ethylbenzene for each corresponding concentration interval, and the associated volume of water entering the trench based on the plume velocities in Table A.

TABLE B – VOLUME OF WATER ENTERING TRENCH BASED ON PLUME VELOCITY

	Contour Interval ($\mu g/L$)	*L (feet)*	*V_p (ft/day)*	*V_w (ft^3/day)*	*V_w (liters/day)*	*Average Interval Concentration ($\mu g/L$)*
TPHg	10-100	23	0.035	0.294	8.33	55
	100-1,000	8	0.035	0.294	8.33	550
	1,000-10,000	8	0.035	0.294	8.33	5,500
	>10,000	8	0.035	0.845	8.33	17,500
Benzene	1-10	23	1.7996	43.5	1,232	5.5
	>10	19	1.7996	35.9	1,018	55
Ethylbenzene	10-100	23.5	0.442	10.9	309	55
	>100	23.5	0.442	10.9	309	550

Based on the volume of water (V_w) entering the trench multiplied by the average concentrations within each interval, approximately 469,737 micrograms per liter (μg) TPHg, 62,762 μg benzene, and 186,920 μg ethylbenzene migrate from the site into the storm drain utility trench each day.

As shown in Table A, the plume velocity in the utility trench from the site toward Glen Echo Creek is 227 feet per day. Based on the trench construction scenario presented in CRA's September 26, 2014 report, using equation (5) the volume of water entering the creek each day from the utility trench is 6,145 liters per day. If the mass of TPHg, benzene, and ethylbenzene are evenly distributed in the groundwater entering the trench each day, each constituent mass divided by the volume of water results in an approximate concentration of 76 μg/L TPHg, 10 μg/L benzene, and 30 μg/L ethylbenzene in the water entering the creek.

Animal and plant life in the aquatic habitat are primarily the likely receptors affected by dissolved hydrocarbons entering the creek. The RWQCB ESLs for the estuary aquatic habitat are 500 μg/L for TPHg, 46 μg/L for benzene, and 43 μg/L for ethylbenzene. Based on these goals, the concentrations of TPHg, benzene, and ethylbenzene predicted to enter the creek from the site are well below the screening levels.