SAIC

June 5, 2012

Mr. Roger Nye
Washington State Department of Ecology
Toxics Cleanup Program, Northwest Regional Office
3190 160th Ave SE
Bellevue, Washington 98008-5452

Dear Mr. Nye:

SAIC Energy, Environment & Infrastructure LLC (SAIC), on behalf of Chevron Environmental Management Company (CEMC), is pleased to submit the following *Surfactant-Enhanced Recovery Work Plan* for former Chevron Service Station No. 20-9335.

If you have any questions or comments, please contact me at (425) 482-3328 or via email at ruth.a.otteman@saic.com.

Enclosures as stated

cc: Mr. Mark Horne – CEMC (electronic copy)
6101 Bollinger Canyon Road, San Ramon, CA 94583

Mr. Larry Hard – Seattle Housing Authority
120 Sixth Avenue North, Seattle, WA 98109-5003

Ms. Veronica Redstone – Bellwether
1651 Bellevue Avenue, Seattle, WA 98122-2014

Project File

SAIC Energy, Environment & Infrastructure, LLC
18912 North Creek Parkway | Ste 101 | Bothell, WA 98011 | tel: (425) 485-5800 | fax: (425) 485-5566 | saic.com\eeandi

SURFACTANT-ENHANCED RECOVERY WORK PLAN

Former Chevron Service Station No. 20-9335
1225 45th Street
Seattle, Washington

June 5, 2012

Prepared for:
Washington State Department of Ecology
Toxics Cleanup Program
3190 160th Ave SE
Bellevue, WA 98008-5452

On Behalf of:
Chevron Environmental Management Company
6101 Bollinger Canyon Road
San Ramon, California 94583-5186

By:
Science Applications International Corporation
18912 North Creek Parkway Ste. 101
Bothell, WA 98011

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Ruth Otteman, LG
Project Manager

SAIC

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ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
Chevron	Chevron Environmental Management Company
COC	Chain-of-Custody
CUL	Cleanup level
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
HRG	The Housing Resources Group
LNAPL	Light Non-Aqueous Phase Liquid
MSDS	Material Safety Data Sheet
MTCA	Model Toxics Control Act
ROI	Radius of influence
QA	Quality Assurance
QC	Quality Control
SAIC	Science Applications International Corporation
SHA	Seattle Housing Authority
SVE	Soil Vapor Extraction
UIC	Underground Injection Control
UST	Underground storage tank
VCP	Voluntary Cleanup Program
VOCs	Volatile organic compounds

1.0 INTRODUCTION

Science Applications International Corporation (SAIC), on behalf of Chevron Environmental Management Company (Chevron), is pleased to submit this Surfactant-Enhanced Recovery Work Plan detailing proposed surfactant injection remedial activities at former Chevron Service Station No. 20-9335 located at 1225 45th Street in Seattle, WA ("the site"). The site is currently enrolled in the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP) under VCP No. NW1415.

2.0 BACKGROUND

2.1 SITE DESCRIPTION

The former Chevron Service Station (No. 20-9335) is located at 1225 45th Street, Seattle, Washington (Figure 1). Current features include a seven-story, mixed-use retail/residential building. The site is bounded to the north by single-family residences and a multistory mixed retail/residential building, to the east by Stone Way North, to the south by Big Wheels Auto Parts and a residential neighborhood with single-family dwellings, and to the west by a residential neighborhood.

2.2 FACILITY HISTORY

According to archive records, a gasoline service station and service garage operated at this location beginning in approximately 1935. The original station included two 1,000-gallon fuel underground storage tanks (USTs), one 550-gallon UST, and one hydraulic hoist. Standard Oil Company (a predecessor of Chevron) purchased the property in 1954. In 1956, the original station was redeveloped, and one 3,000-gallon UST, one 2,000 gallon UST, and one 550-gallon UST were installed. In 1969, the service station building and service garage were removed. Chevron sold the property in 1978 to the Seattle Housing Authority (SHA). The SHA subsequently sold the Chevron property and the property adjacent to the west (the former Wallingford Medical building) to The Housing Resources Group (HRG) in 2005.

The site has been developed by HRG into a seven-story, mixed-use retail/residential building with an underground parking garage, spanning the footprint of the former Chevron facility and the former Wallingford Medical Building properties. During the redevelopment, soil was removed site-wide to a depth of 13 feet bgs and twenty large-diameter bucket auger borings were drilled in areas with remaining contamination to remove impacted soil to approximately 42 feet bgs. Approximately 2,460 tons of impacted soil was removed.

Following the building redevelopment in November 2005, three groundwater monitoring wells (MW-6, MW-7, and MW-8) were installed within the underground parking garage on the north and east portions of the property. In December 2006, two additional wells (MW-9 and MW-10) were installed downgradient from the property.

During development of monitoring wells MW-6 through MW-8 in February 2006, approximately 0.5 feet of light non-aqueous phase liquid (LNAPL) was detected in MW-7. The LNAPL was removed during well development, and weekly bailing of LNAPL from MW-7 was implemented in early February 2006. LNAPL thickness declined over time but was still present when bailing events ceased in August 2006. LNAPL bailing events were discontinued due to concerns

expressed by HRG about residents occupying the building and the storage of recovered LNAPL on the property.

Groundwater samples have been collected from on-site wells since 1993, and monthly bailing of light non-aqueous phase liquid (LNAPL) present in monitoring well MW-7 is currently being performed on a quarterly schedule. The LNAPL present in MW-7 has ranged in thickness between 0.03 (April 2008) to 1.03 feet (July 2003).

2.3 GEOLOGY AND HYDROGEOLOGY

The regional geology of the site includes deposits from advancing and retreating glaciers. These deposits consist of a sequence of sand, silt, and gravel that were likely associated with glacial drift. The site is located on the Seattle Drift Plain, which was formed during the last period of continental glaciation.

The local geology is defined by the environmental borings that have been drilled at the site. The ground surface at the boring locations is overlain by 4 to 6 inches of asphalt. The material underlying the asphalt is typically comprised of dense to very dense, well-graded, fine- to medium-grained sand with some silt and rounded gravel, extending from approximately 8.5 to 20 feet bgs. Underlying this layer is a thick layer of very dense, brown to light brown, poorly graded, fine- to medium-grained sand that is present to the total depth explored of approximately 45.5 feet bgs.

The site is underlain by a relatively deep, productive, water-table aquifer that occurs in a poorly graded sand layer. During drilling, saturated soils were typically encountered at depths of approximately 38 feet bgs within the poorly graded sand layer. This is consistent with historic groundwater levels, which were on average approximately 37 feet bgs. Groundwater levels fluctuate between 34 and 40 feet bgs with a gradient toward the southeast.

Subsequent to remediation activities, LNAPL had been observed in monitoring well MW-7 up to 0.78 feet thick. Groundwater measurements and analytical data indicate that neither the LNAPL plume nor the dissolved-phase hydrocarbon plume extend to down-gradient monitoring well MW-8. The LNAPL observed in monitoring well MW-7 appears to be a remnant of LNAPL saturated soil that was left behind in the annular space between the bucket-auger borings. The CDF-filled bucket-auger borings likely confine the LNAPL plume to the north, east, and west.

An LNAPL recovery test was conducted on September 10, 2010, when approximately 1.5 gallons of LNAPL and water mixture was bailed from monitoring well MW-7. After removing the LNAPL, depth-to-water and depth-to-product measurements were recorded at sporadic intervals for 3 hours. After 3 hours, the LNAPL thickness was recorded at 0.38 foot.

3.0 PURPOSE

In October - November 2009, in response to a request by WDOE, Chevron enrolled this site and several others which have LNAPL present, into the VCP. The purpose of this plan is to describe proposed surfactant injection and extraction remedial actions which will attempt to reduce and/or eliminate the reoccurring presence of LNAPL within the vicinity of monitoring well MW-7.

While the use of surfactant is anticipated to be successful in decreasing or elimination of the occurrence of LNAPL at the site, the presence of dissolved contaminants of concern is expected

to continue, with a potential increase in dissolved concentrations immediately following the remedial injection event.

4.0 SCOPE OF WORK

4.1 SURFACTANT TREATMENT

SAIC will obtain an Underground Injection Control (UIC) permit from Ecology to inject surfactant in the subsurface. The solution to be injected will be a 4 to 5 percent surfactant solution composed of non-ionic surfactant mixed with potable water. The Material Safety Data Sheet (MSDS) for the surfactant solution is included as Appendix A. The surfactant solution will be pre-mixed in an appropriate sized poly-tank and gravity fed at a low flow rate into monitoring well MW-7 (Figure 2). Adjustments will be made to the injection rate based on water-level meter measurements to ensure the fluid levels remain below the top of the screened interval and the hydraulic head does not exceed a few feet. The anticipated amount of solution to be injected in monitoring well MW-7 is 100 gallons.

Groundwater depth will be measured periodically in nearby monitoring wells MW-6 and MW-8 to determine radius of influence (ROI) and ensure that LNAPL does not mobilize off-site prior to the extraction process.

4.2 SURFACTANT AND LNAPL EXTRACTION

Following an equilibration period of approximately 24 hours, a vacuum truck will extract the surfactant and emulsified LNAPL from MW-7. High vacuum pressure will be applied to the well head to increase the extraction radius of influence. Monitoring wells MW-6 and MW-8 will be gauged during extraction to estimate the radius of influence. Extraction will continue until LNAPL extraction rates are negligible and/or no indication of surfactant is observed (by shaking a sample of extraction liquid and examining for foaming). Based on previous surfactant injection events conducted at Chevron sites, the necessary volume of liquid necessary to remove the injected surfactant is three times the injected volume.

4.3 SURFACTANT TREATMENT MONITORING

Groundwater samples will be collected from monitor wells MW-6 and MW-8 prior to the extraction and from wells MW-6, MW-7 (treatment well), and MW-8 following the extraction event. Samples will be transported via overnight air courier to Lancaster Laboratories in Lancaster, Pennsylvania for analysis.

Each groundwater sample will be analyzed for:

- Gasoline-range hydrocarbons by Ecology Method NWTPH-Gx;
- Diesel- and oil-range hydrocarbons by Ecology Method NWTPH-D extended;
- BTEX by United States Environmental Protection Agency (EPA) Method 8021B;
- Foaming Agents, Dissolved Non-ionic/CTAS Surfactants by Method SM554 BD; and

- Field analysis including pH, conductivity, dissolved oxygen, and oxygen-reduction potential.

4.4 POST-SURFACTANT EXTRACTION GROUNDWATER MONITORING

The effectiveness of the surfactant treatment will be evaluated by monitoring hydrocarbon concentrations as part of the ongoing quarterly site monitoring. Groundwater samples will be collected semi-annually from monitoring wells MW-6, MW-7, and MW-8 and analyzed for surfactants during the year following the treatment. The treatment will be considered to be a success if LNAPL decreases or disappears in monitoring well MW-7 or if sampling indicates that significant hydrocarbon mass was removed by the treatment. If LNAPL thicknesses and hydrocarbon concentrations recover to pre-treatment amounts, a second surfactant injection event will be considered.

4.5 DECONTAMINATION

All non-disposable sampling equipment will be decontaminated before and after use at each sampling location. Groundwater measurement equipment (e.g. electronic water level indicator) will be washed with a mixture of tap water and laboratory-grade detergent (e.g. Liquinox or Alconox), followed by rinses with tap water and then distilled water. Decontaminated equipment will be either wrapped in aluminum foil or positioned to preclude inadvertent contamination prior to reuse.

Disposal equipment, such as nitrile gloves, sample baggies, and groundwater bailers, will be disposed of after each soil or groundwater sample is collected.

4.6 INVESTIGATION DERIVED WASTE

All decontamination water and treatment extraction liquids generated during treatment application will be transported in the vacuum truck directly to an approved-disposal. Characterization will be based on a LNAPL and groundwater emulsion sample collected from monitoring well MW-7 prior to the event.

5.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

5.1 DOCUMENTATION

Field documentation for this project will include the following:

- *Field logbooks* will contain a record of each day's activities and all relevant observations, measurements, and data not recorded elsewhere. Copies of the field logbooks will be made at the end of each field event and maintained in the project file.

- *Sample collection data sheets* will be completed for each groundwater sample. Sample data sheets will contain date and time of sample collection, sample number, station location and depth-to-groundwater, field measurements, and analyses performed.

- *Sample labels* will be attached to each sample container collected. Labels will contain the sample number, date and time of sample collection, analyses requested, and sample preservation compounds present.

- *Chain of custody forms* will accompany all samples shipped to the analytical laboratory. In addition to containing a record of sample information, chain of custody forms will document the date and time the samples were shipped. Upon receipt at the laboratory, the chain of custody record will be compared with the samples received, and any discrepancies noted and reported to the SAIC project manager.

A report summarizing the surfactant injection activities will be prepared and submitted to WDOE following the surfactant treatment event.

5.2 FIELD EQUIPMENT CALIBRATION

Field instruments will be calibrated prior to use each day according to the manufacturer's recommended procedure using the appropriate calibration standards. The calibration of such instruments will be noted in the field log book.

5.3 SAMPLE STORAGE, PACKING, AND SHIPMENT

All groundwater samples will be placed in a pre-cooled ice chest while at the Site and during transportation to the laboratory. A temperature compliance vial (temperature blank; provided by the laboratory) will accompany each cooler to verify that proper holding temperatures were maintained during transport.

5.4 CHAIN-OF-CUSTODY PROCEDURES

Each sample cooler (or batch of coolers) containing laboratory samples will contain a fully completed chain-of-custody (COC) form. The field personnel will retain a copy of the COC form, and the original will be sent with the samples to the laboratory.

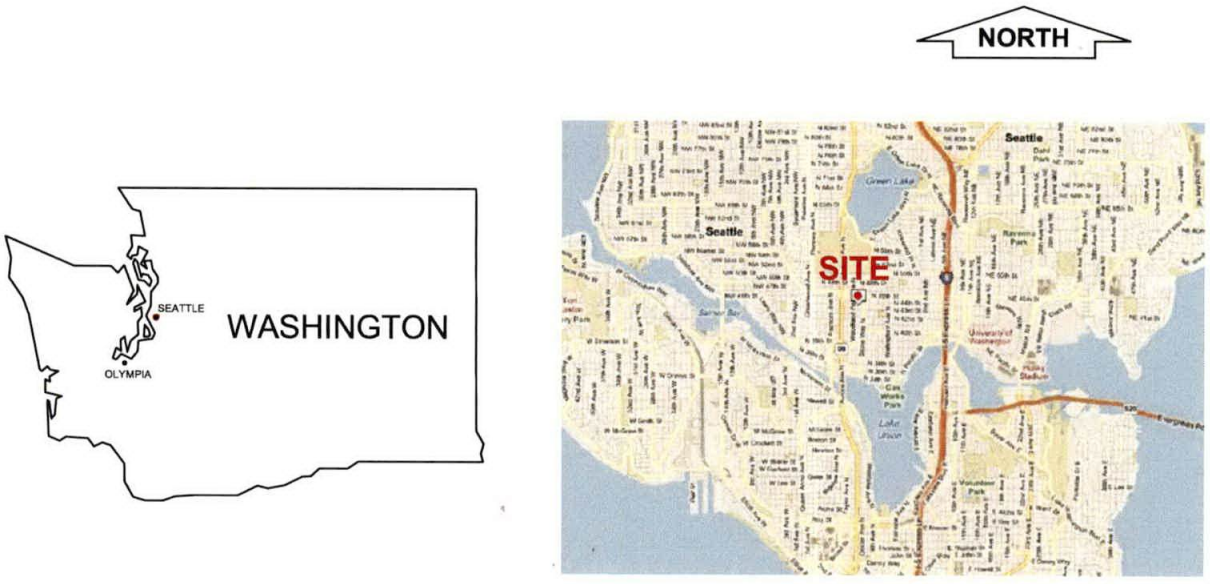
6.0 SCHEDULE

SAIC will finalize the fieldwork schedule following review and approval of this work plan by Ecology. The anticipated schedule for implementation of this investigation is as follows:

1) Preparation for fieldwork – 2 to 4 weeks (contingent on work plan approval, approval of UIC permit, and subcontractor/field staff availability)

2) Completion of field activities (surfactant injection and extraction) – 2 non-consecutive days.

Figures



SAIC	Former Chevron Service Station No. 20-9335 1225 North 45th Street Seattle, Washington	FIGURE 1 Vicinity Map
	FILE NAME: 209335 Vicinity Map.dwg	DATE: 10/5/2011

NORTH 45TH STREET

Sidewalk

Former Service Station 1935

MW-6

MW-7

Former Service Station 1956

MW-8

Stoneway Apartments

Former Wallingford Medical Building

Former Carport

Former Service Station 1956

Sidewalk

Residence

Residence

Residence

Residence

Parking Lot (Asphalt)

Big Wheel Auto Parts

STONE WAY NORTH

Sidewalk

Beso del Sol Restaurant/ Natural Health Clinic

MW-9

Parking Lot

MW-10

NORTH ALLEN PLACE

Legend

Groundwater Monitoring Well

N

0 20 40

Feet

SAIC

Former Chevron Service Station No. 20-9335
1225 North 45th Street
Seattle, Washington

FIGURE 2
Site Map

DATE: 02/02/2012

DRAWING: 209335_GW Contours.dwg

Appendix A:
Material Safety Data Sheet - Surfactant

SAIC

International Chemical Systems, Inc.

ENVIRONMENTAL CHEMICAL SOLUTIONS

"Delivering Solutions to the Customer"

MATERIAL SAFETY DATA SHEET
HYDROCARBON DESORPTION AGENT

RELEASE

GOLD CREW HIT-E001

Emergency: 1-877-253-2665

SECTION I - GENERAL INFORMATION

Name:	Release, Gold Crew HIT-E-001, Hydrocarbon Desorption Agent
Manufacturer	Environmental Chemical Solutions P.O. Box 2029 Gig Harbor, WA 98335 Tel: (877) 253-2665 Fax: (253) 853-1340 www.ecschem.com
Generic Description	Water Based, Biodegradable, Wetting Agents & Surfactants
HMIS Code	Health 0, Fire 0, Reactivity 0
HMIS Key	4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant
D.O.T. Class	Not regulated; not hazardous
Formula:	Proprietary

SECTION II - HAZARDOUS INGREDIENTS

This product does not contain any hazardous ingredients as defined by CERCLA and California's Prop. 65

SECTION III - PHYSICAL & CHEMICAL CHARACTERISTICS

Flash Point:	None	Melting Point:	32F
Specific Gravity:	1.0175 ±.01	Vapor Pressure mm/Hg:	NA
Pounds Per Gallon	8.46	Vapor Density Air 1:	NA
Solubility in Water	Complete	Reactivity with Water:	No
Viscosity	15 Centipoise	Surface Tension @ 5%:	27.7 Dyne/cm at 25°C
Evaporation Rate:	>1 as compared to Water	pH:	10.0 ±.5
Appearance:	Clear Liquid Unless Dyed	Fire Extinguisher Media:	NA
Odor:	Light Fragrance	Fire Fighting Procedures:	NA

SECTION IV - Fire and Explosion Data

Special Fire Fighting Procedures	NA	Percent Volatile by Volume	NA
Unusual Fire and Explosion Hazards	None	Flammable Limit	NA
Solvent for Clean-Up	Water	Auto Ignite Temperature	NA
Flash Point	NA	Fire Extinguisher Media	NA

SECTION V - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be taken in Handling and Storage: Use good normal hygiene.
Precautions to be taken in case of Spill or Leak -
Small spills. Soak up with absorbent materials.
Large spills: dike and contain. Remove with vacuum truck or pump to storage/salvage vessel. Soak up residue with absorbent materials.

Waste Disposal Procedures: Dispose in an approved disposal area or in a manner that complies with all local, state, and federal regulations.

SECTION VI - HEALTH HAZARDS

Threshold Limit Values: NA

Signs and Symptoms of Over Exposure-

Acute: Moderate eye irritation. Skin: Causes redness, edema, drying of skin.
Chronic: Pre-existing skin and eye disorders may be aggravated by contact with this product.

Medical Conditions Generally Aggravated by Exposure: Unknown

Carcinogen: No

Emergency First Aid Procedures -

Eyes: Flush thoroughly with water for 15 minutes. Get medical attention.
Skin: Remove contaminated clothing. Wash exposed areas with soap and water. Wash clothing before reuse. Get attention if irritation develops.
Ingestion: Get medical attention.
Inhalation: None considered necessary.

SECTION VII - SPECIAL PROTECTION INFORMATION

Respiratory Protection:	Not necessary	Ventilation Required:	Normal
Local Exhaust Required:	No	Protective Clothing:	Gloves, safety glasses, wash clothing before reuse.

SECTION VIII - PHYSICAL HAZARDS

Stability:	Stable	Incompatible Substances:	None known
Polymerization:	No	Hazardous Decomposition Products:	NA

SECTION IX - TRANSPORT & STORAGE

DOT Class	: Not Regulated/Non Hazardous	Freeze Temperature	: 28°F
Storage	: 35°F-120°F	Freeze Harm	: None
Shelf Life	: Approximately one year unopened		

SECTION X - REGULATORY INFORMATION

The Information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application, which is not described on the Product label or in this Material Safety Data Sheet is the sole responsibility of the user. This Material Safety Data Sheet was prepared to comply with the OSHA Hazardous Communication Regulation.

All information appearing herein is based upon data obtained by the manufacturer and technical sources. Judgments as to the suitability of information herein for the purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of this information, ICS, ECS or Gold Crew, or its distributors extends no warrantees, makes no representations and assumes no responsibility as to the suitability of such information for application to purchasers intended purposes or for consequences of its use.

