INTERIM REMEDIAL ACTION PROGRESS REPORT

Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90755

Site Cleanup Program No. 0453A, Site ID No. 2047W00
Global ID SL2047W2348

Prepared for
Signal Hill Holding Company
1900 South Norfolk Street, Suite 350, San Mateo, California 94403
March 25, 2016

Submitted to

Ms. Ann Lin
California Regional Water Quality Control Board, Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, California 90013

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Ami Adini & Associates, Inc.

March 25, 2016
Project No. ChemOil.p01
Via E-mail and GeoTracker

Ms. Ann Lin
California Regional Water Quality Control Board, Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, California 90013

Re: Interim Remedial Action Progress Report, Former Chemoil Refinery, 2020 Walnut Avenue, Signal Hill, California 90755, Site Cleanup Program No. 0453A, Site ID No. 2047W00, Global ID SL2047W2348

Dear Ms. Lin:

Ami Adini & Associates, Inc. (AA&A), has prepared this Interim Remedial Action Progress Report at the request of the Signal Hill Holding Company (SHHC) to present an update on the status and progress made in the implementation and operation of the groundwater contaminant mitigation system installed at the site. The mitigation system consists of a flow-through barrier using subsurface metabolic enhancement (SME) technology to mitigate petroleum hydrocarbon contaminants identified in groundwater along the western and southern boundaries of the site as required by the Los Angeles Regional Water Quality Control Board (LARWQCB). This progress report includes a summary of the remedial actions performed to date, and includes an evaluation of the remedial system performance and conclusions and recommendations.

A flow-through barrier using SME technology was selected as the most appropriate technology to prevent the off-site migration of groundwater contaminants. The installation of the SME system was presented to the LARWQCB in the Interim Remedial Action Plan (IRAP), October 24, 2012. The IRAP was approved by the LARWQCB in a letter dated December 7, 2012. An SME System Installation Report, dated April 24, 2014 was submitted to the LARWQCB.

We respectfully submit and request a prompt review of this report. If you have any questions, please contact us at (818) 824-8102.

Respectfully submitted,
AMI ADINI & ASSOCIATES, INC.

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COMMON ABBREVIATIONS

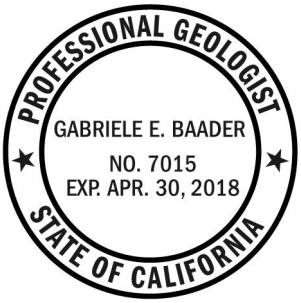
°C	Degrees Celsius
°F	Degrees Fahrenheit
95UCL	95 percent upper confidence limit
AA&A	Ami Adini & Associates, Inc.
acfm	Actual cubic feet per minute
acfh	Actual cubic feet per hour
AOC	Area of concern
AOPC	Area of potential concern
AQMD	Air Quality Management District (South Coast)
ARAR	Applicable, relevant or appropriate requirement
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BAT	Best available technology
BACT	Best available control technology
Bgs	Below ground surface
BMP	Best management practice
BOD	Biochemical oxygen demand
BTEX	Benzene, toluene, ethylbenzene, and xylenes
Cal/EPA	California Environmental Protection Agency
CAP	Corrective action plan
CCR	California Code of Regulations
CCRWQCB	Central Coast Regional Water Quality Control Board
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CFM or CFH	Cubic feet per minute or cubic feet per hour
CFR	Code of Federal Regulations
CH_4	Methane
CHHSLs	California Human Health Screening Levels
COC	Chain of custody
COC	Chemical of concern
COPC	Chemical of potential concern
CRRWQCB	Colorado River Regional Water Quality Control Board
CSF	Cancer slope factor
CSM	Conceptual site model
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
DAF	Dilution-attenuation factor
DCA	Dichloroethane
DCE	Dichloroethene or dichloroethylene
DDD	Dichloro-diphenyl-dichloroethane
DDE	Dichloro-diphenyl-dichloroethene
DDT	Dichloro-diphenyl-trichloroethane
DHS	Department of Health Services
DIPE	Di-isopropyl ether
DNAPL	Dense non-aqueous-phase liquid
DO	Dissolved oxygen
DPE	Dual-phase extraction
DQO	Data quality objective
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources
EB	Equipment blank
EIR	Environmental impact report
EQL	Estimated quantitation limit (also LDL & PQL)
EPA	U.S. Environmental Protection Agency
ESA	Environmental site assessment
ESL	Environmental screening level
ETBE	Ethyl tertiary butyl ether
FID	Flame-ionization detector
FSP	Field sampling plan
ft	Foot or feet
GC/MS	Gas chromatography/mass spectrometry
GW	Groundwater well
GWM	Groundwater monitoring well
H_2S	Hydrogen sulfide
HDPE	High-density polyethylene
HAZWOPER	Hazardous waste operations and emergency response
HHRA	Human health risk assessment
HHSE	Human health screening evaluation
HI	Hazard index
HQ	Hazard quotient
HRC	Hydrogen-releasing compound
HSA	Hollow-stem auger
HSC	Health and Safety Code
HSP	Health and safety plan
HVDPE	High-vacuum dual-phase extraction
HVOC	Halogenated volatile organic compound
IDW	Investigation-derived waste
IRIS	Integrated Risk Information System
J “flag”	Chemical detected below LDL, EQL or PQL
kg	Kilogram
K_{OC}	Organic carbon partition coefficient
LACDHS	Los Angeles County Department of Health Services
LACDPW	Los Angeles County Department of Public Works

LACFD	Los Angeles County Fire Department
LADD	Lifetime average daily dose
LADPW	Los Angeles Department of Public Works
LAFD	Los Angeles City Fire Department
LARWQCB	Los Angeles Regional Water Quality Control Board
LDL	Laboratory detection limit (also EQL and PQL)
LNAPL	Light non-aqueous-phase liquid
LRWQCB	Lahontan Regional Water Quality Control Board
LUST	Leaking underground storage tank
MDL	Method detection limit
MEK	Methyl ethyl ketone (or 2-butanone)
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
MNA	Monitoring and natural attenuation
M,p-xylene	Meta, para-xylene
mph	Miles per hour
MSL	Mean sea level
MTBE	Methyl tertiary butyl ether
mV	Millivolt
MW	Monitoring well
MWD	Metropolitan Water District
NA	Not applicable
ND	Not detected at or above method quantitation limit
NEPA	National Environmental Policy Act
NE	Not established
NFA	No further action
NPDES	National Pollution Discharge Elimination System
NPL	National Priority List
NS	Not sampled
NTU	Nephelometric turbidity unit
OCHCA	Orange County Health Care Agency
OCWD	Orange County Water District
OEHHA	Office of Health Hazard Assessment
ORP	Oxidation reduction potential
OSHA	Occupational Safety and Health Administration
OVA	Organic vapor analyzer
O&G	Oil and grease
o-xylene	Ortho-xylene
PAHs	Poly-aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PCE	Perchloroethene, perchloroethylene, tetrachloroethene, tetrachloroethylene or "perc"
PDF	Portable document format
PE	Professional Engineer
PEA	Preliminary endangerment assessment or preliminary environmental assessment
PEF	Potency equivalent factor
PG	Professional Geologist
PID	Photo-ionization detector
ppb	Parts per billion
ppbv	Parts per billion by volume
PPE	Personal protective equipment
ppm	Parts per million
ppmv	Parts per million by volume
PQL	Practical quantitation limit (also EQL and LDL)
PRG	Preliminary remediation goal (EPA)
PRGi	Industrial preliminary remediation goal (EPA)
PRGr	Residual preliminary remediation goal (EPA)
PRP	Potentially responsible party
QAPP	Quality assurance project plan
QA/QC	Quality assurance/quality control
QC	Quality control
RAP	Remedial action plan
RCRA	Resource Conservation and Recovery Act
REC	Recognized environmental condition
REL	Reference exposure level
RfD	Reference dose
RI/FS	Remedial investigation/feasibility study
RL	Reporting limit
RME	Reasonable maximum exposure
RP	Responsible party
RSL	Regional soil screening level (EPA)
RWQCB	Regional Water Quality Control Board
SAP	Sampling and analysis plan
SARA	Superfund Amendments & Reauthorization Act
SARWQCB	Santa Ana Regional Water Quality Control Board
scfm	Standard cubic feet per minute
scfh	Standard cubic feet per hour
SDRWQCB	San Diego Regional Water Quality Control Board
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SGS	Soil-gas survey
SHSP	Site-specific health and safety plan
SIC	Standard Industrial Classification
SLIC	Spills, Leaks, Investigation and Cleanup
SLOCEHD	San Luis Obispo County Environmental Health Department
SMCHS	San Mateo County Health System
SPCC	Spill prevention control and countermeasure
SSL	Soil screening level
STLC	Soluble threshold limit concentration

SVE	Soil vapor extraction
SVOC	Semi-volatile organic compound
SWPPP	Storm water pollution prevention plan
SWRCB	State Water Resources Control Board
TAME	Tertiary amyl methyl ether
TB	Trip blank
TBA	Tertiary butyl alcohol (tert-butanol)
TCA	Trichloroethane
TCE	Trichloroethene or trichloroethylene
TCLP	Toxic characteristic leaching procedure
TDS	Total dissolved solids
TMB	Trimethylbenzene
TOC	Total organic carbon
TPCA	Toxic Pit Cleanup Act
TPH	Total petroleum hydrocarbons
TPHcc	Total petroleum hydrocarbons carbon chain
TPHd	Total petroleum hydrocarbons as diesel
TPHg	Total petroleum hydrocarbons as gasoline
TPHo	Total petroleum hydrocarbons as oil
TRPH	Total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSS	Total suspended solids
TTLC	Total threshold limit concentration
USA	Underground Service Alert
USCS	Unified Soils Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geologic Survey
µg/m^3	Micrograms per cubic meter
µg/kg	Micrograms per kilogram
µg/l	Micrograms per liter
UST	Underground storage tank
VCP	Voluntary Cleanup Program
VES	Vapor extraction system
VET	Vapor extraction test
VOC	Volatile organic compound
WDR	Waste discharge requirement
WET	Waste extraction test
WIP	Well Investigation Program

PROFESSIONAL CERTIFICATION

This *Interim Remedial Action Progress Report* has been prepared by



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EXECUTIVE SUMMARY

Ami Adini and Associates, Inc. (AA&A), has prepared this *Interim Remedial Action Progress Report* to present an update on the status and progress made in the implementation and operation of the groundwater contaminant mitigation system installed along the western and southern boundaries of the Former Chemoil Refinery (site) located at 2020 Walnut Avenue in Signal Hill, California 90806.

The mitigation system consists of a flow-through barrier using subsurface metabolism enhancement (SME) technology to mitigate petroleum hydrocarbon contaminants identified in groundwater along the western and southern boundaries of the site as required by the Los Angeles Regional Water Quality Control Board (LARWQCB).

A flow-through barrier using SME technology was selected as the most appropriate technology to prevent the off-site migration of groundwater contaminants. The installation of the SME system was presented to the LARWQCB in the Interim Remedial Action Plan (IRAP), October 24, 2012. The IRAP was approved by the LARWQCB in a letter dated December 7, 2012.

SME (U.S. patent no. 6,464,005) technology is an in-situ process of soil and groundwater remediation that uses natural microorganisms found natively in soil to degrade petroleum hydrocarbons. SME technology incorporates the technologies of nutrient injection, air injection, and air and biogenic-gas extraction. Using a combination of air and nutrient injection into the subsurface through a series of injection wells and the extraction of air and biogenic gas from a series of extraction wells, oxygen flow-throughout the subsurface is enhanced. The increased circulation of oxygen and nutrients in the subsurface stimulates the aerobic metabolism of petroleum hydrocarbons by naturally occurring, native microbes in the soil. Extraction of biogenic gas, primarily carbon dioxide, prevents anaerobic conditions from developing in the subsurface, promotes the natural metabolism of petroleum hydrocarbons, and maintains a negative pressure in the subsurface, which promotes the flow and spread of injected air and nutrients throughout the area of contamination. SME technology addresses soil and groundwater contamination simultaneously and is also effective in treating hydrocarbon contamination above and below the groundwater table.

After obtaining the required permits for the construction, installation, and operation of the SME system, AA&A commenced the installation of the network of air and nutrient injection wells, biogenic-gas extraction wells, and barrier monitoring wells. A total of 150 wells were installed to a maximum depth of 40 feet below ground surface at the site between December 17, 2013, and January 15, 2014. Installation of the conveyance piping and the mechanical equipment required to operate the SME system was completed and preliminary operation of the SME commenced on March 3, 2014.

Starting in March of 2014, The SME operation was initiated and included periodic nutrient injections and air injection only with no biogenic gas extraction. Shortly after that, biogenic gas extraction was initiated but the activated carbon was being depleted within a day due to the high hydrocarbon vapor load and as such, the extraction operations were shut down. At about that same time, operations had to cease in order to secure a storm water permit from the City of Signal Hill, which was secured in June of 2014. Additionally, the power supply to the SME system was shut down from April to June of 2014, during which time the air injection was shut down.

The air injection was resumed in June of 2014, and in October of 2014, a supplemental interim remedial action that included operation of a vapor extraction system and treatment of the off-gas with a catalytic oxidizer unit was initiated to handle the high hydrocarbon vapor load in the extracted biogenic gas. Three interim treatment periods were conducted using the catalytic oxidizer unit between October 2014 and September 2015. The catalytic

oxidizer system was operated 6,222 hours and the inlet hydrocarbon vapor levels to the system were sufficiently reduced by the end of the last treatment period.

In October 2015, the SME fixed system using activated carbon for the well gas treatment media was started for continuous operations. This is the first reporting period for these system operations and the system operated 98 days until January 2016. The system is planned for continuous operations through the next operational period.

The progress and performance of the SME system was evaluated on the basis of a number of general criteria On balance, it does appear that the SME system is reducing the TPH-g and TPH-d contamination in the groundwater in the flow-through barrier zone as it was designed.

Per the requirements of the Waste Discharge Requirements (WDR) permit, quarterly monitoring reports prepared specifically to report groundwater parameters required by the permit are being regularly submitted to the LARWQCB. The next groundwater monitoring event to be conducted for the parameters specified in the WDR permit will be conducted during the first quarter of 2016.

Per the requirements of the LARWQCB, routine semi-annual groundwater monitoring reports prepared to report groundwater conditions are being regularly submitted to the LARWQCB. The next semi-annual groundwater monitoring event will be conducted during the second quarter of 2016.

Use of SME technology requires by law that the patent number (U.S. patent no. 6,464,005) be included.

1. INTRODUCTION

Ami Adini & Associates, Inc. (AA&A), has prepared this *Interim Remedial Action Progress Report* to present an update on the status and progress made in the implementation and operation of the groundwater contaminant mitigation system installed along the western and southern boundaries of the Former Chemoil Refinery (site) located at 2020 Walnut Avenue in Signal Hill, California 90806 (Figures 1 and 2). The mitigation system consists of a flow-through barrier using subsurface metabolic enhancement (SME) technology to mitigate petroleum hydrocarbon contaminants identified in groundwater along the western and southern boundaries of the site as required by the Los Angeles Regional Water Quality Control Board (LARWQCB).

This progress report includes a summary of the remedial actions performed to date.

A flow-through barrier using SME technology was selected as the most appropriate technology to prevent the off-site migration of groundwater contaminants. The installation of the SME system was presented to the LARWQCB in the Interim Remedial Action Plan (IRAP), October 24, 2012. The IRAP was approved by the LARWQCB in a letter dated December 7, 2012. (Appendix A). An SME System Installation report, dated April 24, 2014 was submitted to the LARWQCB.

1.1 Objective

The objective of the mitigation system is to prevent the off-site migration of petroleum hydrocarbon contaminants identified in groundwater along the western and southern boundaries of the site as required by the LARWQCB. The system consists of a flow-through barrier using SME technology to mitigate the off-site migration of groundwater contaminants previously identified at the site. A detailed discussion of the design, installation, and operation of the system is provided in this report as well as an evaluation of the system performance.

2. BACKGROUND AND SITE HISTORY

The site is a former oil refinery that operated from 1922 to early 1994. The Chemoil Corporation (Chemoil) acquired the refinery in August 1988 and operated it until February 1994. Prior to being acquired by Chemoil, the refinery was owned and operated by the MacMillan-Ring Free Oil Company. According to the Additional Off-Site Environmental Investigation Report, dated July 11, 2012, prepared by Geosyntec Consultants, of Oakland California, the refinery and associated equipment were dismantled and removed between 1997 and 1998 (Geosyntec, 2012). The site is currently vacant and does not contain any aboveground or underground storage tanks.

The site address is 2020 Walnut Avenue in Signal Hill, California, and comprises a total of 23 parcels identified by the Los Angeles County, Office of the Assessor. The site is divided by Walnut Avenue into two primary parcels, identified as the Eastern and Western parcels. The western parcel is bound by Walnut Avenue to the east, commercial office/light industrial properties to the north, Gundry Avenue to the west, and a former railway corridor parallel to East Wesley Drive to the southwest. Residential properties are located south and west of the former railway corridor south of the site. The eastern parcel is bound by Walnut Avenue to the west, East 20th Street and Alamitos Avenue to the south, North Gaviota Avenue to the east, and the American University of Health Sciences to the north.

2.1 Previous Assessments, Monitoring and Remediation

A summary of previous reports and chronology of pertinent activities included in the Report on Groundwater Quality Monitoring Program, July 2012, dated July 15, 2012 prepared by Testa Environmental Corporation (TEC), of Mokelumne Hill, California indicates that several phases of assessment, monitoring and remediation have been conducted at the site dating back to December 1985 (TEC, 2012). The summary prepared by TEC indicates that the initial groundwater monitoring report for the site was prepared in March 1987 and that a proposed remedial action plan was prepared in March 2002. The documents summarized by TEC were not available for review by AA&A at the time of the preparation of this report.

The Report on Groundwater Quality Monitoring Program, April 2012, dated April 15, 2012 prepared by TEC, indicates that a light, non-aqueous phase liquid (LNAPL), or free-product, was formerly encountered in four wells associated with the site; one monitoring well (MW9) and three LNAPL recovery wells (R-4 through R-6). A map included in the TEC report dated April 15, 2012, indicates that LNAPL was formerly present in three areas at the site:

- Pool No. 1, located along the eastern boundary of the western portion of the site, north of East 21 Street, in the vicinity of former LNAPL recovery well R-4, and vicinity of current monitoring wells MW9 and MW11;
- Pool No. 2, located along the western boundary of the western portion of the site, in the vicinity of former LNAPL recovery well R-5, and vicinity of current monitoring well MW12; and
- Pool No.3, located in the southern-most corner of the site near the intersection of Walnut Avenue and East Wesley Drive, in the vicinity of former LNAPL recovery well R-6, and up-gradient of current monitoring well MW14.

A LNAPL recovery program was implemented in March 1986 and approximately 27.9 barrels of LNAPL were recovered by December 1994. Although the volume of a barrel was not reported in the TEC summary, the generally accepted volume is 42 gallons, suggesting that approximately 1,171.8 gallons of LNAPL were recovered between March 1986 and December 1994. The LNAPL recovery wells were abandoned in 2009. The April and July 2012 reports prepared by TEC do not indicate if additional remediation had been conducted after 1994.

3. ENVIRONMENTAL SETTING

3.1 Regional Geology

The site is located in the Los Angeles Basin, part of the Coastal Plain of Los Angeles County. The Coastal Plain is in the northwest corner of the Peninsular Range geomorphic province, which extends southward into San Diego County and Baja California. The Peninsular Range province consists of generally northerly- and northwesterly-trending mountain ranges and associated valleys. To the north of this province is the Transverse Range province, which consists of east- to west-trending mountains, including the Santa Monica and San Gabriel Mountains (California Department of Water Resources [DWR], 1961).

A northwest structural trend is evident in many folding and faulting features of the regional geology, characteristic of the Peninsular Ranges geomorphic province. These include the Newport–Inglewood Fault Zone, the Paramount Syncline, the Dominguez Anticline, the Gardena Syncline, the Wilmington Anticline, and the Wilmington Syncline. Geologic units of the northern Peninsula Ranges province consist of Jurassic- and

Cretaceous-age basement rocks overlain by as much as 32,000 feet of marine and non-marine sedimentary strata ranging in age from the late Cretaceous to Holocene epochs. Characteristic of the southwestern block of the Los Angeles Basin is the basement rock referred to as the Catalina Schist. The nearly ubiquitous presence of this Cretaceous schist as a basement rock in the region indicates that the Newport–Inglewood Fault Zone may have been a boundary between oceanic and continental crusts, separated by a subduction zone at that boundary (Barrows, 1974).

The Newport–Inglewood–Rose Canyon fault zone is located approximately 0.25-miles northeast of the site.

3.2 Local Geology

According to the Geologic Map of California, Long Beach Sheet (USGS, 1962), the site is situated on Quaternary non-marine terrace deposits. Based upon a review of available historical site documents presenting site assessment activities dating back to 1987 the site appears to be generally underlain with non-continuous intervals of sandy silt and silty sand with various distributions of grain size and sand to silt ratios to 45 feet bgs. Clay, clayey silt, and/or clayey sand have been reported in several borings at thicknesses ranging from 1 to 20 feet thick, but do not appear to constitute a continuous confining layer at the site.

In general, soil lithology in the borings completed during the installation of the SME system consisted primarily of dry, medium dense to dense, silty sand from ground surface to depths of 7 to 17 feet bgs. Medium dense to dense, poorly graded fine sand was generally encountered below the silty sand to depths up to 40 feet bgs, the maximum depth explored.

3.3 Regional Hydrogeology

The site is located within the West Coast sub-basin of the Central Plain of Los Angeles groundwater basin. The basin is identified as Basin Number 4-11.03 by the DWR in the California's Groundwater Bulletin 118 (last updated February 27, 2004). According to the DWR, the surface area of the sub-basin is 142 square miles. The sub-basin is bound to the north by the Ballona Escarpment, to the east by the Newport-Inglewood fault zone, and the Pacific Ocean and consolidated rock of the Palos Verdes Hills on the south and west. Water bearing formations in the sub-basin generally consist of Holocene, Pleistocene, and Pliocene age unconsolidated and semi-consolidated marine and alluvial sediments. The primary aquifer in the sub-basin is the Silverado aquifer, estimated to be 500 feet thick with a storage capacity of 6.5 million acre-feet (DWR, 2004).

Records available from the County of Los Angeles Department of Public Works (LADPW) well information website (http://dpw.lacounty.gov/general/wells/#), indicate that the nearest production well, identified as Well ID 420 (State No. 4S12W30R01) is located approximately 850 feet south of the southernmost property boundary of the site. The LADWP lists the well as active with the most recent measurement date of October 7, 2008; the depth to groundwater was 56.60 feet bgs with a water surface elevation of -40.60 feet bgs. The first measurement of the well was recorded on June 29, 1960, with a depth to water of 93.10 feet bgs. Depth to water in the well has ranged from 56.20 (April 2004) to 98.90 (November 1977) feet bgs.

3.4 Local Hydrogeology

Groundwater monitoring at the site began in March 1987. Since the initial monitoring event through June 2012, groundwater elevations have remained relatively consistent. In June 2012, groundwater elevations ranged from 4.99 (MW-2) to 6.82 (MW-3) feet above MSL. From 2012 to 2013, the groundwater elevations have decreased significantly, followed by a relative small decrease in elevation through 2015. Since the initial monitoring event,

less than 7 feet have separated the highest groundwater elevation measurements from the lowest measurements in the site wells.

During the groundwater monitoring event conducted in December 2015, the average groundwater elevation was 2.62 feet above MSL; 3.00 feet separated the highest and lowest measurements. The average depth to groundwater was approximately 22.84 feet bgs. Due to site topography the difference between the depth to water measurements in the monitoring wells is 29.89 feet. Groundwater flow was determined to be toward the southeast at an approximate gradient of 0.0012 feet per feet.

The topographic gradient at the site is toward the south. The elevation of the southeast corner of the western portion of the site is approximately 25 feet above MSL, approximately 25 feet lower than the northeast corner of the western portion of the site. The approximate elevations of the southern and northern boundaries of the eastern portion of the site are 28 and 42 feet above MSL, respectively.

4. REMEDIATION SYSTEM DESCRIPTION AND INSTALLATION

The selected technology to treat groundwater contamination along the western and southern boundaries of the site is a flow-through barrier using subsurface metabolism enhancement (SME). SME (U.S. patent no. 6,464,005) is an in-situ bioremediation process of soil and groundwater remediation that uses natural microorganisms found natively in soil to degrade petroleum hydrocarbons. SME technology incorporates the technologies of nutrient injection, air injection, and air and biogenic-gas extraction (BGE). Using a combination of air and nutrient injection into the subsurface through a series of injection wells, and the extraction of air and biogenic gas from a series of extraction wells, oxygen flow-throughout the subsurface is stimulated. The increased circulation of oxygen and nutrients into the subsurface stimulates the aerobic metabolism of petroleum hydrocarbons by naturally occurring, native microbes in the soil. Accumulation of carbon dioxide in the subsurface prevents bacterial growth. Extraction of biogenic gas, primarily carbon dioxide, prevents the subsurface from becoming anaerobic, promotes the natural metabolism of petroleum hydrocarbons, and maintains a negative pressure in the subsurface, which promotes the flow and spread of injected air and nutrients throughout the area of contamination.

SME technology injects nutrients in batched intervals several weeks to months between injections to allow the nutrients to disperse throughout the subsurface. Because low-flow air injection, between 10 and 20 cubic feet per hour per injection point, is used to provide oxygen to the subsurface, and air and vapor extraction is performed at approximately one to four times the injection rate, equipment required to conduct SME is significantly less expensive to operate than typical air sparge and/or vapor and dual-phase extraction (DPE) equipment. SME relies on in-situ hydrocarbon destruction and bioremediation, as opposed to mechanical extraction.

The goal of this remedial action is to maximize the reduction of contaminant concentration in the groundwater throughout the flow-through barrier zone to practicable, low, economically attainable levels.

A discussion of the SME system design elements and detailed discussion of the construction and installation of the necessary components and equipment to allow for the operation of the SME system is provided below.

4.1 SME Flow-Through Barrier Design and Construction

SME flow-through barrier technology comprises five primary components: air injection, BGE, nutrient injection, a surface seal, and groundwater monitoring wells. The installed SME system consists of a network of 92 air/nutrient injection wells, 46 BGE wells, a surface seal, and 12 groundwater monitoring wells. The air/nutrient

injection and extraction wells associated with SME were installed using direct-push drilling technology. A map illustrating the proposed locations and arrangement of the well network and surface seal is provided as Figure 3.

AA&A worked with the LARWQCB and other various agencies to obtain the required authorizations and permits to complete the installation and operation of the SME system.

After obtaining the required permits for the construction, installation, and operation of the SME system, between December 17, 2013, and January 15, 2014, AA&A preformed the installation of the network of air and nutrient injection wells, biogenic-gas extraction wells, and barrier monitoring wells. Installation of the conveyance piping and the mechanical equipment required to operate the SME system was then completed, and preliminary operation of the SME commenced on March 3, 2014.

4.2 Injection, Extraction and Monitoring Wells

The SME system uses a network of injection, extraction and monitoring wells. A detailed discussion of the installation of each of the types of wells is provided below. A map illustrating the general locations and arrangement of the well network and surface seal is provided as Figure 3. Locations and identifications of each of the wells are provided on Figures 4 and 5. Details regarding the construction of each of the wells are summarized in the attached Table 1.

4.2.1 Barrier Monitoring Wells

To monitor groundwater conditions and evaluate the effectiveness of the SME flow-through barrier, AA&A installed 12 monitoring wells (identified as BMW-1 through BMW-12) located along the approximate center line of the flow-through barrier. The wells were constructed of 0.75-inch or 1.5-inch-diameter, prepack schedule 40, PVC well materials and installed using a direct-push drill rig. Due to the elevation changes observed between the southern and northern portions of the site and the relatively flat groundwater gradient observed at the site, well construction details varied amongst the wells. The well constructions were modified in the field to construct the wells with approximately 5 feet of screen above the groundwater surface and 10 feet of screen below. The locations of the monitoring wells are shown on Figure 3. A well construction diagram for the monitoring wells is provided as Figure 6. Complete details of the monitoring well constructions are summarized in the attached Table 1.

As the design and installation of the air injection, nutrient injection, and BGE wells required an understanding of groundwater conditions throughout the area of the SME treatment area, the monitoring wells were the first wells installed at the site.

4.2.2 Air Injection

The network of 92 air injection points (identified as AI1 through AI92) is divided into two circuits. Circuit 1 is located on the southern parcel and consists of wells AI1 through AI50; circuit 2 is located on the northern parcel and consists of wells AI51 through AI92. Air injection points are constructed in the same borings as the nutrient injection wells using 0.25-inch-diameter nylon tubing connected to a 6-inch-long, stainless steel screened, air injection point. The desired depth of the air injection point is 6 to 8 feet below the groundwater surface. The installation depth of the air injection points was determined in the field based on the depth to water observed in the adjacently located barrier monitoring wells. A well construction diagram for the air injection point/nutrient injection well is provided as Figure 7. Details of the construction of each of the air injection points are summarized in the attached Table 1.

Two rows of injection circuits were installed along the western property boundary and two rows of injection circuits were installed along the southern property boundary. Each of the two rows was placed approximately 15 feet apart with the first row placed approximately 20 feet from the property boundaries. Maps illustrating the configuration of the air injection circuits are provided as Figures 3, 4 and 5.

Air injection is completed using two 2.9-horsepower, 100 percent oil-less, rotary-vane, Becker DX4.40K air compressors. Individual compressors provide air to each of the air injection well circuits. One compressor was installed in a secured equipment enclosure, centrally located between the air injection wells on the southern portion of the site; the second compressor was also installed in a secured equipment enclosure on the northern portion of the site. Specifications for the air compressor are provided in Appendix B.

Air is supplied to the air injection wells through a 2-inch diameter header pipe. An air distribution manifold is connected to the header pipe inside a 2-foot by 2-foot sealed, access cover at each of the barrier monitoring well locations. Air is supplied from the manifold through 3/8-inch diameter polyethylene tubing to an air flow controller to each of the air injection points. The air flow controllers regulate the incoming air supply from the air compressors to between 10 and 30 cubic feet per hour (cfh).

4.2.3 Biogenic Gas Extraction

Biogenic gas is extracted from the subsurface to promote the circulation of oxygen and prevent the accumulation of carbon dioxide. The metabolic activity of subsurface microbes decreases as conditions become anaerobic. Vapor samples of the extracted gases are measured in the field for oxygen and carbon dioxide content to verify that subsurface conditions stay aerobic and maintain the optimum ratio of oxygen and carbon dioxide.

The network of 46 BGE wells (identified as BGE1 through BGE46) is divided into four circuits. Two BGE circuits were installed on the southern portion of the site and two BGE circuits were installed on the northern portion of the site. The BGE circuits installed on the southern portion of the site comprise wells BGE 1 through BGE12 (circuit 1), and BGE13 through BGE25 (circuit 2). The BGE circuits installed on the northern portion of the site comprise wells BGE 26 through BGE38 (circuit 3), and BGE39 through BGE46 (circuit 4).

Vacuum is applied to each circuit by 6.16-horsepower, Airtech 3BA1510-7AT56 regenerative blowers capable of applying up to 150 inches of water vacuum and approximately 160 cubic feet per minute (cfm) to the network of BGE wells to remove carbon dioxide and promote the circulation of oxygen in the subsurface. Two blowers were installed in the secured equipment enclosure centrally located between the extraction wells on the southern portion of the site; two blowers were also installed in the secured equipment enclosure on the northern portion of the site. The piping to the blowers in each of the equipment enclosures is configured so that each blower can apply vacuum to either, or both, circuits in their respective site portion (i.e. blowers 1 or 2 can apply vacuum to BGE circuit 1 or 2 and blowers 3 and 4 can apply vacuum to circuit 3 or 4). Specifications for the blowers are provided in Appendix C.

BGE wells were constructed using 1-inch-diameter, Schedule 40 PVC blank and 0.020-inch-slot screen material. The desired depth of the BGE wells is approximately 5 to 8 feet above the groundwater surface. The installation depth of the BGE wells was determined in the field based on the depth to water observed in the adjacently located barrier monitoring wells. A well construction diagram for the BGE wells is provided as Figure 8. Details of the construction of each of the BGE wells are summarized in attached Table 1.

A single row of BGE circuits was installed along the western property boundary and a single row of BGE circuits was installed along the southern property boundary. Each row of BGE wells was placed between the two rows of

injection circuits. Maps illustrating the configuration of the air injection circuits are provided as Figures 3, 4, and 5.

Although the intent of BGE is to remove biogenic gas, primarily carbon dioxide, and promote the circulation of oxygen in the subsurface, extraction may include some petroleum hydrocarbon and VOC vapors that are present in the subsurface as a result of the contamination that exists. As such, the BGE system includes a treatment system to remove any hydrocarbon vapors that may be present prior to discharge to the atmosphere.

The treatment system consists of nine, 200-pound granular activated carbon canisters arranged in a parallel-series configuration. Three 1,500-pound granular activated carbon canisters were added arranged in a series configuration downstream from the other canisters. All extracted vapors from the southern and northern portions of the site are routed to the treatment system located in the equipment enclosure located on the northern portion of the site. The treatment system is permitted by the AQMD.

Shortly after operations were started it was discovered that extraction of the biogenic gas caused the activated carbon to be quickly depleted. It was decided to attempt to reduce the hydrocarbon loading to the system by conducting a supplemental interim remedial action that included operation of a vapor extraction system and treatment of the off-gas with a catalytic oxidizer unit. The vapor extraction system is described in more detail in the following Section 5., Remedial System Start-up and Operation

4.2.4 Nutrient Injection

Nutrients are injected into the subsurface to maintain optimum ratios of carbon to nitrogen to phosphorus. As microbial metabolism of hydrocarbons occurs, nutrients such as nitrate and phosphorus are depleted. A solution of ammonium sulfate is used to maintain nitrate concentrations. Authorization was obtained from the LARWQCB and Waste Discharge Requirements (WDR) permit was acquired prior to initiating nutrient injections.

Nutrients are injected into the subsurface via 92 dedicated injection points constructed in the same borings as the air injection wells. Nutrient injection wells (identified as NI1 through NI92) are constructed using 0.75-inch-diameter, Schedule 40 PVC blank and 0.020-inch-slot screen material. The desired depth of the nutrient injection wells is for the bottom of the well to be above the capillary fringe. The installation depth of the nutrient injection wells was determined in the field based on the depth to water observed in the adjacently located barrier monitoring wells. To minimize the potential for submerging the screened interval of the nutrient injection wells, the wells were constructed with a 5-foot long screened interval placed approximately 5 feet above the anticipated groundwater level. A well construction diagram for the air injection points/nutrient injection wells is provided as Figure 7. Details of the construction of each of the nutrient injection wells are summarized in the attached Table 1.

Two rows of nutrient injection wells were installed along the western and southern property boundaries. Each of the two rows was placed approximately 15 feet apart with the first row placed approximately 20 feet from the property boundaries. Maps illustrating the configuration of the air injection circuits are provided as Figures 3, 4 and 5.

Each nutrient injection point is individually piped to a distribution location within a sealed 2-foot by 2-foot, access cover at each of the barrier monitoring well locations. As nutrient injection wells and air injection points are constructed in the same borehole, the arrangement of nutrient injection wells is the same as the air injection points.

4.3 SME System Construction

4.3.1 Equipment Enclosure

Physical equipment associated with the SME flow-through barrier system was installed in sealed, lockable enclosures to minimize noise and provide security for the equipment. A map illustrating the locations of the equipment enclosures is provided as Figures 3, 4 and 5. A piping and instrumentation diagram illustrating the general configuration of the injection and extraction equipment is provided as Figure 9.

4.3.2 Surface Seal and Soil Stabilization

SME relies upon the circulation of air and nutrients in the subsurface along with the removal of carbon dioxide rich biogenic gas. Sealing of the surface is required to promote the circulation of air and nutrients in the subsurface between the air injection points and BGE wells. The surface seal also increases the radius of influence of SME by reducing the potential of air at the surface from being drawn into the BGE wells and effectively short-circuiting the wells.

The surface seal was completed after the installation of the air/nutrient and BGE wells and associated conveyance piping. The seal consists of 6 mil thick polyethylene plastic sheeting and extends 20 feet beyond each side of the locations of the air/nutrient injection circuits. After placement, the polyethylene plastic sheeting was covered with clean fill material to prevent damage to the seal. Approximately 2 feet of fill material was placed over the conveyance piping and 1 foot of fill was placed over the portions of the seal that extend beyond the conveyance piping. All conveyance piping was tested for leaks prior to the installation of the surface seal. The location of the surface seal is shown on Figure 3.

To control dust and prevent erosion of the fill material placed above the surface seal, a soil stabilization product (Soiltac®, manufactured by Soilworks®, LLC) was applied to the fill material at a rate of approximately one gallon per 70 square feet. Soiltac is a biodegradable, liquid copolymer that is sprayed on the surface of the fill. Once applied, the Soiltac cures to form a transparent, durable and water resistant solid mass. Soiltac was applied to the area of fill material and extends approximately 7 to 10 feet beyond the extent of the fill material to form an erosion resistant surface designed to last 12 to 24 months. Annual maintenance, consisting of the re- application of Soiltac at a rate of approximately 1/3 the initial application can extend the design life indefinitely.

5. REMEDIATION SYSTEM START-UP AND OPERATION

This report covered the operation of the SME system from start-up through the end of the last reporting period which is January 26, 2016.

Operation of the SME system began on March 3, 2014. Preliminary operations indicated that current subsurface conditions were oxygen deficient. To increase the concentration of oxygen in the subsurface the SME system was operated with air injection only. The objective of air injection without biogenic gas extraction was to maximize the residence time of the injected air and increase the concentration of oxygen in the subsurface.

Although the system is intended to operate with air injection and biogenic gas extraction simultaneously, operation of the biogenic gas extraction portion of the system at the start-up period may also remove the injected air without increasing the concentration of oxygen in the subsurface.

The first nutrient injection event was completed on March 11 and 12, 2014. A solution of 1 pound of ammonium sulfate in 1 gallon of deionized water was injected into each of the 92 nutrient injection wells. A material safety data sheet for the ammonium sulfate product is provided as Appendix D. The additional nutrient injection events are described in detail below.

Biogenic gas extraction operations were started on about March 12, 2014 when it was determined that biogenic gas extraction could be initiated such that air injection and biogenic gas extraction were conducted simultaneously. The oxygen levels were sufficient and carbon dioxide levels were increasing to levels that would not be beneficial to the microbes and the biogenic gas extraction was initiated to remove the accumulated carbon dioxide. Upon startup of the biogenic gas extraction it was discovered that extraction of the biogenic gas caused the activated carbon to be quickly depleted, within a day. Because of this, the biogenic gas extraction operations were shut down. At about that same time, operations had to cease in order to secure a storm water permit from the City of Signal Hill, which was secured in June of 2014. Additionally, the power supply to the SME system was shut down from April to June of 2014 due to vandalism of the power supply cables.

From March 2014 until October 2014, the SME system operated with air injection only. There was no extraction of biogenic gas. In October 2014, biogenic gas extraction operations were re-started. It was decided to attempt to reduce the hydrocarbon loading to the system by conducting a supplemental interim remedial action that included operation of a vapor extraction system and treatment of the off-gas with a catalytic oxidizer unit. This operation is described in detail in the report prepared by AA&A titled System Operations Report, dated January 31, 2016 which is contained in Appendix E.

The subsequent operation of the nutrient injections, the air injections, and the biogenic gas extraction are described in detail in the following sections. Additionally, groundwater monitoring activities are described below.

5.1 Nutrient Injection Activities

Following the first injection event completed on March 11 and 12, 2014, the next event was conducted on July 2, 2014. A solution of 1 pound of ammonium sulfate in 1 gallon of deionized water was injected into each of the 92 nutrient injection wells. Immediately following the nutrient injection into the injection points 1 gallon of deionized water was injected to flush the nutrients through the injection point piping.

Following the July 2, 2014 nutrient injection, subsequent nutrient injection events were conducted at approximate 6-week time intervals as follows:

- In 2014: August 12, September 16, November 7, and December 19.
- In 2015: February 16, April 9, May 29, August 12, October 20,and December 22.
- In 2016: January 26.

In each of the above-specified nutrient injection events, the protocol was the same: A solution of 1 pound of ammonium sulfate in 1 gallon of deionized water was injected into each of the 92 nutrient injection wells. Immediately following the nutrient injection into the injection points 1 gallon of deionized water was injected to flush the nutrients through the injection point piping.

The following were the only exceptions to the above-described nutrient injection protocols:

On December 22, 2014, the southern portion of the site was found to be inaccessible for the injection equipment due to rainfall creating large areas of standing water and mud. As such, on this date only the injection wells on the northern portion of the site were injected with nutrients.

Starting from the August 12, 2015 nutrient injection event and all continuing with all subsequent events, accumulated nutrients in the piping caused partial blockage and resulted in backflow. To correct this situation, each injection point was pressurized to approximately 45 to 50 pounds per square inch (psi) during injections and this corrected the blockage.

5.2 Air Injection Activities

Air injection was initiated on March 3, 2014, and then ran continuously except for short shutdown periods for pump maintenance/repairs during the times the system was in operation. The following is a summary of the air injection operational times:

- Air injection started on March 3, 2014, and ran continuously, 24 hours per day, 7 days per week (24/7).
- Air injection stopped on April 3, 2014 when it was discovered the power supply cables were vandalized and the power supply was shut down which placed the air injection out of operation.
- On June 18, 2014, AA&A had the power restored and air injection was started again and ran continuously, 24/7.
- Around September 15, 2015, one of the air compressors was found to have seized up. At that time, the other compressor was shut down which placed the air injection out of operation. A factory-authorized representative was dispatched to repair the compressors.
- On about September 27, 2015, after the compressors were repaired, the air injection was started again and has been running 24/7 ever since..

Air was injected to the network of 92 air injection points from two compressors (one compressor for the northern array and one compressor for the southern array). The air injection system operated at a discharge pressure of about 11 pounds per square inch gage (psig). The air injection flow rates were determined from the compressor flow performance curves. Based on the curves, the flow from each compressor is 25 scfm (1,500 scfh) for a system total of 50 scfm or 3,000 scfh for both compressors. There are individual flow meter regulators on each of the 92 air injection lines.

The flow meters were checked and the flow measurements were recorded initially on system start-up. Appendix F is the completed field log with the recorded flow measurements taken on March 10, 2014. The flow rates were all in the range of 10 to 30 acfh. The flow meters were randomly inspected during injection events and appeared in normal operating range; however, in a post rainy season check of March 10, 2016 (Appendix F), about 25 percent were observed to malfunction and are getting replaced at this time.

5.3 Biogenic Gas Extraction Activities

As noted above, a supplemental interim remedial action that included operation of a vapor extraction system and treatment of the off-gas with a catalytic oxidizer unit was initiated once it was determined that the activated carbon was being depleted quickly due to the hydrocarbon vapor load. Three interim treatment periods were conducted using the catalytic oxidizer unit between October 2014 and September 2015. The catalytic system was operated intermittently for about one week at a time, with a rebound period allowed between each event to maximize hydrocarbon removal efficiency. Operations revealed that the inlet levels from the northern area are significantly higher than in the southern area, so flow was focused on the northern piping array. The catalytic

oxidizer system was operated 6,222 hours and removed 7,411 pounds of TPH-g and the inlet levels to the system were reduced from 5,400 µg/l TPH-g initially to just 238 µg/l TPH-g by the end of the last treatment period.

In October 2015, the SME fixed system using activated carbon for the well gas treatment media was started for continuous operations. This is the first reporting period for these system operations and the system operated 98 days until January 2016 and removed 193 pounds of TPH-g in this period. The system is planned for continuous operations through the next operational period.

The above summary of the biogenic gas extraction activities is described in detail in a report prepared by AA&A titled *System Operations Report,* dated January 31, 2016 which is contained in Appendix E. In particular, the system operational and monitoring data contained in the report should be referenced.

The following is a summary of the information provided in the *System Operations Report* contained in Appendix E.

5.3.1 Supplemental Remedial Action

In an effort to quickly remove as much contaminant mass as possible and reduce the inlet hydrocarbon concentrations, AA&A conducted a supplemental interim remedial action consisting of operation of a vapor extraction system. Vapors were extracted from the combined well array using a mobile extraction device provided by AA&A. The unit is equipped with three 3-stage Siemens blowers, each capable of extracting up to 120 cubic feet per minute of air and inducing 22 inches of mercury vacuum. The blowers can be operated individually or in combination to provide a wide range in flow and vacuum capability. The system is permitted by the South Coast Air Quality Management District (SCAQMD) under a various locations permit.

5.3.1.1 First Period of Interim Remedial Action

The first period of interim remedial action was initiated on October 23, 2014 and ended on November 14, 2014.

The catalytic oxidizer equipment was transported to the site and continuous vapor extraction operations were started. The system was operated using all extraction pipes accessing all four areas at an applied vacuum pressure of about 30 inches of water column (in. WC), producing a consistent well gas flow of about 200 scfm. The flow was adjusted between the two extraction lines to maximize hydrocarbon removal. The system was started using all extraction lines open equally to flow. After one day the relative flow to the south extraction array was reduced as the northern array produced much higher hydrocarbon levels. The northern array extraction lines provided the majority of the flow (75 to 85 percent) until the end of the operating period.

During operations, the well gas from each area was monitored for VOC content using a photo-ionization detector (PID), and for oxygen and carbon dioxide content using a Mini-Rae multi gas meter. Results of monitoring indicate the northern section of the northern area produced the highest inlet levels with an initial hydrocarbon concentration of 1280 parts per million (ppm). The southern section of the northern area had 760 ppm initially. In contrast, the two southern areas had 320 and 260 ppm initially. By the end of the operational period the inlet levels from the two northern areas were 1,270 and 635 ppm, and the south area produced about 324 ppm. Results of oxygen and carbon dioxide monitoring indicated the northern area had oxygen levels ranging from 10.4 to 15.3 percent with carbon dioxide level ranging from 1.5 to 5.2 percent. The southern area had oxygen levels ranging from 10.6 to 16.8 percent and carbon dioxide ranging from 2.1 to 4.3 percent.

On October 30, 2014, a vapor sample was collected from the combined system influent to gauge the productivity of the well stream and to calculate the mass removed. The sample was analyzed for TPH-g and VOCs and results

of analysis indicated the detections were 5,400 µg/l of TPH-g, 4.3 µg/l of benzene, 1.1 µg/l of toluene, 2.1 µg/l of xylenes, and 4.1 µg/l of 1,2 DCA. This data was used to calculate the contaminant mass removed in vapor phase. A total of 1,822 pounds of TPH-g was removed in the treatment period.

5.3.1.2 Second Period of Interim Remedial Action

The second period included intermittent system operations from December 23, 2014 through April 22, 2015. The system was run for about a week at eight different intervals during the period. In each treatment interval, the system was operated continuously using all extraction pipes accessing all four areas at an applied vacuum pressure of about 25 in. WC, producing a consistent well gas flow of about 200 scfm. The flow was adjusted to maximize removal of the higher hydrocarbon concentrations in the northern array extraction lines (about 85 percent of the total flow) throughout the operating period. The treatment events included system operations from December 23-30, 2014, January 6-12, January 20-26, February 3-10, February 21-28, March 10-17, March 23-28, and April 15-22, 2015.

Results of well gas monitoring for VOCs indicated the northern section of the northern area produced the highest inlet levels with a maximum hydrocarbon concentration of 1,400 ppm. The southern section of the northern area had up to 700 ppm in this period. In contrast, the two southern areas had maximum levels of 350 ppm in this period. By the end of the operational period the inlet levels from the two northern areas were 780 and 290 ppm, and the south area produced about 65 ppm. Results of oxygen and carbon dioxide monitoring indicated the northern area had oxygen levels ranging from 9.8 to 17.0 percent with carbon dioxide level ranging from 3.0 to >5 percent. The southern area had oxygen levels ranging from 9.2 to 13.5 percent and carbon dioxide ranging from 1.3 to 4.5 percent.

Results of monthly vapor sample analysis indicated the TPH-g levels were reduced from a maximum of 3,400 µg/l to 2,400 µg/l by April 20, 2015. Low levels of VOCs were detected in the sample from January 20, 2015 with 1.2 µg/l xylenes. In addition, the final sample collected on April 20, 2015, had low levels of toluene (1.4 µg/l), ethylbenzene (1.1 µg/l), and xylenes (2.8 µg/l). No other VOC was detected in any of the samples. This data was used to calculate the contaminant mass removed in vapor phase. A total of 3,345 pounds of TPH-g was removed in the treatment period.

5.3.1.3 Third Period of Interim Remedial Action

The third period included intermittent system operations from May 1, 2015 through September 5, 2015. The system was run for about a week at seven different intervals during the period. In each treatment interval, the system was operated continuously using all extraction pipes accessing all four areas at an applied vacuum pressure of about 25 in. WC, producing a consistent well gas flow of about 200 scfm. The flow was adjusted to maximize removal of the higher hydrocarbon concentrations in the northern array extraction lines (about 85 percent of the total flow) throughout the operating period. The treatment events included system operations from May 1-7, May 16-22, May 30-June 5, June 20-27, July 15-21, August 13-21, and August 31-September 5, 2015.

Results of well gas monitoring for VOCs indicated the northern section of the northern area produced the highest inlet levels with a maximum hydrocarbon concentration of 1,520 ppm on June 27, 2015. These levels were reduced to about 200 ppm by the end of the period. Results of oxygen monitoring indicated improving results as the oxygen levels increased from about 12 percent at the start of the period to about 15 percent at the end of the period.

Results of monthly vapor sample analysis indicated the TPH-g levels were reduced from a maximum of 2,000 µg/l in May 2015 to just 238 µg/l TPH-g in August 2015. None of the samples had detectable levels of VOC. A

total of 2,244 pounds of TPH-g was removed in the treatment period, for a total of 7,411 pounds since treatment started.

5.3.2 Regular SME Extraction Activities

As a result of the Supplemental Interim Remedial Action program using the catalytic oxidizer unit, the inlet levels to the system were reduced from 5,400 µg/l TPH-g initially in October 2014 to just 238 µg/l TPH-g in September 2015. In the last period of operation, none of the vapor samples had detectable levels of VOC, and only TPH-g was detected. Based on these data, the levels of hydrocarbon from the extraction system were within range of acceptable treatment using the activated carbon that was initially planned as a polishing action for the SME system. Accordingly, the catalytic oxidizer was removed from the site and the permitted fixed system using activated carbon was prepared for continuous operations.

5.3.2.1 First Period of System Operation

The first period included fixed system operations from October 1, 2015 through January 19, 2016. The system was operated continuously during this period except for a brief interval between October 20 and November 2, 2015, when the activated carbon was changed. During this operational period, the system operated with the flow divided roughly evenly between the north and south lines until December 27, 2015, when the flow was increased to the northern lines so that about 2/3 of the net was derived from these lines. In addition, the net well flow was reduced on November 2, 2015, (after restarting the system after the activated carbon change) by allowing dilution air into the well stream to preserve the new activated carbon.

During operations, the net flow-through the system was constant at about 110 scfm. In the initial period when no dilution air was used, the system provided 25 in. WC vacuum evenly distributed between north and south lines. The net flow from the subsurface was cut to about 50 scfm when the dilution air was allowed in the system (beginning on November 2, 2015). After adjusting the flow to emphasize the north lines, and slightly reducing the amount of dilution air, the net well gas flow was about 70 scfm under 20 in. WC vacuum.

Results of well gas monitoring indicate the northern area produced the highest inlet levels with a maximum hydrocarbon concentration of 321 ppm on October 5, 2015. These levels were reduced to about 225 ppm by the end of the period. Results of oxygen monitoring indicated a consistent oxygen level of about 19 percent, until December 2015, when the levels decreased to about 14 percent, then increased to over 16 percent by the end of the period.

Results of monthly vapor sample analysis indicated the TPH-g levels were reduced from a maximum of 883 µg/l in October 2015 to just 450 µg/l TPH-g in December 2015. The final sample collected in January 2016 with flow directed mostly to the north lines had 1,010 µg/l TPH-g. None of the samples had detectable levels of VOCs. A total of 193 pounds of TPH-g was removed in the treatment period, for a total of 7,604 pounds since treatment started.

The system is planned for continuous operations through the next operational period.

5.4 Groundwater Monitoring Activities

As it pertains to the remedial action, routine periodic groundwater monitoring is necessary to quantify the reduction of contaminant concentration in the groundwater throughout the flow-through barrier zone and WDR groundwater monitoring is necessary to quantify the groundwater parameters and conditions pursuant to the

requirements of the WDR permit. Routine groundwater monitoring and WDR groundwater monitoring are performed separately and are described in detail below.

5.4.1 Routine Groundwater Monitoring Activities

According to the requirements of the LARWQCB, semi-annual groundwater monitoring reports were submitted to the LARWQCB. The monitoring reports that related to the SME system started in the fourth quarter of 2013, with semi-annual frequency. Pursuant to a directive from the LARWQCB dated June 7, 2013, the wells required to be sampled alternated each monitoring event between 20 monitoring wells (all 16 monitoring wells plus the four selected barrier monitoring wells) and a limited number of wells totaling 14 (10 selected monitoring wells plus the four selected barrier monitoring wells). The LARWQCB directive in Appendix A specifies the wells to be sampled. The following groundwater monitoring reports relevant to the SME system have been submitted to date. Included is a link to access the reports on the State GeoTracker database.

- Fourth Quarter 2013 event for semi-annual July to December time period conducted on 12/27/13: 17 wells sampled. This event was conducted prior to the start of the SME system being operational and will be considered as a baseline representing pre-treatment conditions. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/8668778896/SL2047W2348.PDF

- Second Quarter 2014 event for semi-annual January to June time period conducted on 06/13/14: 9 wells sampled. This event was conducted during the preliminary operation of the SME system. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/2438529312/SL2047W2348.PDF

- Fourth Quarter 2014 event for semi-annual July to December time period conducted on 12/07/14: 17 wells sampled. This event was conducted during the time the SME system was fully operational. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/2438529312/SL2047W2348.PDF

- Second Quarter 2015 event for semi-annual January to June time period conducted on 05/28/15: 10 wells sampled. This event was conducted during the time the SME system was fully operational. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/6026922643/SL2047W2348.PDF

- Fourth Quarter 2015 event for semi-annual July to December time period conducted on 12/10/15: 18 wells sampled. This event was conducted during the time the SME system was fully operational. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/2848665356/SL2047W2348.PDF

Appendix G Part 1 contains a historical summary of groundwater monitoring data, including iso-concentration maps for TPH-g and TPH-d, historical groundwater analytical tables, and graphs of contaminant concentrations over time for individual monitoring wells.

The analytical results of the above-described groundwater monitoring events as it relates to the performance of the SME system are described in Section 6.0 below.

5.4.2 WDR Groundwater Monitoring Activities

According to the requirements of the Waste Discharge Requirements (WDR) permit, quarterly monitoring reports prepared specifically to report groundwater parameters required by the permit were submitted to the LARWQCB. The monitoring reports were required starting from the time the WDR permit was granted. The monitoring includes measuring physical parameters including pH, temperature, conductivity, dissolved oxygen, ORP, TSS and turbidity. Additionally the monitoring includes analysis for mineral constituents including sulfate, nitrates,

phosphorus, ammonia, chloride and boron and lastly analysis for chemical constituents including TPH and VOCs. The basic regulatory objective of the WDR monitoring is to ascertain if the injection of nutrients has caused a detrimental effect on the groundwater quality.

Ten selected wells (MW-8, MW-11, MW-14, MW-15, MW16, MW19, BMW-2, BMW5, BMW-8 and BMW-11) deemed to be representative of the injection activity were monitored on a quarterly frequency, commencing with a baseline monitor event pre-treatment. It should be noted that MW-8 was damaged, and until this well was replaced, MW-9 was monitored in its stead.

The following WDR monitoring reports have been submitted to date:

Baseline monitoring in the second quarter 2013, followed by monitoring each succeeding quarter through the fourth quarter 2015 (total of 11 events). It should be noted that in addition to the quarterly reports, annual summary reports were submitted for 2013 and 2014. Below is an itemized list of all the reports with pertinent information and a link to access the reports on the State GeoTracker database.

- Second quarter 2013: This event was conducted prior to the start of the SME system being operational and will be considered as a baseline representing pre-treatment conditions. The BMW wells were not installed. Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/5782289624/WDR100009997.PDF

- Third quarter 2013: This event was conducted prior to the start of the SME system being operational and will be considered as a baseline representing pre-treatment conditions. The BMW wells were not installed. Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/2446433782/WDR100009997.PDF

- Fourth quarter 2013: This event was conducted prior to the start of the SME system being operational and no groundwater sampling was conducted. Not all of the BMW wells were installed. Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/8392157852/WDR100009997.PDF

- Annual summary for 2013: Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/2483529269/WDR100009997.PDF

- First quarter 2014: This event was conducted prior to the start of the SME system being operational and was the only baseline monitoring event in which all of the required wells were sampled and will be considered as the baseline representing pre-treatment conditions. Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/6222827970/WDR100009997.PDF

- Second quarter 2014: This event was conducted during the preliminary operation of the SME system. Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/5905061841/WDR100009997.PDF

- Third quarter 2014: This event was conducted during the time the SME system was fully operational. Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/4059287369/WDR100009997.PDF

- Fourth quarter 2014: This event was conducted during the time the SME system was fully operational Reference:
  http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/8855627477/WDR100009997.PDF

- Annual summary for 2014: Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/3386451482/WDR100009997.PDF

- First quarter 2015; This event was conducted during the time the SME system was fully operational. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/9010401129/WDR100009997.PDF

- Second quarter 2015: This event was conducted during the time the SME system was fully operational. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/9140852510/WDR100009997.PDF

- Third quarter 2015: This event was conducted during the time the SME system was fully operational. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/4549964249/WDR100009997.PDF

- Fourth quarter 2015: This event was conducted during the time the SME system was fully operational. Reference: http://geotracker.waterboards.ca.gov/esi/uploads/geo_report/6546156466/WDR100009997.PDF

Appendix G Part 2 contains a historical summary of WDR groundwater monitoring data, including historical groundwater analytical tables and graphs of contaminant concentrations over time for individual monitoring wells.

The analytical results of the above-described groundwater monitoring events as it relates to the performance of the SME system are described in Section 6.0 below.

6. EVALUATION OF REMEDIATION PROGRESS AND PERFORMANCE

The progress and performance of the SME system is being evaluated on the basis of the following general criteria: 1) The effectiveness of the system operation based upon operational parameters; 2) measured concentrations of oxygen, carbon dioxide, and volatile organic compounds in the extracted biogenic gas to determine if optimal conditions exist in the subsurface for the metabolic process to function effectively; 3) measured non-chemical parameters of the groundwater including dissolved oxygen and carbon dioxide, and carbon, nitrogen and phosphorus concentrations; 4) the effectiveness of the supplemental interim remedial action; and 5) the most important measure which is the target contaminant concentrations in the groundwater throughout the flow-through barrier zone to determine the mass reduction of contaminants in the groundwater.

The following sections describe each criterion and the attendant performance in detail.

6.1 Operational Parameters

AA&A measured important subsurface parameters to quantify the effectiveness of the subsurface metabolic enhancement. During system operations, the injection flow rates and the extraction flow rates and applied vacuum were measured. The operating data is provided below:

For biogenic gas extraction:

- During the Supplemental Remedial Action, from 10/23/14 to 09/05/15: Flow rate = 200 scfm, vacuum = 25 to 30 inches water column.

- During regular SME extraction, from 10/01/15 to 01/19/16, Flow rate = 50 to 110 scfm, vacuum = 11 to 25 inches water column.

For air injection:

- Average system flow rate of 50 scfm at 11 psig pressure measured at the compressors

- Flow rate at injection points at 10 to 40 acfh

The above measured parameters are within the equipment capacity and meet the design specifications.

6.2 Composition of Extracted Biogenic Gas

Concentrations of oxygen, carbon dioxide, and volatile organic compounds in the extracted biogenic gas were measured and used to evaluate the effectiveness of SME. Extracted oxygen concentrations are compared to baseline oxygen concentrations, as depressed oxygen concentrations indicate oxygen is being consumed during the metabolic process. Additionally, adequate oxygen concentrations in the subsurface are necessary to promote the growth of the microorganisms.

Carbon dioxide concentrations approaching zero are an indication that the energy source of hydrocarbons is being depleted. Additionally, elevated carbon dioxide concentrations in the subsurface are detrimental to the microorganisms and will reduce the microorganism population.

During the Supplemental Remedial Action, from 10/23/14 to 09/05/15, oxygen levels ranged from 9.8 percent to 19.8 percent.

During the regular SME extraction, from 10/01/15 to 01/19/16, oxygen levels ranged from 14.0 percent to 22.2 percent.

During the Supplemental Remedial Action, from 10/23/14 to 09/05/15, carbon dioxide levels ranged from 0.8 percent to 5.2 percent.

During the regular SME extraction, from 10/01/15 to 01/19/16, carbon dioxide levels ranged from 1.4 percent to over 5 percent.

6.3 Measurement of Non-chemical Parameters in Groundwater

Concentrations of dissolved oxygen were measured in groundwater samples collected from the barrier monitoring wells to check on metabolic activity. This testing was conducted as part of the WDR monitoring. In the flow-through barrier zone, dissolved oxygen varied but was generally in the 0.1- to 2-milligram per liter (mg/l) range.

Nutrients were injected into the subsurface to maintain optimum ratios of carbon to nitrogen to phosphorus. As microbial metabolism of hydrocarbons occurs, nutrients such as nitrate and phosphorus are depleted. Nitrogen sources such as ammonia, nitrate, and urea are typically used to replace nutrients depleted during metabolism. In this project, a solution of ammonium sulfate was used to maintain nitrate concentrations. Nitrate concentrations in groundwater were monitored as part of the WDR monitoring. In the flow-through barrier zone, nitrate

concentrations in groundwater were found to be generally very low, at or near the laboratory detection limit. Nitrite concentrations in groundwater were also found to be very low.

In the WDR permit. the LARWQCB provides Water Quality Objectives (WQOs) for TDS, sulfate, chloride, and boron of 800, 250, 250 and 1.5 mg/l, respectively. WDR Analytical results for TDS, sulfate, and chloride in samples collected before and after the nutrient injection events are comparable and the injection of nutrients at the site does not appear to have caused WQOs to be exceeded. Therefore, the operation of the SME system does not seem to have a negative impact on the groundwater quality.

6.4 Effectiveness of Supplemental IRA

Although it was not initially anticipated, a supplemental interim remedial action had to be conducted due to the higher than expected concentrations of TPH and VOCs in the soil vapor in the vadose zone. The supplemental IRA involved the implementation of soil vapor extraction and treatment of the off-gas with a catalytic oxidizer unit as a substitute to activated carbon to destroy petroleum hydrocarbon and VOC vapors and eliminate any air quality impacts. The vapor extraction was successfully implemented and operated from late October 2014 through the beginning of September 2015, after which time TPH level were reduced enough for activated carbon to be used as was intended.

The added benefit of the supplemental IRA was manifest by the amount of petroleum hydrocarbons that were extracted from the vadose zone in the flow-through barrier zone. A total of 7,604 pounds of TPH-g was removed from the subsurface since treatment began.

6.5 Measurement of Target Chemical Contaminants in Groundwater

SME technology is effective in remediating petroleum hydrocarbon contamination in soil and groundwater simultaneously. One method to determine how effective the remedial action is at reducing the contaminants is to measure the petroleum hydrocarbon concentrations in the groundwater in the flow-through barrier zone over time as the SME system is in operation.

The target contaminant concentrations in the groundwater were measured throughout the flow-through barrier zone. There are 12 barrier GWM wells BMW-1 through BMW-12. However, the only barrier wells ever sampled were BMW-2, BMW-5, BMW-8 and BMW-11. The sampling was limited to just four wells for primarily economic reasons and four barrier wells were deemed to be representative and adequate to monitor the groundwater conditions in the barrier zone.

The target compounds that best represent petroleum hydrocarbons are primarily TPH-g and TPH-d. The following table depicts the TPH-g and TPH-d concentrations in the four barrier wells for each routine semi-annual groundwater monitoring event that was conducted during the time the SME system has been in operation. The initial monitoring was completed prior to the start-up of the SME system, to establish a baseline concentration.

TPH-g and TPH-d Historical Groundwater Analytical Results
(From Routine Semi-annual Groundwater Monitoring Events)

Sample Date	WELL BMW-2		WELL BMW-5		WELL BMW-8		WELL BMW-11	
	TPH-g (µg/l)	TPH-d (µg/l)	TPH-g (µg/l)	TPH-d (µg/l)	TPH-g (µg/l)	TPH-d (µg/l)	TPH-g (µg/l)	TPH-d (µg/l)
12/27/2013 (Baseline)	187	944	1,090	1,520	3,700	<500	42,000	6,650
SME System Start-up on 03/03/2014								
6/13/2014	NS	NS	1,110	1,690	7,050	4,280	16,000	9,650
12/7/2014	<50	699	350	1,090	3,730	2,710	7,390	2,640
5/28/2015	<50	<500	488.0	<500	1,930	<500	10,900	>500
12/10/2015	373	4,050	331	<500	1,490	539J	7,780	4,800

The following table below depicts the same TPH-g and TPH-d concentrations for each quarterly WDR groundwater monitoring event during a comparable time period. It should be noted that for the WDR monitoring, a no-purge method of sample collection was employed.

TPH-g and TPH-d Historical Groundwater Analytical Results
(From WDR Quarterly Groundwater Monitoring Events)

Sample Date	WELL BMW-2		WELL BMW-5		WELL BMW-8		WELL BMW-11	
	TPH-g (µg/l)	TPH-d (µg/l)	TPH-g (µg/l)	TPH-d (µg/l)	TPH-g (µg/l)	TPH-d (µg/l)	TPH-g (µg/l)	TPH-d (µg/l)
1/23/2014 (Baseline)	468	1,150	1,430	25,800	4,100	1,900	11,500	<500
SME System Start-up on 03/03/2014								
6/12/2014	NS	NS	1,340	1,680	4,400	3,840	12,600	6,960
9/14/2014	<50	655J	1510	11,500	5,540	6,690	6,560	6,280
12/7/2014	142	597J	1,580	2,460	6,240	3,420	11,000	961
2/16/2015	<50	675J	1,080	2,050	2,050	1,180	7,090	1,340
5/29/2015	<50	657	956	1,250	1,240	760	8,460	1,490
9/9/2015	<50	<500	506.0	572.0	1,530	667J	9,190	5,620
12/10/2015	544	5,800	598	<500	1,100	<500	4,970	3,360

Both tables above show a general trend for a gradual reduction in the TPH-g and TPH-d concentrations, although the concentrations fluctuate. It appears that the contaminant plume in groundwater is somewhat dynamic in that the plume is moving over time causing concentrations at any given location to vary which may explain why the TPH levels fluctuate over time.

Appendix G, Part 1 includes iso-concentration maps for TPH-g and TPH-d for all of the pertinent routine groundwater monitoring events. In examining the contaminant plumes over time, it appears that the plumes are shrinking in overall size, particularly in the most recent monitoring event.

It should be noted that an off-site plume source of TPH contamination was discovered, cross-gradient and up-gradient to the west/northwest of the site. Contamination emanating from the off-site source has likely migrated and encroached upon the site and the flow-through barrier zone. This off-site source presents an unknown factor in terms of its effect on contaminant concentrations as this source has never been investigated.

On balance, it does appear that the SME system is reducing the TPH-g and TPH-d contamination in the groundwater in the flow-through barrier zone as it was designed.

7. CONCLUSIONS AND RECOMMENDATIONS

AA&A has prepared this Interim Remedial Action Progress Report to present an update on the status and progress made in the implementation and operation of the groundwater contaminant mitigation system installed along the western and southern boundaries of the Former Chemoil Refinery located at 2020 Walnut Avenue in Signal Hill, California 90806.

The mitigation system consists of a flow-through barrier using SME technology to mitigate petroleum hydrocarbon contaminants identified in groundwater along the western and southern boundaries of the site as required by the LARWQCB.

A flow-through barrier using SME technology was selected as the most appropriate technology to prevent the off-site migration of groundwater contaminants. The installation of the SME system was presented to the LARWQCB in the Interim Remedial Action Plan (IRAP), October 24, 2012. The IRAP was approved by the LARWQCB in a letter dated December 7, 2012.

The SME system was installed in late 2013 and early 2014, and preliminary operations were initiated in March 2014, which included periodic nutrient injections and air injection only with no substantial biogenic gas extraction until October, 2014 as it was found in March of 2014 that the activated carbon was being depleted quickly due to the high hydrocarbon vapor load. To address this problem, a supplemental interim remedial action that included operation of a vapor extraction system and treatment of the off-gas with a catalytic oxidizer unit was initiated.

Three interim treatment periods were conducted using the catalytic oxidizer unit between October 2014 and September 2015. In October 2015, the SME fixed system using activated carbon for the well gas treatment media was started for continuous operations. This is the first reporting period for these system operations and the system operated 98 days until January 2016. The system is planned for continuous operations through the next operational period.

The following are AA&A's conclusions based on an evaluation of the progress and performance of the remedial activities detailed herein:

- The operating parameters for the SME system are within the equipment capacity and meet the design specifications. It is therefore concluded that the system operates effectively.
- Oxygen and carbon dioxide concentrations in the biogenic extraction gas were at acceptable levels to promote the metabolic processes.
- Levels of dissolved oxygen in the groundwater have been on the low side.
- The supplemental IRA consisting of soil vapor extraction and treatment of the off-gas with a catalytic oxidizer unit was used as a substitute to activated carbon treatment. The successful operation was manifested by the amount of petroleum hydrocarbons that were extracted from the vadose zone in the flow-through barrier zone. A total of 7,604 pounds of TPH-g was removed from the subsurface since treatment began. This translates into less hydrocarbon mass in the vadose zone than could migrate to the groundwater.
- The contaminant concentrations in the groundwater over time throughout the flow-through barrier zone were evaluated to determine the mass reduction of contaminants in the groundwater. A general trend for a gradual reduction in the TPH-g and TPH-d concentrations was observed. It appears that the contaminant plume in groundwater is somewhat dynamic in that the plume is moving over time, causing concentrations at any given location to vary which may explain why the TPH levels fluctuate over time.

- The oxygen concentrations indicate that the petroleum is moving through this area. Generally, in a confined treatment plume, the concentration of O2 trends towards background (~21 percent) in a short amount of time. The fact that this is not happening indicates that there is a very active microbial community and that the petroleum is being degraded as fast as oxygen can be injected. The system will tolerate more oxygen. The carbon dioxide is as expected, the inverse of the curve on oxygen.
- Appendix G, Part 1 includes iso-concentration maps for TPH-g and TPH-d for all of the pertinent routine groundwater monitoring events. In examining the contaminant plumes over time, it appears that in and around the barrier zone the plumes are shrinking in overall size, particularly in the most recent monitoring event.
- It should be noted that an off-site plume source of TPH contamination was discovered, cross-gradient and up-gradient to the west/northwest of the site. Contamination emanating from the off-site source has likely migrated and encroached upon the site and the flow-through barrier zone. This off-site source presents an unknown factor in terms of its effect on contaminant concentrations as this source has never been investigated.
- On balance, the SME system is reducing the TPH-g and TPH-g contamination in the groundwater in the flow-through barrier zone.

The following are AA&A's recommendations based on an evaluation of the progress and performance of the remedial activities detailed herein:

- Continued operation of the SME is expected to further reduce the levels of TPH-g and TPH-d in the groundwater at the SME operational zone. If such reduction is desired, then it is recommended to continue with the SME program.
- Double the injected mass of ammonium sulfate from 1 to 2 pounds per gallon of water in the injected solutions.
- Replace and/or repair defective air-injection flow regulators, increase the frequency of inspection of the regulators such that they are fully inspected during the nutrient injection events and clean or replace regulators as warranted. Watch for levels of dissolved oxygen in the groundwater and adjust the regulators as warranted.
- Continue to conduct routine semi-annual groundwater monitoring. The next monitoring event will be conducted in the second quarter of 2016. Details of the operation of the SME system will be included in the semi-annual groundwater monitoring reports completed for the site. The next semi-annual report is due on or before July 15, 2016.
- Continue to conduct WDR quarterly groundwater monitoring. The next monitoring event will be conducted in the first quarter of 2016. The next quarterly report is due on or before April 15, 2016.
- Currently 4 of the 12 existing barrier monitoring wells are being sampled. In the future, as contaminant concentrations are further reduced, to better monitor the target contaminant concentrations in the groundwater beneath the flow-through barrier zone, it is recommended to sample additional barrier wells or initiate a sampling rotation of different combinations of barrier monitoring wells.
- The independent off-site plume source of TPH contamination that was discovered to the west/northwest of the site has never been investigated. An investigation to delineate the extent of the contaminant plume emanating from the off-site source may be necessary at some future time.

8. REFERENCES

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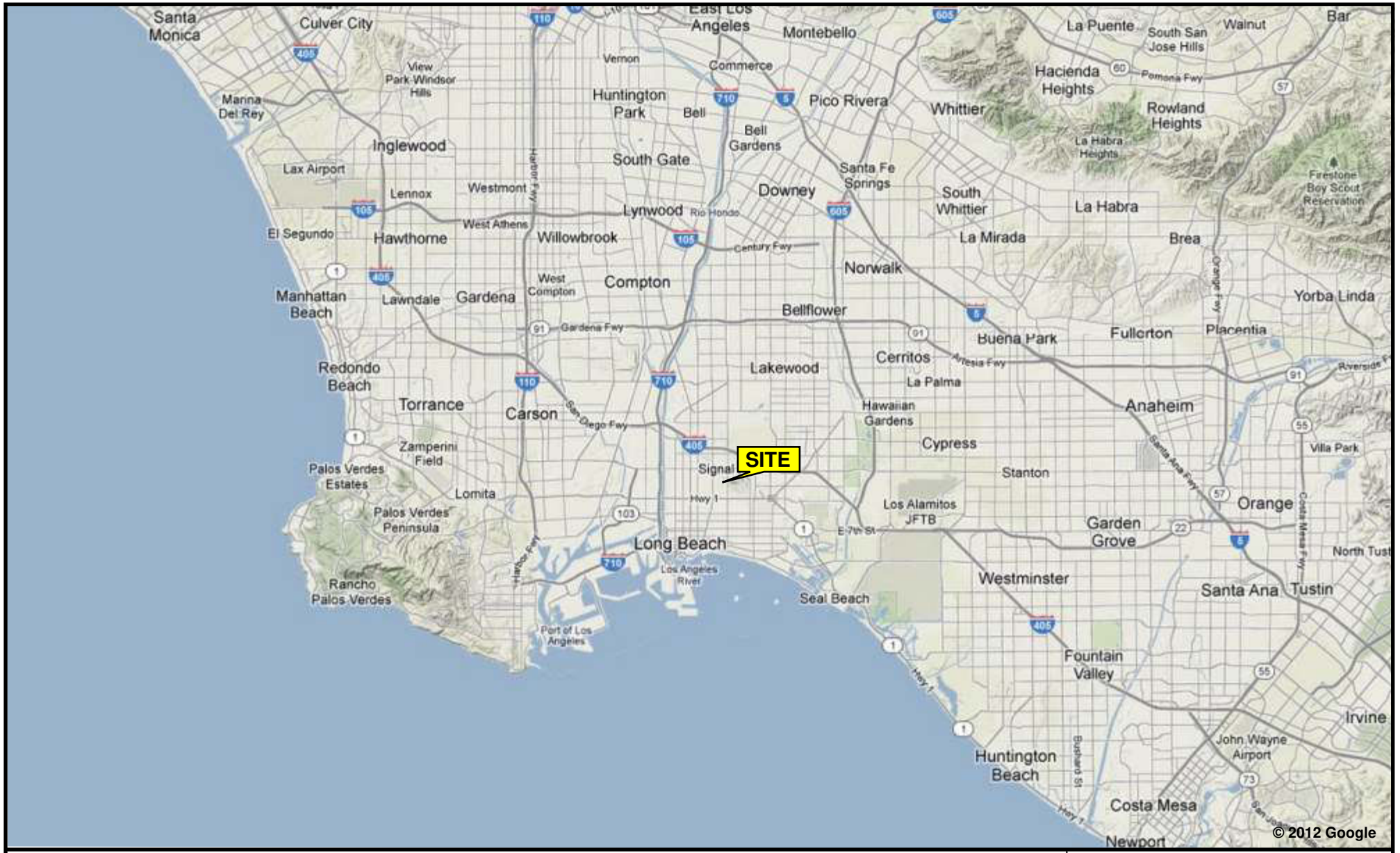
FIGURES

Figures 1 through 9



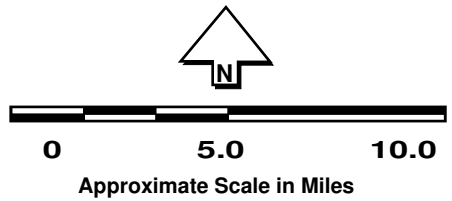


Figure 1: Site Location Map
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	October 2012	ChemOil.p01

Ami Adini & Associates, Inc.

LEGEND

MW-18 ● Monitoring well

Property line

Subsurface Metabolism Enhancement treatment area

Figure 2: Site Vicinity Map
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	March 2014	ChemOil.p01

Ami Adini & Associates, Inc.

Commercial/ Industrial Property

Commercial/ Industrial Property

Commercial/ Industrial Property

Commercial/ Industrial Property

Commercial/ Industrial Property

Signal Hill Elementary School
Approximately 70 feet North

Commercial/ Industrial Property

Commercial/ Industrial Property

Commercial/ Industrial Property

Commercial/ Industrial Property

American University of Health Services

American University of Health Services

American University of Health Services

Parking Lot

Parking Lot

Parking Lot

Sidewalk

Sidewalk

Sidewalk

Sidewalk

Sidewalk

Sidewalk

Sidewalk

Sidewalk

Gundry Avenue

Walnut Avenue

North Gaviota Avenue

BMW12 (1,460 @ 36')

BMW11 (2,400 ppm @ 35')

Surface Seal
(extended 55 feet in from property line)

Extraction Circuit 4 (EC4)

BMW10 (1,330 ppm @ 36').

Equipment Compound 2 (EQP2)

15'

20'

20'

41'

BMW9 (300 @ 12')

Vapor Effluent Conveyance Piping

BMW8 (1,080 ppm @ 30')

Extraction Circuit 3 (EC3)

BMW7 (313 ppm @ 23')

Parking Spaces

East 21st Street

49'

Sewer

BMW6 (700 ppm @ 12')

Surface Seal
(extended 55 feet in from property line)

BMW5 (135 ppm @ 20')

Extraction Circuit 2 (EC2)

BMW4 (370 ppm @ 8')

Equipment Compound 1 (EQP1)

BMW3 (5,000+ ppm @ 12')

500'

Extraction Circuit 1 (EC1)

20'

15'

20'

BMW2 (140 ppm @ 16')

BMW1
(97 ppm @ 27')

Bike Path

Former Railway Corridor

Alley

Residential Properties

Sidewalk

East Wesley Drive

Sidewalk

Residential Properties

Bike Path

Former Railway Corridor

East Wesley Drive

Alley

Residential Properties

Sidewalk

East 20th Street

Sidewalk

Long Beach City College Pacific Coast Campus

Sewage Pump Station

Former Railway Corridor

Alamitos Avenue

Sidewalk

Sidewalk

Parking Lot

Parking Lot

Commercial/ Industrial Property

East 20th Street

Sidewalk

Sidewalk

Sidewalk

Vacant Land
(Former Railway Corridor)

Chittick Field Park

BMW1 - BMW12 (

LEGEND

- Flow-through barrier monitoring well with maximum VOC concentration in soil
- Nested air and nutrient injection well
- Biogenic gas extraction well
- Equipment compound
- Surface seal
  (Polyethylene plastic sheeting, 6-10 Mil,
  installed approximately 1 to 2 feet below grade)
- Sewer line
- Air injection conveyance piping
  (2-inch diameter PVC header connected to 0.25-inch-diameter, nylon or polyethylene tubing)
- Nutrient injection conveyance piping
  (0.75-inch-diameter, schedule 40 PVC)
- Biogenic gas extraction conveyance piping
  (2-inch-diameter, schedule 40 PVC)
- Vapor effluent conveyance piping
  (4-inch-diameter, schedule 40 PVC)

N

0 50 100

Approximate Scale in Feet

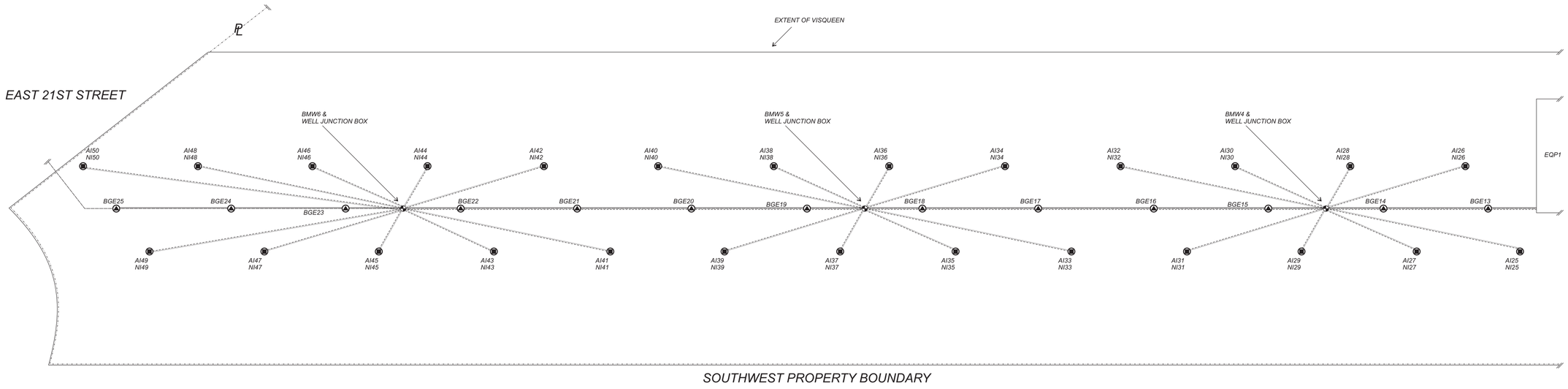
Figure 3: Site Detail Map with Flow-Through Barrier System
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	March 2014	ChemOil.p01

Ami Adini & Associates, Inc.

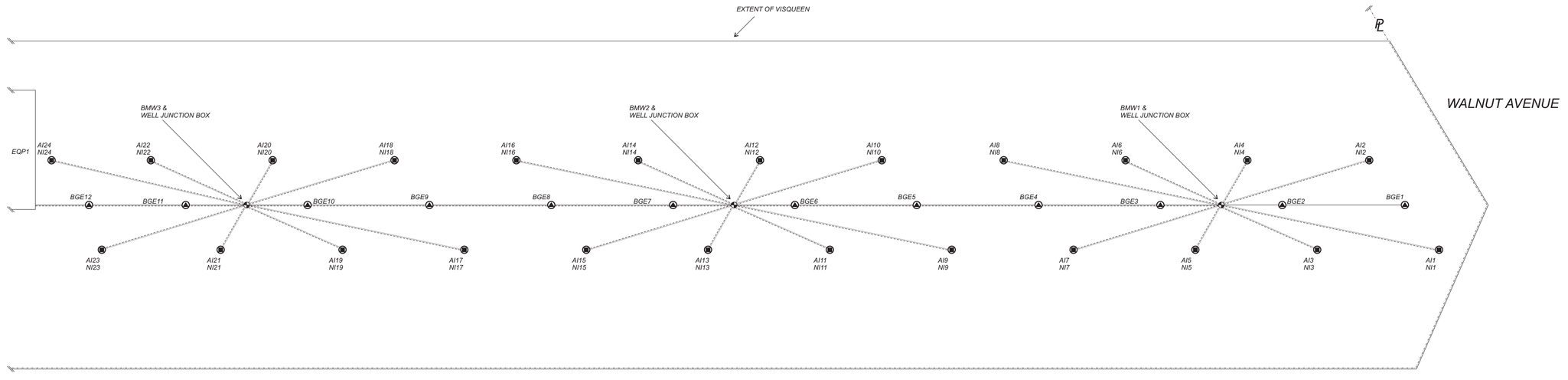
SOUTHERN PARCEL - UPPER HALF

1" = 10'



SOUTHERN PARCEL - LOWER HALF

1" = 10'



LEGEND

- BGE46 — BIOGENIC GAS EXTRACTION WELL
- AI92 / NI92 — NESTED AIR / NUTRIENT INJECTION WELL
- BMW12 — FLOW-THROUGH BARRIER MONITORING WELL
- EQP2 — EQUIPMENT COMPOUND
- BIOGENIC GAS EXTRACTION CONVEYANCE PIPING (2-INCH DIAMETER, SCH40 PVC)
- VAPOR CONVEYANCE PIPE (4-INCH DIAMETER, SCH40 PVC)
- NUTRIENT INJECTION CONVEYANCE PIPE (3/4-INCH DIAMETER, SCH40 PVC)
- AIR INJECTION CONVEYANCE PIPE (2-INCH DIAMETER PVC HEADER TO 3/8-INCH DIAMETER POLYETHYLENE TUBING)
- PL — PROPERTY LINE

0 10.0 20.0
Approximate Scale In Feet

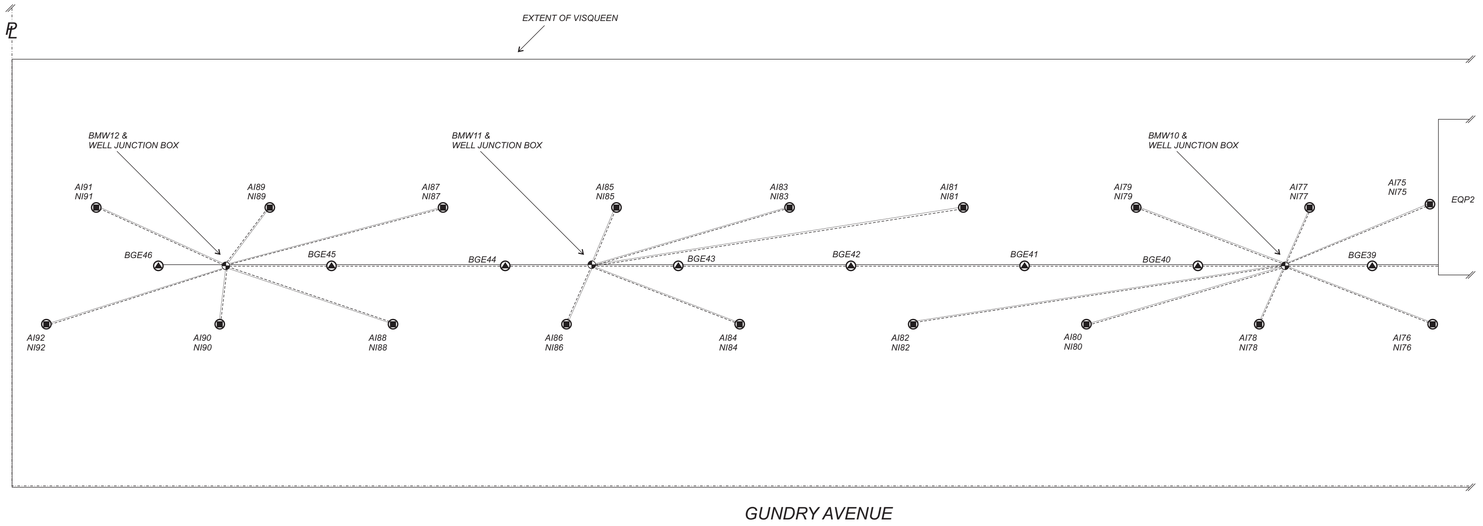
Figure 4: Conveyance Piping Map - Southern Parcel
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
SS/MRd	March 2014	ChemOil.p01

Aml Adlnl & Associates, Inc.

NORTHERN PARCEL - UPPER HALF

1” = 10’

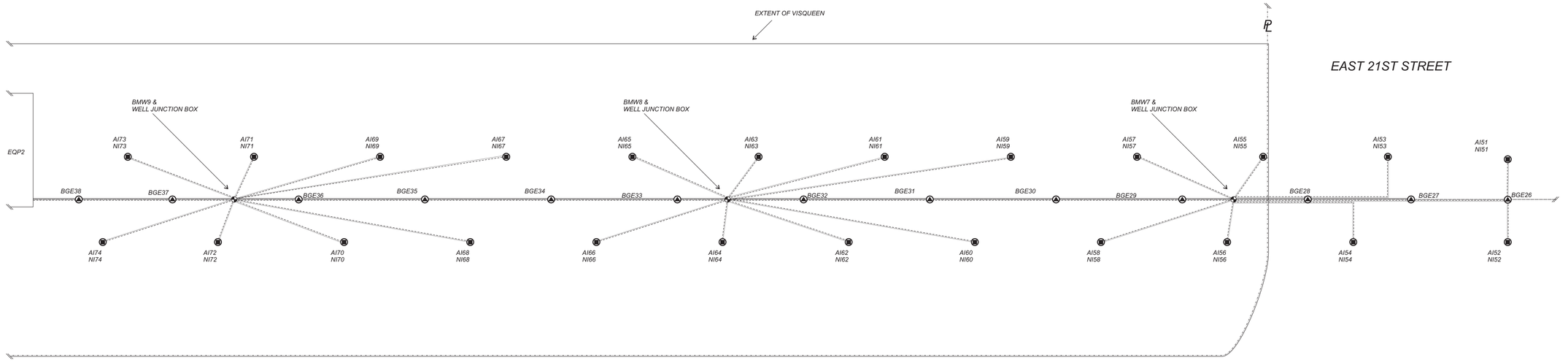


NORTHERN PROPERTY BOUNDARY

GUNDRY AVENUE

NORTHERN PARCEL - LOWER HALF

1” = 10’



GUNDRY AVENUE

LEGEND

- BGE46 — BIOGENIC GAS EXTRACTION WELL
- AI92 / NI92 — NESTED AIR / NUTRIENT INJECTION WELL
- BMW12 — FLOW-THROUGH BARRIER MONITORING WELL
- EQP2 — EQUIPMENT COMPOUND
- BIOGENIC GAS EXTRACTION CONVEYANCE PIPING (2-INCH DIAMETER, SCH40 PVC)
- VAPOR CONVEYANCE PIPE (4-INCH DIAMETER, SCH40 PVC)
- NUTRIENT INJECTION CONVEYANCE PIPE (1/2-INCH DIAMETER, SCH80 PVC)
- AIR INJECTION CONVEYANCE PIPE (2-INCH DIAMETER PVC HEADER TO 3/8-INCH DIAMETER POLYETHYLENE TUBING)
- PL — PROPERTY LINE

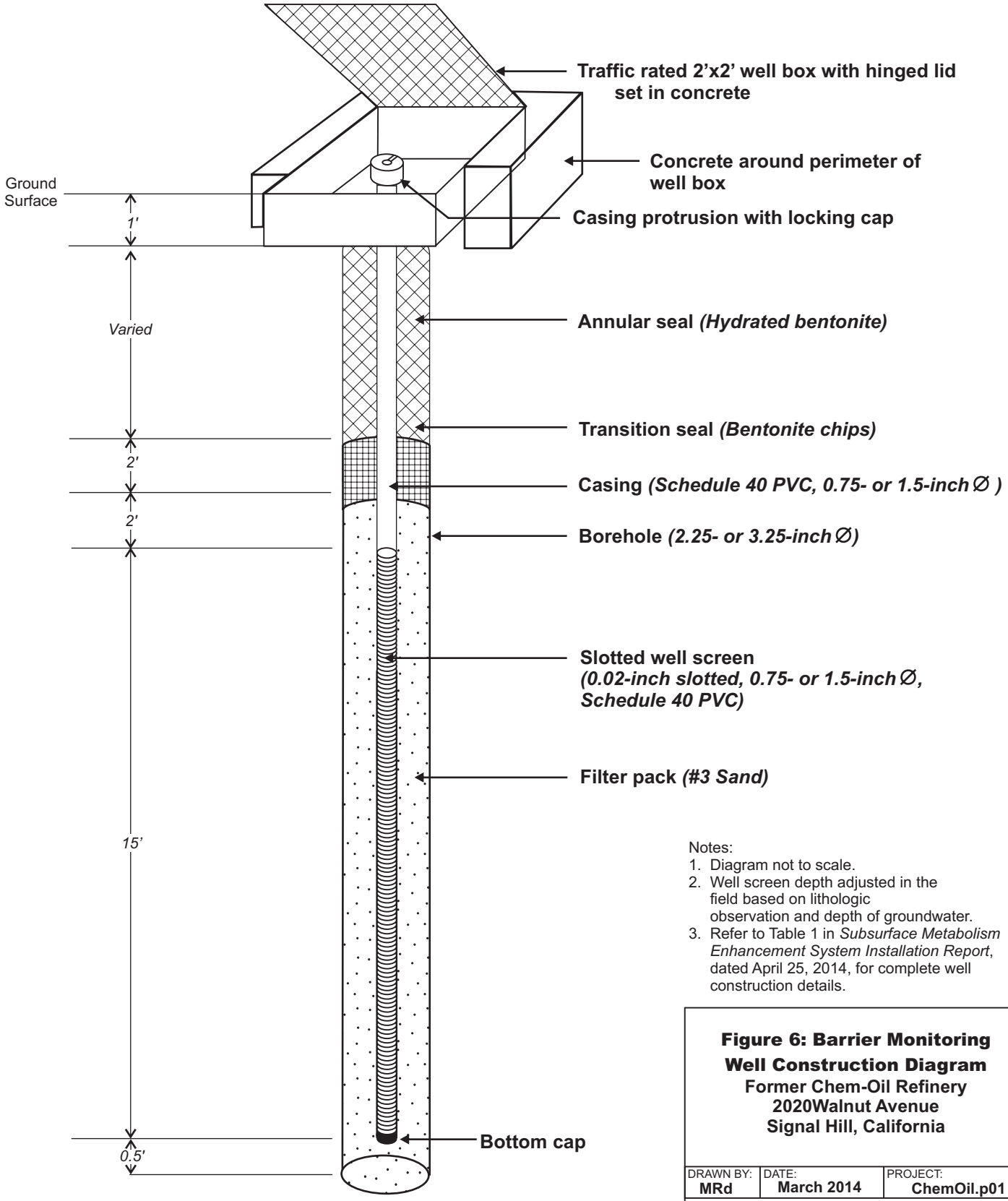
0 10.0 20.0
Approximate Scale in Feet

Figure 5: Conveyance Piping Map - Northern Parcel
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
SS/MRd	March 2014	ChemOil.p01

Ami Adini & Associates, Inc.

Barrier Monitoring Well Construction Diagram
BMW1 through BMW12



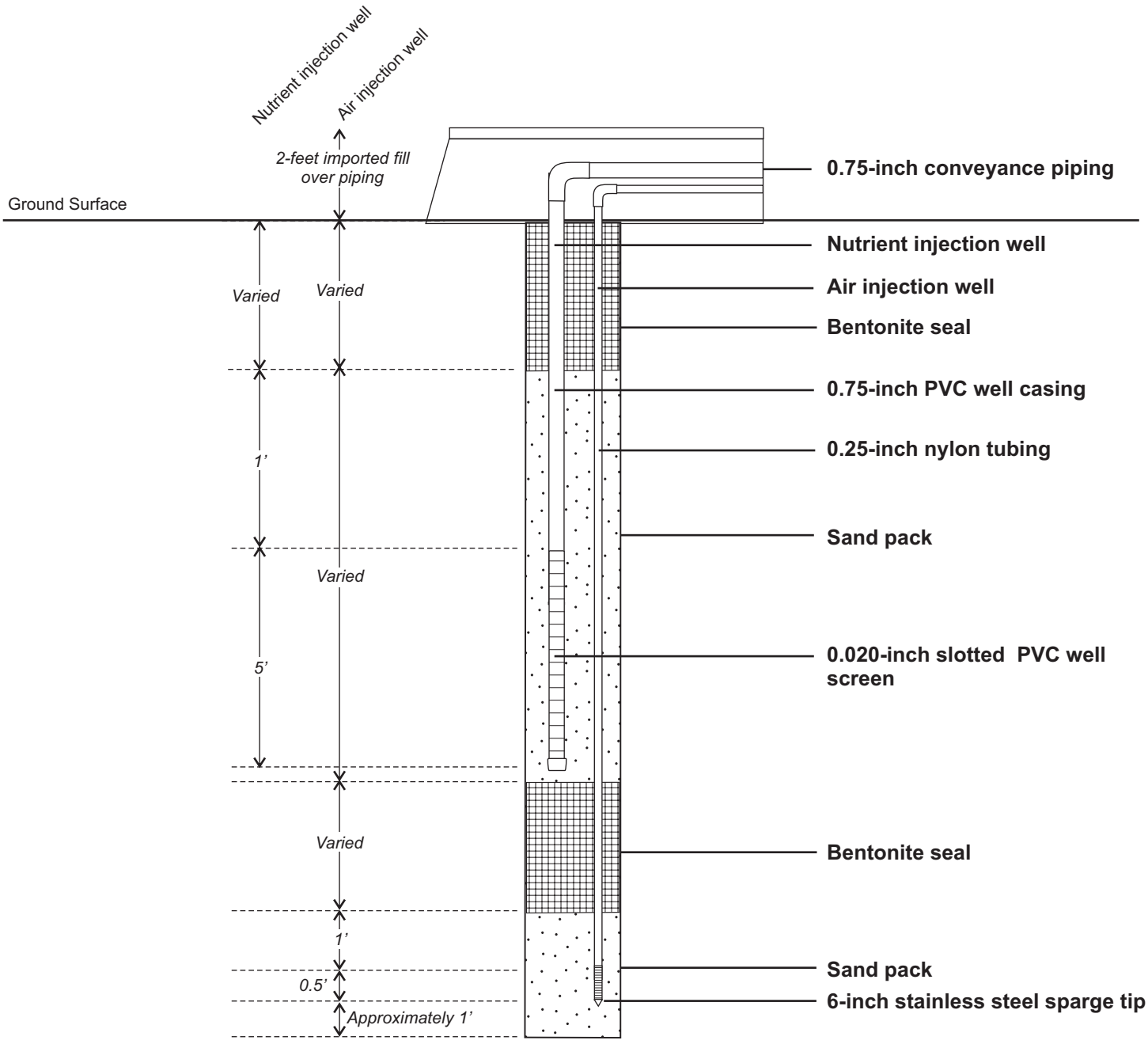
Notes:
1. Diagram not to scale.
2. Well screen depth adjusted in the field based on lithologic observation and depth of groundwater.
3. Refer to Table 1 in *Subsurface Metabolism Enhancement System Installation Report*, dated April 25, 2014, for complete well construction details.

Figure 6: Barrier Monitoring Well Construction Diagram
Former Chem-Oil Refinery
2020Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	March 2014	ChemOil.p01

Ami Adini & Associates, Inc.

Air and Nutrient Injection Well Construction Diagram



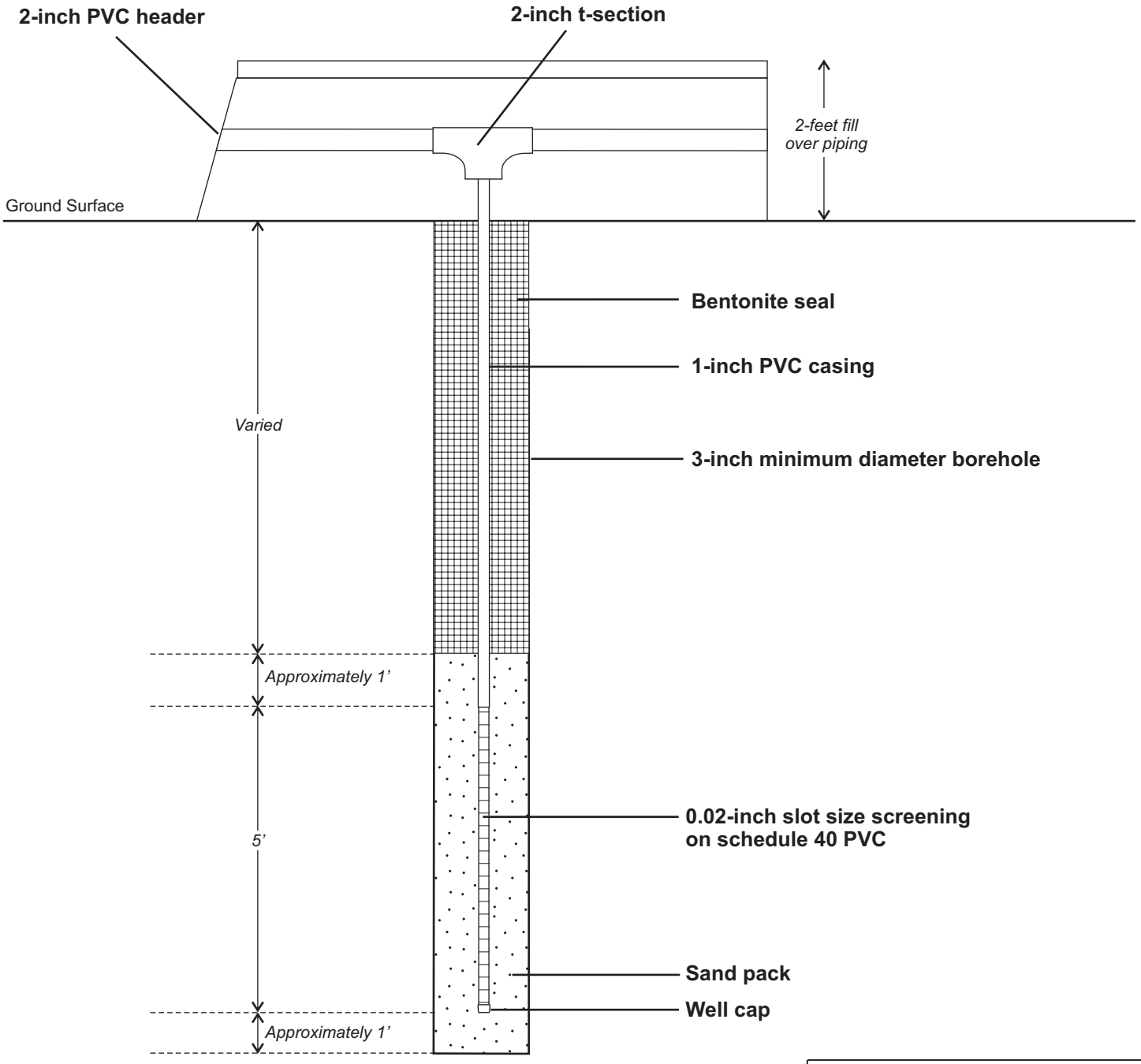
Notes:
1. Diagram not to scale.
2. Well screen depth adjusted in the field based on lithologic observation and depth of groundwater.
3. Sand pack thicknesses were completed as shown. Thickness of bentonite seals were adjusted to accommodate for changes in well depths.
4. Refer to Table 1 in *Subsurface Metabolism Enhancement System Installation Report*, dated April 25, 2014, for complete well construction details.

Figure 7: Air and Nutrient Injection Well Construction Diagram
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	March 2014	ChemOil.p01

Ami Adini & Associates, Inc.

Biogenic Gas Extraction Well Construction Diagram



Notes:
1. Diagram not to scale.
2. Well screen depth adjusted in the field based on lithologic observation and depth of groundwater.
3. Refer to Table 1 in *Subsurface Metabolism Enhancement System Installation Report*, dated April 25, 2014, for complete well construction details.

Figure 8: Biogenic Gas Extraction Well Construction Diagram
Former Chem-Oil Refinery
2020Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	March 2014	ChemOil.p01

Ami Adini & Associates, Inc.

NOTES

1. Not all wells in barrier system shown in P&ID. Number of wells and piping lines drawn back to equipment compound (blowers, gate valves, etc.) shown to depict system circuits only.

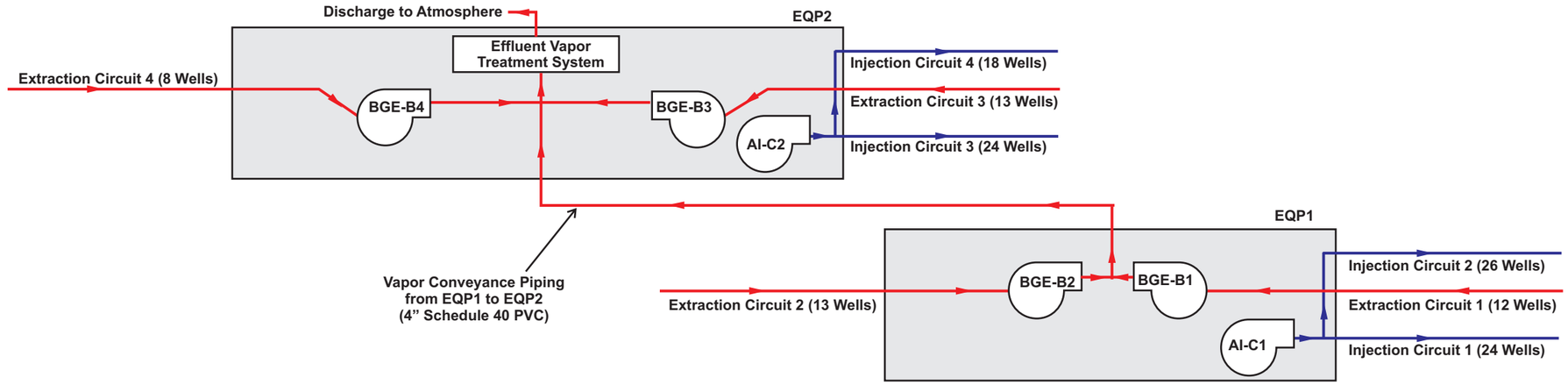
2. Each air injection compressor will service two Injection Circuits.

3. Each biogenic gas extraction blower will service one extraction circuit.

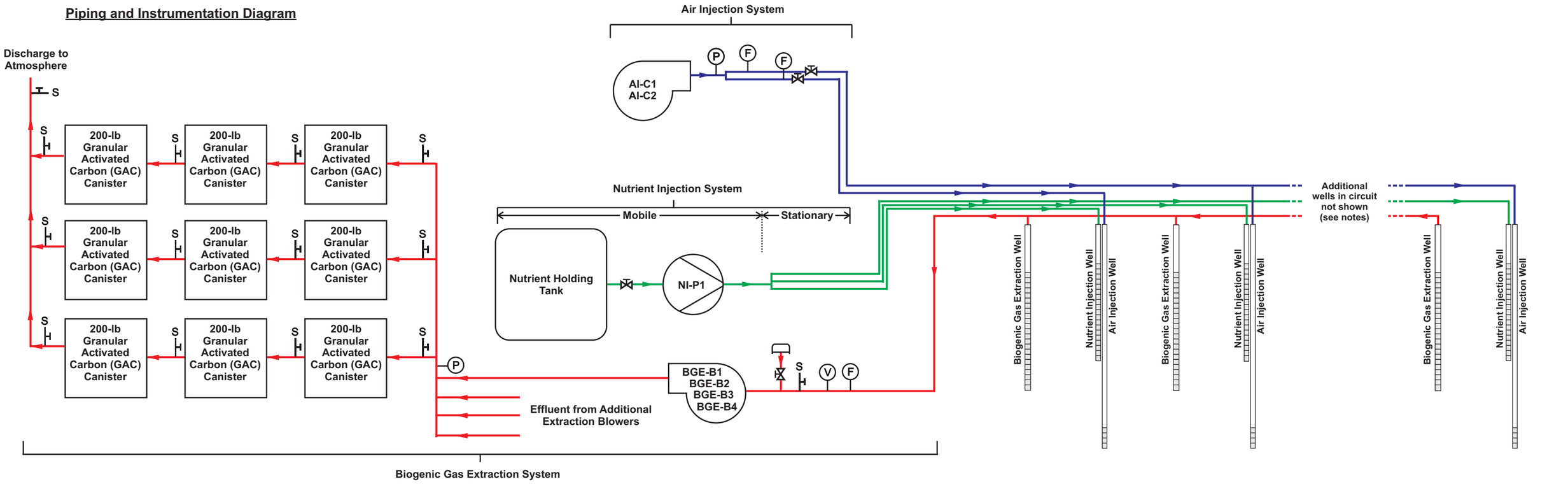
4. Nutrient injection pump and holding tank will be mobile and connect as needed to inlets for nutrient injection.

5. Vapor effluent from EQP-1 will be trenched to EQP-2 and treated with one vapor treatment system.

Circuit Overview



Piping and Instrumentation Diagram



BGE-B1
BGE-B2
BGE-B3
BGE-B4

2-Horsepower (160 scfm)
Regenerative blower
- BGE-B1 connected to 12 wells
- BGE-B2 connected to 13 wells
- BGE-B3 connected to 12 wells
- BGE-B4 connected to 11 wells

AI-C1
AI-C2

2.9-Horsepower (28 scfm)
Rotary-vane compressor
- AI-C1 connected to 24 wells
- AI-C2 connected to 26 wells

NI-P1 — Nutrient injection pump

S — Vapor sampling port

Fresh-air dilution assembly

LEGEND

- F — Flow gauge
- V — Vacuum gauge
- P — Pressure gauge
- Gate valve

Well (cross-section view)

Approximate location of screen

- Common conveyance piping for biogenic gas extraction (BGE) wells, 2-inch-diameter, schedule 40 PVC (arrow indicates flow direction)
- Tubing for air injection (AI) wells, individually piped 0.25-inch-diameter, nylon and polyethylene tubing (arrow indicates flow direction)
- Piping for nutrient injection wells, individually piped 0.75-inch-diameter, schedule 40 PVC (arrow indicates flow direction)

Figure 9:
SME Piping and Instrumentation Diagram
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	March 2014	ChemOil.p01

Ami Adini & Associates, Inc.

TABLES

Table 1

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	BGE1	BGE2	BGE3	BGE4	BGE5	BGE6	BGE7	BGE8	BGE9	BGE10	BGE11
Well Type	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Total Depth	15	15	15	15	15	15	15	15	15	15	15
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*
Well Diameter	1	1	1	1	1	1	1	1	1	1	1
Slot Size	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Screen Interval	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15
Sand Pack	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15
Bentonite Chips	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9
Bentonite Pellets (below water)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Well Identification	BGE12	BGE13	BGE14	BGE15	BGE16	BGE17	BGE18	BGE19	BGE20	BGE21	BGE22
Well Type	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Total Depth	15	15	15	15	15	15	15	15	15	15	15
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*
Well Diameter	1	1	1	1	1	1	1	1	1	1	1
Slot Size	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Screen Interval	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15
Sand Pack	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15
Bentonite Chips	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9
Bentonite Pellets (below water)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	BGE23	BGE24	BGE25	BGE26	BGE27	BGE28	BGE29	BGE30	BGE31	BGE32	BGE33
Well Type	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Total Depth	15	15	15	15	15	15	18.5	17	18.5	18.5	20.5
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	21*	21*	21*	21*	22.5*
Well Diameter	1	1	1	1	1	1	1	1	1	1	1
Slot Size	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Screen Interval	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	10 to 15	8to 18	7 to 17	13 to 18	13 to 18	15 to 20
Sand Pack	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	9 to 15	6 to 18.5	5 to 17	11 to 18.5	11 to 18.5	13 to 20.5
Bentonite Chips	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 9	0 to 6	0 to 5	0 to 11	0 to 11	0 to 13
Bentonite Pellets (below water)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Well Identification	BGE34	BGE35	BGE36	BGE37	BGE38	BGE39	BGE40	BGE41	BGE42	BGE43	BGE44
Well Type	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE	BGE
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Total Depth	20	20	20	22	24	24	24	25	25	25	25
Depth to GW during drilling	22.5*	22.5*	23.5*	25*	26*	26*	26*	27*	27*	29*	29*
Well Diameter	1	1	1	1	1	1	1	1	1	1	1
Slot Size	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Screen Interval	15 to 20	15 to 20	15 to 20	17 to 22	19 to 24	19 to 24	19 to 24	20 to 25	20 to 25	20 to 25	20 to 25
Sand Pack	14 to 20	14 to 20	14 to 20	16 to 22	18 to 24	18 to 24	18 to 24	19 to 25	19 to 25	19 to 25	19 to 25
Bentonite Chips	0 to 14	0 to 14	0 to 14	0 to 16	0 to 18	0 to 18	0 to 18	0 to 19	0 to 19	0 to 19	0 to 19
Bentonite Pellets (below water)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	BGE45	BGE46		AI1	NI1	AI2	NI2	AI3	NI3	AI4	NI4
Well Type	BGE	BGE		AI	NI	AI	NI	AI	NI	AI	NI
Boring Diameter	2.25	2.25		2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
Total Depth	25	25		27	27	27	27	27	27	27	27
Depth to GW during drilling	29*	29*		19*	19*	19*	19*	19*	19*	19*	19*
Well Diameter	1	1		NA	0.75	NA	0.75	NA	0.75	NA	0.75
Slot Size	0.02	0.02		NA	0.02	NA	0.02	NA	0.02	NA	0.02
Depth to GW in well	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA
Screen Interval	20 to 25	20 to 25		26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15
Sand Pack	19 to 25	19 to 25		25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15
Bentonite Chips	0 to 19	0 to 19		15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9
Bentonite Pellets (below water)	NA	NA		19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA

Well Identification	AI5	NI5	AI6	NI6	AI7	NI7	AI8	NI8	AI9	NI9	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI10	NI10	AI11	NI11	AI12	NI12	AI13	NI13	AI14	NI14	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

Well Identification	AI15	NI15	AI16	NI16	AI17	NI17	AI18	NI18	AI19	NI19	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI20	NI20	AI21	NI21	AI22	NI22	AI23	NI23	AI24	NI24	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

Well Identification	AI25	NI25	AI26	NI26	AI27	NI27	AI28	NI28	AI29	NI29	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI30	NI30	AI31	NI31	AI32	NI32	AI33	NI33	AI34	NI34	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

Well Identification	AI35	NI35	AI36	NI36	AI37	NI37	AI38	NI38	AI39	NI39	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI40	NI40	AI41	NI41	AI42	NI42	AI43	NI43	AI44	NI44	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

Well Identification	AI45	NI45	AI46	NI46	AI47	NI47	AI48	NI48	AI49	NI49	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI50	NI50	AI51	NI51	AI52	NI52	AI53	NI53	AI54	NI54	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	27	27	27	27	27	27	27	27	27	27	
Depth to GW during drilling	19*	19*	19*	19*	19*	19*	19*	19*	19*	19*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	26.5 to 27	10 to 15	
Sand Pack	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	25 to 27	9 to 15	
Bentonite Chips	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	15.5 to 19	0 to 9	
Bentonite Pellets (below water)	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	19 to 25	NA	

Well Identification	AI55	NI55	AI56	NI56	AI57	NI57	AI58	NI58	AI59	NI59	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	29	29	29	29	28.5	28.5	28.5	28.5	28.5	28.5	
Depth to GW during drilling	20.5*	20.5*	20.5*	20.5*	21*	21*	21*	21*	21*	21*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	28.5 to 29	13 to 18	28.5 to 29	13 to 18	27.5 to 28	12 to 17	27.5 to 28	12 to 17	27.5 to 28	14 to 19	
Sand Pack	27 to 29	12 to 19	27 to 29	12 to 19	26 to 28	11 to 17.5	26 to 28.5	11 to 17.5	26 to 28	13 to 19.5	
Bentonite Chips	19 to 20	0 to 12	19 to 20	0 to 12	17.5 to 20	0 to 11	17.5 to 20	0 to 11	19.5 to 20.5	0 to 13	
Bentonite Pellets (below water)	20 to 27	NA	20 to 27	NA	20 to 26	NA	20 to 26	NA	20.5 to 26	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI60	NI60	AI61	NI61	AI62	NI62	AI63	NI63	AI64	NI64	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	28.5	28.5	28.5	28.5	28.5	28.5	30	30	30	30	
Depth to GW during drilling	21*	21*	21*	21*	21*	21*	24*	24*	24*	24*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	27.5 to 28	12 to 17	27.5 to 28	12 to 17	27.5 to 28	12 to 17	29.5 to 30	15 to 20	29.5 to 30	15 to 20	
Sand Pack	26 to 28	11 to 17.5	26 to 28	11 to 17.5	26 to 28	11 to 17.5	28 to 30	14 to 20	28 to 30	14 to 21	
Bentonite Chips	17.5 to 20	0 to 11	17.5 to 20	0 to 11	17.5 to 20	0 to 11	20 to 24	0 to 14	21 to 24	0 to 14	
Bentonite Pellets (below water)	20 to 26	NA	20 to 26	NA	20 to 26	NA	24 to 28	NA	24 to 28	NA	

Well Identification	AI65	NI65	AI66	NI66	AI67	NI67	AI68	NI68	AI69	NI69	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	30	30	30	30	30	30	30	30	33.5	33.5	
Depth to GW during drilling	24*	24*	24*	24*	24*	24*	24*	24*	27*	27*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	29.5 to 30	15 to 20	29.5 to 30	15 to 20	29.5 to 30	15 to 20	29.5 to 30	15 to 20	32.5 to 33	15 to 20	
Sand Pack	28 to 30	14 to 20	28 to 30	14 to 21	28 to 30	14 to 20	28 to 30	14 to 21	31.5 to 33.5	14 to 21	
Bentonite Chips	20 to 24	0 to 14	21 to 24	0 to 14	20 to 24	0 to 14	21 to 24	0 to 14	21 to 27	0 to 14	
Bentonite Pellets (below water)	24 to 28	NA	24 to 28	NA	24 to 28	NA	24 to 28	NA	27 to 31.5	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI70	NI70	AI71	NI71	AI72	NI72	AI73	NI73	AI74	NI74	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	33.5	33.5	33.5	33.5	33.5	33.5	36.5	36.5	36.5	36.5	
Depth to GW during drilling	27*	27*	27*	27*	27*	27*	29*	29*	29*	29*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	32.5 to 33	15 to 20	32.5 to 33	15 to 20	32.5 to 33	15 to 20	35.5 to 36	15 to 20	35.5 to 36	15 to 20	
Sand Pack	31.5 to 33.5	14 to 21	31.5 to 33.5	14 to 21	31.5 to 33.5	14 to 21	34 to 36.5	14 to 21	34 to 36.5	14 to 21	
Bentonite Chips	21 to 27	0 to 14	21 to 27	0 to 14	21 to 27	0 to 14	21 to 29	0 to 14	21 to 29	0 to 14	
Bentonite Pellets (below water)	27 to 31.5	NA	27 to 31.5	NA	27 to 31.5	NA	29 to 34	NA	29 to 34	NA	

Well Identification	AI75	NI75	AI76	NI76	AI77	NI77	AI78	NI78	AI79	NI79	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	36.5	36.5	36.5	36.5	36.5	36.5	36	36	36.5	36.5	
Depth to GW during drilling	29*	29*	29.5*	29.5*	29*	29*	30*	30*	29*	29*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	35.5 to 36	15 to 20	35.5 to 36	15 to 20	35.5 to 36	15 to 20	35.5 to 36	15 to 20	35.5 to 36	15 to 20	
Sand Pack	34 to 36.5	14 to 21	34 to 36.5	14 to 21	34 to 36.5	14 to 21	34 to 36	14 to 21	34 to 36.5	14 to 21	
Bentonite Chips	21 to 29	0 to 14	21 to 30	0 to 14	21 to 29	0 to 14	21 to 30	0 to 14	21 to 29	0 to 14	
Bentonite Pellets (below water)	29 to 34	NA	30 to 34	NA	29 to 34	NA	30 to 34	NA	29 to 34	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI80	NI80	AI81	NI81	AI82	NI82	AI83	NI83	AI84	NI84	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	36	36	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	
Depth to GW during drilling	30*	30*	29.5*	29.5*	29.5*	29.5*	29.5*	29.5*	29.5*	29.5*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	35.5 to 36	15 to 20	36.5 to 37	20 to 25	36.5 to 37	20 to 25	36.5 to 37	20 to 25	36.5 to 37	20 to 25	
Sand Pack	34 to 36	14 to 21	35 to 37.5	19 to 26	35 to 37.5	19 to 26	35 to 37.5	19 to 26	35 to 37.5	19 to 26	
Bentonite Chips	21 to 30	0 to 14	26 to 29	0 to 19	26 to 29	0 to 19	26 to 29	0 to 19	26 to 29	0 to 19	
Bentonite Pellets (below water)	30 to 34	NA	29 to 35	NA	29 to 35	NA	29 to 35	NA	29 to 35	NA	

Well Identification	AI85	NI85	AI86	NI86	AI87	NI87	AI88	NI88	AI89	NI89	
Well Type	AI	NI	AI	NI	AI	NI	AI	NI	AI	NI	
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	
Total Depth	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	38.5	
Depth to GW during drilling	30*	30*	30*	30*	30*	30*	30*	30*	30*	30*	
Well Diameter	NA	0.75	NA	0.75	NA	0.75	NA	0.75	NA	0.75	
Slot Size	NA	0.02	NA	0.02	NA	0.02	NA	0.02	NA	0.02	
Depth to GW in well	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Screen Interval	37.5 to 38	20 to 25	37.5 to 38	20 to 25	37.5 to 38	20 to 25	37.5 to 38	20 to 25	37.5 to 38	20 to 25	
Sand Pack	36.5 to 38.5	19 to 26	36.5 to 38.5	19 to 26	36.5 to 38.5	19 to 26	36.5 to 38.5	19 to 26	36.5 to 38.5	19 to 26	
Bentonite Chips	26 to 30	0 to 19	26 to 30	0 to 19	26 to 30	0 to 19	26 to 30	0 to 19	26 to 30	0 to 19	
Bentonite Pellets (below water)	30 to 36.5	NA	30 to 36.5	NA	30 to 36.5	NA	30 to 36.5	NA	30 to 36.5	NA	

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

Table 1
Subsurface Metabolism Enhancement System Well Construction Details
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well Identification	AI90	NI90	AI91	NI91	AI92	NI92			BMW1	BMW2	BMW3
Well Type	AI	NI	AI	NI	AI	NI			MW	MW	MW
Boring Diameter	2.25	2.25	2.25	2.25	2.25	2.25			3.25	3.25	3.25
Total Depth	39.5	39.5	39.5	39.5	39.5	39.5			27	24	24
Depth to GW during drilling	31*	31*	31*	31*	31*	31*			20	20	18
Well Diameter	NA	0.75	NA	0.75	NA	0.75			1.5	1.5	1.5
Slot Size	NA	0.02	NA	0.02	NA	0.02			0.02	0.02	0.02
Depth to GW in well	NA	NA	NA	NA	NA	NA			NM	19.65 to grade	NM
Screen Interval	38.5 to 39	22 to 27	38.5 to 39	22 to 27	38.5 to 39	22 to 27			12 to 27	9 to 24	9 to 24
Sand Pack	37 to 39.5	20 to 28	37 to 39.5	20 to 28	37 to 39.5	20 to 28			10 to 27	7 to 24	7 to 24
Bentonite Chips	28 to 31	0 to 20	28 to 31	0 to 20	28 to 31	0 to 20			0 to 10	0 to7	0 to7
Bentonite Pellets (below water)	31 to 37	NA	31 to 37	NA	31 to 37	NA			NA	NA	NA

Well Identification	BMW4	BMW5	BMW6	BMW7	BMW8	BMW9	BMW10	BMW11	BMW12		
Well Type	MW	MW	MW	MW	MW	MW	MW	MW	MW		
Boring Diameter	3.25	3.25	3.25	3.25	2.25	2.25	2.25	2.25	2.25		
Total Depth	24	25	24	23	30	34	37	40	40		
Depth to GW during drilling	18	20.5	18	22.5	23.5	24.5	28.5	32	31.5		
Well Diameter	1.5	1.5	1.5	1.5	0.75	0.75	0.75	0.75	0.75		
Slot Size	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
Depth to GW in well	18.16	19.65	18.04	20.9	22.5	24.7	26.97	29.7	30.62		
Screen Interval	9 to 24	8 to 23	9 to 24	8 to 23	15 to 30	18 to 33	22 to 37	24 to 39	23 to 38		
Sand Pack	7 to 24	6 to 23	7 to 24	6 to 23	13 to 30	16 to 34	20 to 37	22 to 40	21 to 40		
Bentonite Chips	0 to 7	0 to 6	0 to 7	0 to 6	0 to 13	0 to 16	0 to 20	0 to 22	0 to 21		
Bentonite Pellets (below water)	NA	NA	NA	NA	NA	NA	NA	NA	NA		

BGE - Biogenic gas extraction
AI - Air injection
NI - Nutrient injection

NA - Not applicable
GW - Groundwater
* - depth to water inferred from nearby monitoring wells

APPENDIX A

LARWQCB Correspondence

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

December 7, 2012

Mr. Jerome Lorenzo
Signal Hill Holding Corporation
1900 South Norfolk Street, Suite 350
San Mateo, CA 94403

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
7012 1640 0000 6228 4502

SUBJECT: APPROVAL OF INTERIM REMEDIAL ACTION PLAN FOR MITIGATING GROUNDWATER CONTAMINATION AT THE PROPERTY BOUNDARIES

SITE: FORMER CHEMOIL REFINERY FACILITY, 2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA (SCP NO. 0453A, SITE ID NO. 2047W00)

Dear Mr. Lorenzo:

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) staff reviewed a report titled "Interim Remedial Action Plan (IRAP)" dated October 24, 2012, prepared by Ami Adini & Associates, Inc. (AA&A) on behalf of the Signal Hill Holding Corporation (SHHC). On August 29, 2012, you met with the Regional Board staff to discuss remediation alternatives for the former Chemoil Refinery facility located at 2020 Walnut Avenue in Signal Hill, California (site). As the results of that meeting, you submitted the IRAP to address Regional Board's concern on groundwater contaminants that might migrate off the property boundary.

Based on results of the phased investigations conducted between 2008 through 2012, AA&A proposed a remedial design of a flow-through barrier along the western and southern boundaries, which is an in-situ bioremediation process of soil and groundwater remediation that uses natural microorganisms found natively in soil to degrade petroleum hydrocarbons. Figure 3 illustrates the proposed flow-through barrier system. The proposed system comprises the following five components:

1. Air injection (a network of 95 air/nutrient injection wells);
2. Biogenic-gas extraction (BGE), primarily carbon dioxide (a total of 47 BGE wells);
3. Nutrient injection (a network of 95 air/nutrient injection wells);
4. A surface seal, and
5. Groundwater monitoring wells (a total of 12 wells).

The goal of the IRAP is to timely maximize the reduction of total petroleum hydrocarbons (TPH) concentration in the groundwater throughout the barrier. In the IRAP, AA&A proposed the

remediation goals for the proposed boundary control system, which are TPH gasoline range at or less than 100 microgram per liter (µg/l), and TPH diesel range (using the silica gel rinse) at or less than 100 µg/l, for groundwater along the south and southwest property boundaries. We have no objection for you to use these target concentrations levels to evaluate the performance of the proposed remediation system along the boundary with the following conditions:

- For confirmation of the cleanup, TPH diesel shall be analyzed by EPA Method 8015M.
- Site investigation and remediation activities must be in compliance with the *Interim Site Assessment & Cleanup Guidebook* developed by Los Angeles Regional Board in May 1996, and Resolution No. 92-49, the Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304.

Based on our review of the information submitted to the Regional Board, Regional Board staff concurs with the scope of work proposed in the IRAP. To implement the IRAP, you must file a complete Report of Waste Discharge with this Regional Board to obtain Waste Discharge Requirements (WDRs) for the proposed remediation system. As we discussed during a field meeting held at the site on November 29, 2012, you shall submit supplemental information to specify your monitoring program with the Report of Waste Discharge for application of the WDRs.

Prior to the commencement of any field work, you must develop a site-specific Health and Safety Plan (H&SP) in accordance with section 5192 of the California Code of Regulations (CCR), title 8 and submit to the Regional Board project staff. The jurisdictional agency, California Occupational Safety and Health Administration (Cal-OSHA), may inspect the field activities.

If you have any questions, please contact Ms. Ann Lin at (213) 576-6781 or me at (213) 576-6734.

Sincerely,

Ann Lin, P.E.
Water Resource Control Engineer
Site Cleanup Program, Unit IV

Enclosed: Figure 3. Site Detail Map with Proposed Flow-Through Barrier System.

cc: Dr. Ann Chang, Groundwater Permitting, California Regional Water Quality Control Board, Los Angeles Region, Ann.Chang@waterboards.ca.gov
Rick McAuley, MPO Walnut Partners, LLC. rick@aztecgrp.com
Tom Graf, Ground Modifications, Inc. tgraf@groundmod.com
Ami Adini, AMI ADINI & Associates, Inc. amia@amiadini.com

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Los Angeles Regional Water Quality Control Board

June 7, 2013

Mr. Jerome Lorenzo
Signal Hill Holding Corporation
1900 South Norfolk Street, Suite 350
San Mateo, CA 94403

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
7012 1640 0000 6228 3772

SUBJECT: COMMENTS ON PROPOSED MODIFICATIONS TO ROUTINE GROUND WATER MONITORING PROGRAM

SITE: FORMER CHEMOIL REFINERY FACILITY, 2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA (SCP NO. 0453A, SITE ID NO. 2047W00)

Dear Mr. Lorenzo:

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board) is the public agency with the primary responsibility for the protection of ground and surface water within major portions of Los Angeles and Ventura County. The referenced site is located in Los Angeles County.

Regional Board staff reviewed a report titled "*Proposed Modifications to Groundwater Monitoring Program*" dated April 9, 2013, prepared by Ami Adini & Associates, Inc. (AA&A) on behalf of the Signal Hill Holding Corporation (SHHC). You are currently conducting groundwater quality monitoring and sampling program of sixteen monitoring wells on a quarterly basis.

On your behalf, AA&A proposed to modify current monitoring program as follows:

1. Reduce frequency of monitoring from quarterly to semi-annual;
2. Add four boundary monitoring wells to the program, and propose to sample eighteen wells in the full semi-annual event, and sample selected twelve wells in a limited-scale event;
3. Reduce analyses on groundwater samples, removing two tests from current groundwater monitoring program, which is no longer to analyze water samples for total petroleum hydrocarbons (TPH) diesel range organics (DRO) by US Environmental Protection Agency (EPA) Method 8015B, nor to analyze semi-volatile organic compounds (SVOCs) by EPA Method 8270C.

Regional Board staff has completed the review of your submittal, and we have the following comments:

- The Regional Board issued an approval of *Interim Remedial Action Plan for Mitigating Groundwater Contamination at the Property Boundaries*, dated December 7, 2012. On April 24, 2013, this Regional Board issued a General Waste Discharge Requirements (WDR), consisting of Order No. R4-2007-0019 (Series No.29), Monitoring and Reporting Program (MRP) No. CI-9933, and Standard Provisions Applicable to Waste Discharge Requirements. Implementing the MRP, and submitting monitoring or technical reports to the Regional Board per WDR requirements shall be stand-alone documents, and shall NOT be combined with any other reports. This comment letter does NOT make any change to MRP No.CI-9933 requirements.

- The modification of the groundwater monitoring program that we discussed here in this letter is related to your current routine monitoring with site cleanup program, which objective is to fully delineate on- and off-site dissolved-phase contaminated plume beneath the site.
- Based on our review of the information you submitted, we agreed on your proposal of reducing sampling frequency from quarterly to semi-annual. The differences we had with you on selected monitoring well network, respectively, for each semi-annual monitoring event, show in the following table:

SAMPLING FREQUENCY	CURRENT GROUNDWATER MONITORING PROGRAM	AA&A PROPOSED SEMI-ANNUAL EVENTS	REGIONAL BOARD APPROVED MONITORING PROGRAM UPDATE	REGIONAL BOARD APPROVED ANALYSES UPDATE
Quarterly	MW-1, MW-1A, MW-2, MW-3, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-17, MW-18, MW-19			
Semi-annual event (January – June)		MW-8, MW-9, MW-11, MW-12, MW-14, MW-15, MW-16, MW-19 , BMW-2, BMW-5, BMW-8, and BMW-11.	MW-8, MW-9, MW-11, MW-12, MW-14, MW-15, MW-16, MW-17, MW-19 , BMW-2, BMW-5, BMW-8, and BMW-11.	VOCs (including fuel oxygenates) by EPA Method 8260B; TPH, including gasoline range organics (GRO) and diesel range organics (DRO) by EPA Method 8015 Modified; and SVOCs by EPA Method 8270C.
Semi-annual event (July – December)		MW-1, MW-1A, MW-2, MW-8, MW-9, MW-10, MW-11 MW-12, MW-13, MW-14, MW-15, MW-16, MW-17, MW-19, BMW-2, BMW-5, BMW-8, and BMW-11.	MW-1, MW-1A, MW-2, MW-3, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16, MW-17, MW-18, MW-19, BMW-2, BMW-5, BMW-8, and BMW-11.	VOCs (including fuel oxygenates) by EPA Method 8260B; TPH, including gasoline range organics (GRO) and diesel range organics (DRO) by EPA Method 8015 Modified; and SVOCs by EPA Method 8270C.

- As we specified in that approval letter, "TPH diesel shall be analyzed by EPA Method 8015 (Modified)", which means without silica-gel rinse. The Regional Board will continue evaluating TPH plume beneath the site based on water data analyzed by EPA Method 8015 (Modified), as

specified in the *Interim Site Assessment & Cleanup Guidebook* developed by this Regional Board in May 1996. AA&A's proposal to analyze water sample with silica-gel rinse method only for DRO test is not accepted.

- Based on the historical detections of semi-volatile organic compounds (SVOCs) in groundwater, we determined that AA&A's proposal of the discontinuation of semi-volatile organic compounds by EPA Method 8270C is not accepted at this time. You are required to continue testing SVOCs until the analytical data can demonstrate that there is no concern of water quality related to SVOCs.
- You shall submit your groundwater monitoring reports on semi-annual basis, and make sure that you do not combine these reports with any WDR requirements reports.

If you have any questions, please contact me at (213) 576-6781.

Sincerely,

Ann Lin, P.E.
Water Resource Control Engineer
Site Cleanup Program, Unit IV

cc: Rick McAuley, MPO Walnut Partners, LLC. rick@aztecgrp.com
George B. Paspalof. gbpaspalof@aol.com
Tom Graf, Ground Modifications, Inc. tgraf@groundmod.com
Ami Adini, AMI ADINI & Associates, Inc. amia@amiadini.com

APPENDIX B

Air Compressor Specifications

DT4.10—4.40 Series

ISO 9001 Certified
CE Compliant

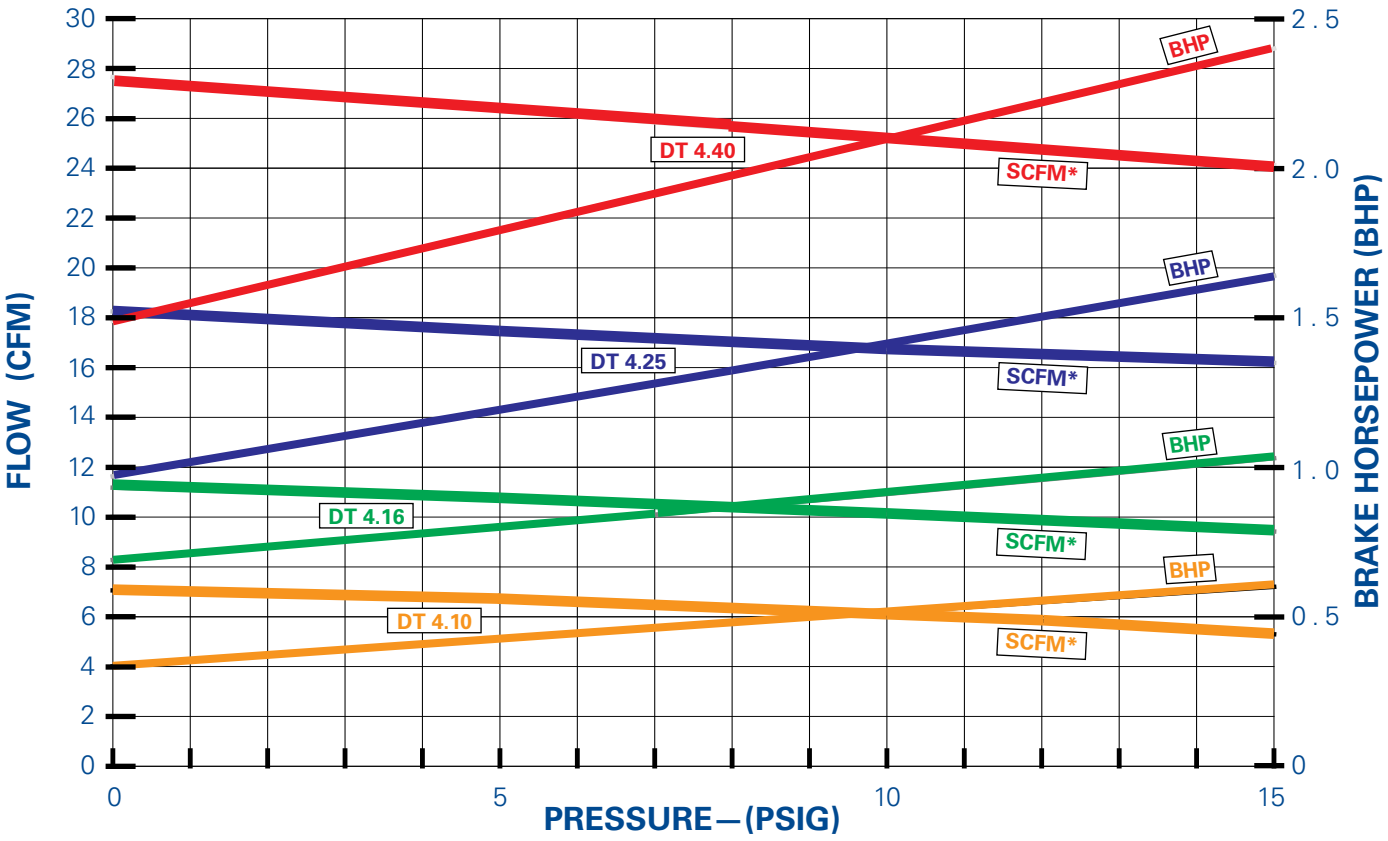
100% OIL-LESS COMPRESSORS

The Becker DT4.10—4.40 Series compressors are 100% oil-less rotary vane compressors. They are designed to operate on a continuous basis at any point from atmospheric pressure to a pressure of 15 PSIG.

The DT series compressors are direct drive units and are supplied with a TEFC flange mounted electric motor. Each pump is equipped with an integral pressure relief valve, a 10µ inlet filter, and vibration isolators as standard equipment.

Becker DT series compressors have a reputation for being exceptionally quiet. These newly redesigned pumps are even quieter, and operate cooler than previous units. If you are an OEM, their attractive styling will never cause embarrassment when included with your product.

These 100% oil-less, non-polluting compressors are ideal for applications where oil or water is objectionable. All Becker DT series compressors use long-life, self-lubricating graphite composite vanes. Vacuum, and combination pressure/vacuum models are also available.

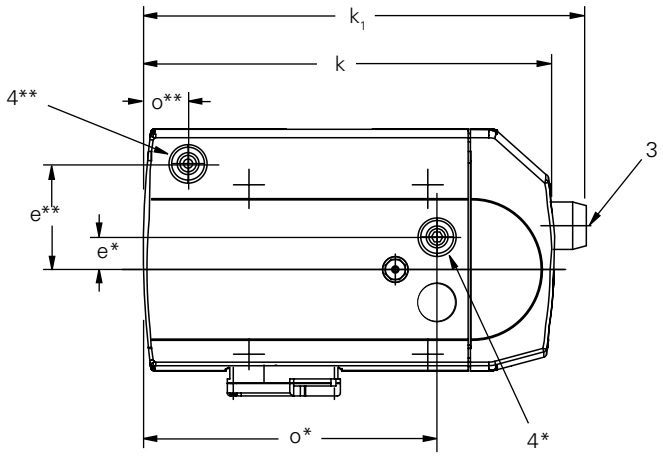


* @ 29.92" Hg Bar. Pr.; 68°F; 36% R.H.; 0.075#/ft³

Becker Pumps Corp. • 100 East Ascot Lane • Cuyahoga Falls, Ohio 44223-3768
Ph. (330) 928-9966 • FAX: (330) 928-7065 • e-mail: info@beckerpumps.com • beckerpumps.com

BECKER

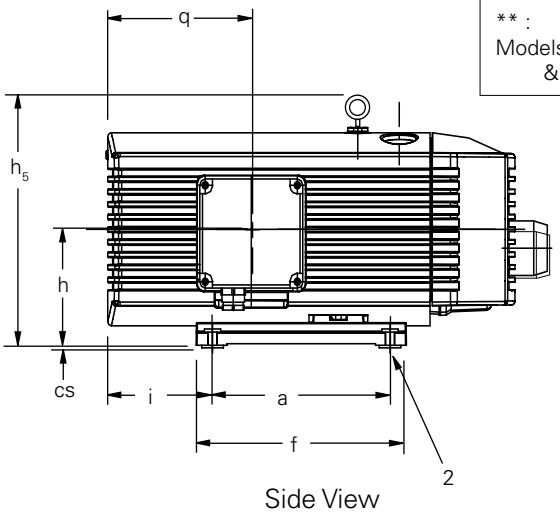
TECHNICAL DATA



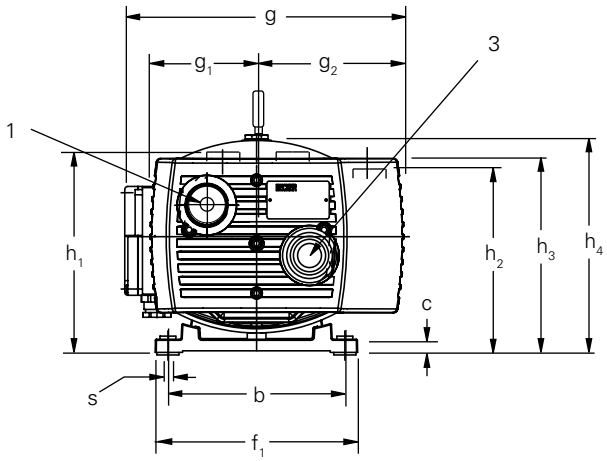
Top View

* :
Models DT4.10
& DT4.16

** :
Models DT4.25
& DT4.40



Side View



End View (Opposite Motor End)

All data based on 60 Hz operation	DT 4.10	DT 4.16	DT 4.25	DT 4.40
Flow (SCFM @ 0 PSIG)	7.1	11	18	28
Horsepower	0.6	0.94	1.75	2.9
Speed (RPM)	1740	1740	1740	1740
Max. Oper. Pressure (PSIG)	15	15	15	15
Weight (lbs.)—w/ motor	35.2	51.7	80.3	101
Noise Level (Max. dBA)	62	64	68	70
Outlet size (BSP, inches)	½	½	¾	¾
Dimensional Data	(Inches)			
a	6.3	7.95	8.66	8.66
b	4.41	4.92	8.19	8.19
c	0.6	0.6	0.6	0.6
cs	0.12	0.12	0.12	0.12
e	1.38	1.38	5.12	5.12
f	7.88	9.53	10.24	10.24
f_1	5.6	6.1	9.37	9.37
g	8.11	9.1	12.92	12.92
g_1	3.54	4.03	4.92	4.92
g_2	3.54	4.03	6.81	6.81
h	4.21	4.45	5.51	5.51
h_1	6.66	7.4	—	—
h_2	—	—	8.43	8.43
h_3	6.93	7.32	8.9	8.9
h_4	7.44	8.07	9.84	9.84
h_5	7.68	8.3	11.42	11.42
i	4.17	2.88	4.45	7.0
k	15.25	16.38	19.89	23.04
k_1	16.9	17.8	21.46	24.61
o	10.12	11.48	2.16	2.16
q	4.84	5.97	6.81	7.56
s	0.27	0.27	0.27	0.27

Manufacturer reserves right to alter data without notice.

1 - Inlet
2 - Vibration Isolator
3 - Pressure Regulating Valve
4 - Discharge Port

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APPENDIX C

Vacuum Blower Specifications

AIRTECH® VACUUM

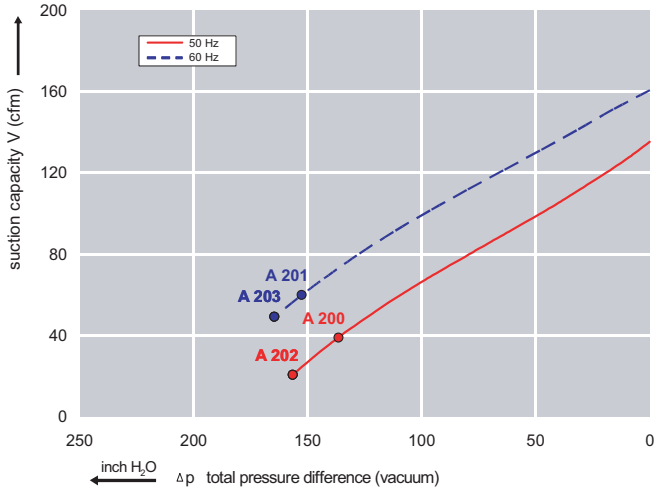
3BA1510

Vacuum/Pressure Regenerative Blower

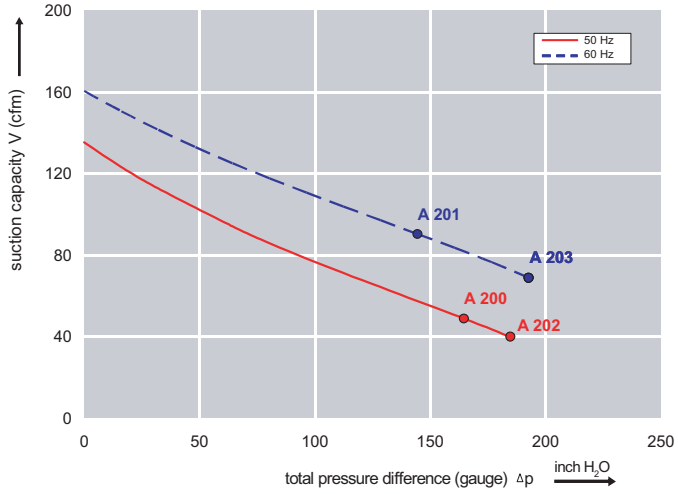
Features:

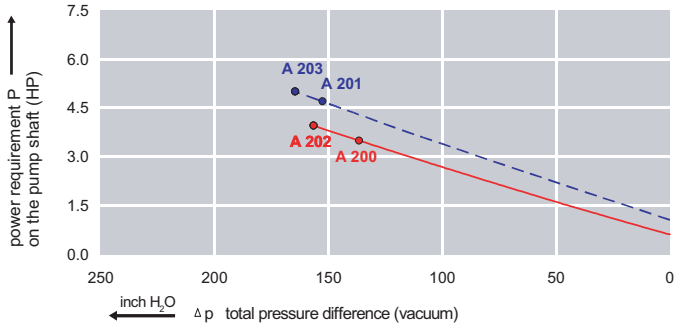
- Cooler running, outboard bearing provides maintenance-free operation
- Environmentally friendly oil-free technology
- Extremely quiet operation
- All motors are standard TEFC with Class F insulation, UL recognized, CE Compliant
  Explosion-Proof motors available
- Custom construction blowers are available
- Rugged die cast aluminum construction

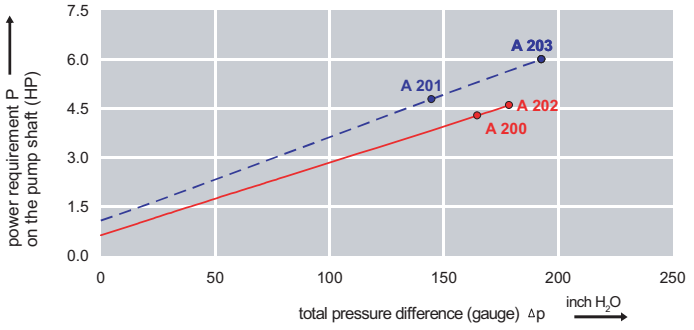
Performance curve for Vacuum pump

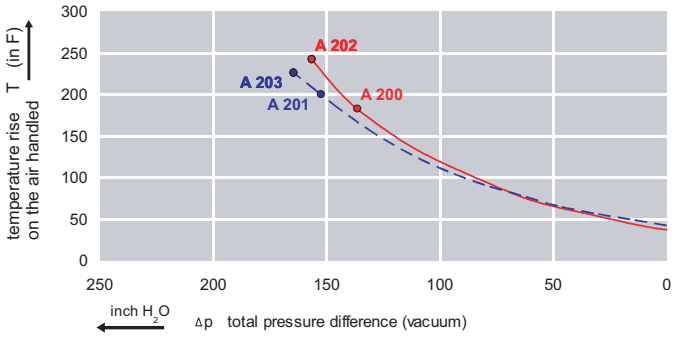


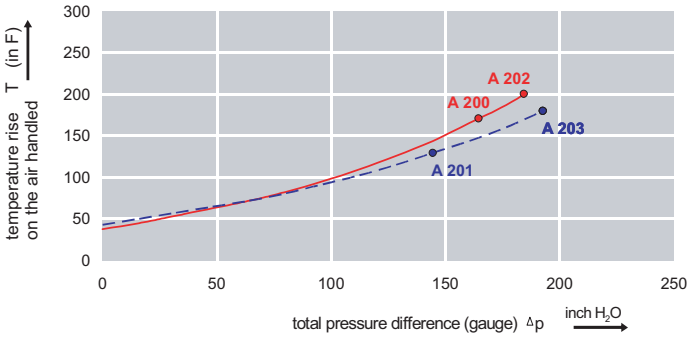
Performance curve for Compressor









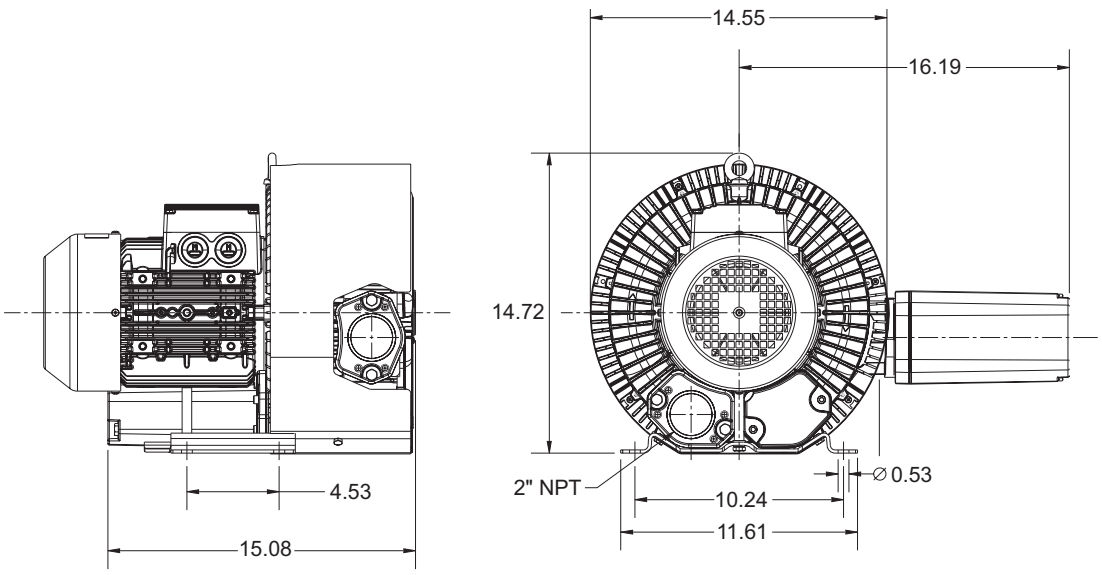


AIRTECH VACUUM

3BA1510

Vacuum/Pressure Regenerative Blower

Dimensions: (inches)



Recommended Accessories:

Relief valve:

VC61Z (Vacuum)

PC61Z (Pressure)

Filter:

ATF-200-15124/1 (Vacuum)

AFS-30-200-10 (Pressure)

Specifications subject to change without notice. Please contact factory for specification updates.

Selection & Ordering Data - Type 3BA1510

Curve No.	Order No.	Frequency Hz	Rated power HP	Input voltage V		Input current A		Permissible total differential pressure Vacuum inch H2O	Permissible total differential pressure Compressor inch H2O	Sound pressure level dB(A)	Weight lbs
3~ 50/60 Hz IP55 insulation material class F											
A 200	3BA1510-7AT46	50	4.02	200D ... 240D	345Y ... 415Y	12.5D	7.2Y	-136	165	72	86
A 201	3BA1510-7AT46	60	4.62	220D ... 250D	415Y ... 460Y	12.0D	6.5Y	-153	145	74	86
A 202	3BA1510-7AT56	50	5.36	200D ... 240D	345Y ... 415Y	17.4D	10.0Y	-157	197	72	95
A 203	3BA1510-7AT56	60	6.16	220D ... 250D	415Y ... 460Y	15.2D	8.5Y	-165	193	74	95

Suitable for 208 Volt Operation

All curves are rated at 14.7 psia and 68° F ambient conditions and are reported in SCFM referenced to 68° F and 14.696 psia sea level conditions. Curve values are nominal, actual performance may vary by up to 10% of the values indicated. For inlet temperatures above approximately 80° F or for handling gases other than air, please contact your Airtech sales representative for assistance.

APPENDIX D

Ammonium Sulfate MSDS

Material Safety Data Sheet
J. R. Simplot Company
AgriBusiness

Trade Name: Simplot Ammonium Sulfate **M11070**
Registration No: None

SECTION 1 CHEMICAL PRODUCT AND COMPANY INFORMATION

Manufacturer or Formulator: J.R. Simplot Company
P.O. Box 70013
Boise, ID 83707
Emergency Phone - Chemtrec: 1-800-424-9300

Product Name: Simplot Ammonium Sulfate
Common Name: Simplot Ammonium Sulfate, 21-0-0,
Chemical Type: Salt

SECTION 2 COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name and Synonyms	C.A.S. No.	Chemical Formula	WT%	TLV	PEL
			Hazardous		
None					
			Non-Hazardous		
This is a homogeneous granular product containing:					
Ammonium Sulfate	7783-20-2	$(NH_4)_2SO_4$	99.96-99.90%	10 mg/m^3 Nuisance Dust	15 mg/m^3 Nuisance Dust
Anti-caking agent	NA	NA	.04 - .10%		

SECTION 3 HAZARDS IDENTIFICATION

Ingestion: Small doses may cause mild discomfort. Used as a general purpose food additive for buffer and neutralizing agent.
Inhalation: Slight discomfort possible--causes readily reversible changes which disappear after end of exposure. Dust may cause further aggravation to those predisposed to respiratory problems.
Eye Contact: Slight eye abrasion possible.
Skin Absorption: Prolonged contact may cause slight skin abrasion.
Skin Contact: Slight abrasion possible.
Effects of Overdose: One reference lists that massive doses ingested or large doses administered under the skin, or in the blood stream, may cause diarrhea, and there arises the possibility of sufficient absorption to produce diuresis and systemic ammonia poisoning. Another reference lists unknown--no information on humans considered valid by authors.

SECTION 4 FIRST AID MEASURES

Ingestion: If ingested in large amount, give 2-3 glasses of water and induce vomiting. Call a doctor.
Inhalation: Should cause no problems by inhalation.
Eyes: Flush eyes with running water for 15 minutes. Seek medical attention if condition persists.
Skin: Wash skin with mild soap and water. Seek medical attention if condition persists.

SECTION 5 FIRE FIGHTING MEASURES

Extinguishing Media: Used in a solution as a fire retardant and to fight fires. Use media suitable to extinguish source of fire.
Special Fire Fighting Procedures: Use media suitable to extinguish source of fire.
Unusual Fire and Explosion Hazards: Releases NH_3 and Sulfur Oxides when decomposing. If accidentally mixed with oxidizers it will sensitize these materials and make them more reactive under fire conditions.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Environmental Precautions: Keep out of waterways and all bodies of water. Do not contaminate any body of water by direct application, cleaning of equipment or disposal. Since Ammonium Sulfate is a fertilizer, it may promote algae growth in waterways.
Steps to be taken in case material is released or spilled:
Contain spill. Sweep up and scoop into suitable container for use or recycle. May be used as a fertilizer using good agronomic practices.

SECTION 7 HANDLING AND STORAGE

Precautions to be taken in handling and storing:
Avoid prolonged contact with skin. Use dust mask if material is dusty. Separate from strong oxidizers such as chlorates, nitrates and nitrites.
Other Precautions: Store in cool, dry area--preferably on pallets off of floor.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation Protection: Adequate ventilation for bulk storage.
Respiratory Protection: Use dust mask if material is dusty.
Protective Clothing: Normal clean work clothing. Gloves as needed.
Eye Protection: Safety glasses with side shield.
Other: Eyewash fountain in area.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point:	Decomposed @ 455°F	**Solubility in Water:**	70g/100g H_2O cold, 100g/100g H_2O hot
Density:	66-69 lbs/ft^3	**% Volatiles (by volume):**	0
Flashpoint:	Non-flammable	**Vapor Pressure, mm Hg:**	Nil
pH:	10 g/90 g H_2O: 5.5 - 6.0	**Evaporation Rate:**	Not available
Appearance:	White or off-white crystals.	**Specific Gravity:**	1.1
Reaction with Water:	None	**VOC:**	Not available
Extinguishing Media:	Non-flammable. Used in a solution for fighting fires.		

SECTION 10 STABILITY AND REACTIVITY

Stability (Normal Conditions): Stable
Conditions to Avoid: None
Incompatibility (Material to Avoid): Oxidizers.
Hazardous Decomposition Products: Releases NH_3 and Sulfur Oxide fumes when decomposing.
Hazardous Polymerization: Will not occur

SECTION 11 TOXICOLOGY INFORMATION

Acute Oral Toxicity: LD_{50} (rat) is 640-4,250 mg/kg; not acutely toxic by oral exposure. (TFI Product Testing Results, OECD Guideline 425)
Acute Dermal Toxicity: LD_{50} (rat) is greater than 2,000 mg/kg (ppm); not acutely toxic by dermal exposure. (TFI Product Testing Results, OECD Guideline 402).
Acute Aquatic Toxicity: Fish 96-hour LC_{50} is greater than 13.6-159.8 mg total NH_3/L; daphnia 96-hour LC_{50}: greater than 27 mg total NH_3/L. Slightly-toxic to aquatic organisms. (TFI Product Testing Results)

SECTION 12 ECOLOGICAL INFORMATION

None listed.

SECTION 13 DISPOSAL CONSIDERATIONS

Waste Disposal Procedures: Use or recycle. As the product is a fertilizer, use as fertilizer following good agronomic practices or consult local authorities.

SECTION 14 TRANSPORT INFORMATION

Shipping name:	Not regulated by D.O.T.		
Hazard Class:	None	**C.A.S. Number:**	7783-20-2
Reportable Quantity (RQ):	None	**D.O.T. Number:**	None
Labels Required:	None	**Haz Waste No:**	None
Placard:	None	**EPA Regist No:**	None

SECTION 15 REGULATORY INFORMATION

Carcinogenicity: by IARC?: Yes ( ) No (X) by NTP?: Yes ( ) No (X) by OSHA Yes ( ) No (X)

Not on the 302 list of SARA reportable quantities.

SECTION 16 OTHER INFORMATION

Flash Point (Test Method):	Non-flammable	**Flammable Limits**	**LOWER**	**UPPER**
Autoignition Temperature:	Not applicable	(% BY VOLUME)	N/A	N/A

MSDS Version Number: 8 (revision to product name and Section 2)

Reviewed by: The Environmental Health & Safety Department
September 2012 (208) 389-7425

APPENDIX E

System Operations Report, AA&A, dated January 31, 2016

SYSTEM OPERATION REPORT
FORMER CHEMOIL REFINERY
2020 Walnut Avenue
Signal Hill, California

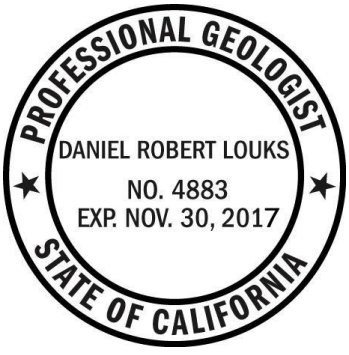
LARWQCB Site Cleanup Program No. 0453A
Global ID: SL2047W2348

January 31, 2016

Prepared For: **Signal Hill Holding Company**
1900 South Norfolk Street, Ste 350
San Mateo, CA 94403

By: **AMI ADINI & ASSOCIATES, INC.**
100 North Brand Avenue, Ste. 600
Glendale, California 91203
Tel: (818) 824-8102

Compiled & Written By:
GSA ENGINEERING, INC,



Dan Louks
Professional Geologist #4883

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1.0 INTRODUCTION

This report presents the details from vapor extraction system operations conducted by Ami Adini & Associates, Inc (AA&A) as part of the Subsurface Metabolism Enhancement system (SME) at the Former Chemoil Refinery site. The site is located at 2020 Walnut Avenue in Signal Hill, California (**Figure 3: Site Detail Map, AA&A, March 2014**). The scope of work included operation of the permitted vapor extraction system using the existing combined well array on a continuous basis. This is the first reporting period for the vapor extraction portion of the SME system. Prior to these operations, three interim remedial actions were conducted to reduce the inlet hydrocarbon levels using a catalytic oxidizer prior to using activated carbon as a treatment media. This report summarizes the interim treatment and provides details of the on-going continuous system operations.

2.0 BACKGROUND

The site is a former oil refinery that operated from 1922 until early 1994. The Chemoil Corporation (Chemoil) acquired the refinery in August 1988 and operated it until February 1994. Prior to being acquired by Chemoil, the refinery was owned and operated by the MacMillan-Ring Free Oil Company. According to the "*Additional Off-Site Environmental Investigation Report"*, dated July 11, 2012, prepared by Geosyntec Consultants, of Oakland California, the refinery and associated equipment were dismantled and removed between 1997 and 1998 (Geosyntec, 2012). The site is currently vacant and does not contain any aboveground or underground storage tanks.

The site comprises a total of 23 parcels and is divided by Walnut Avenue into two primary parcels, identified as the Eastern and Western parcels. The western parcel is bound by Walnut Avenue to the east, commercial office/light industrial properties to the north, Gundry Avenue to the west, and a former railway corridor parallel to East Wesley Drive to the southwest. Residential properties are located south and west of the former railway corridor south of the site. The eastern parcel is bound by Walnut Avenue to the west, East 20th Street and Alamitos Avenue to the south, North Gaviota Avenue to the east, and the American University of Health Sciences to the north.

AA&A submitted a *"Subsurface Metabolism Enhancement System Installation Report"* (dated April 25, 2014) to present the design and work performed for the installation of the groundwater contaminant mitigation system along the western and southern boundaries of the site. The mitigation system consists of a flow through barrier using subsurface metabolism enhancement (SME) technology to mitigate petroleum hydrocarbon contaminants identified in groundwater along the western and southern boundaries of the site as required by the Los Angeles Regional Water Quality Control Board (LARWQCB).

A flow through barrier using SME technology was selected as the most appropriate technology to prevent the off-site migration of groundwater contaminants. The installation of the SME system was presented to the LARWQCB in the Interim Remedial Action Plan, October 24, 2012. The IRAP was approved by the LARWQCB in a letter dated December 7, 2012

SME (U.S. patent no. 6,464,005) technology is an in-situ process of soil and groundwater remediation that uses natural microorganisms found natively in soil and groundwater to degrade petroleum hydrocarbons. SME technology incorporates the technologies of nutrient injection, air injection, and air and biogenic-gas

extraction. Using a combination of air and nutrient injection into the subsurface through a series of injection wells and the extraction of air and biogenic gas from a series of extraction wells, oxygen flow throughout the subsurface is enhanced. The increased circulation of oxygen and nutrients in the subsurface stimulates the aerobic metabolism of petroleum hydrocarbons by naturally occurring, native microbes in the soil. The forced removal of biogenic gas, primarily carbon dioxide, prevents anaerobic conditions from developing in the subsurface, promotes the natural metabolism of petroleum hydrocarbons, and maintains a negative pressure in the subsurface, which promotes the flow and spread of injected air and nutrients throughout the area of contamination. SME technology was developed to accelerate the natural breakdown of hydrocarbons in soil and groundwater simultaneously.

After obtaining the required permits for the construction, installation, and operation of the SME system, AA&A commenced the installation of the network of air and nutrient injection wells, biogenic-gas extraction wells, and barrier monitoring wells. A total of 150 wells were installed to a maximum depth of 40 feet below ground surface at the site between December 17, 2013, and January 15, 2014. Installation of the conveyance piping and the mechanical equipment required to operate the SME system was completed, and preliminary operation of the SME commenced on March 3, 2014.

Shortly after operations were started it was discovered that extraction of the biogenic gas caused the activated carbon to be quickly depleted. It was decided to attempt to reduce the hydrocarbon loading to the system by conducting a limited supplemental interim remedial action that included operation of a vapor extraction system and treatment of the off-gas with a catalytic oxidizer unit.

3.0 INTERIM REMEDIAL ACTION

In an effort to quickly remove as much contaminant mass as possible and reduce the inlet hydrocarbon concentrations, AA&A conducted an interim remedial action consisting of operation of a vapor extraction system. Vapors were extracted from the combined well array using a mobile extraction device provided by AA&A. The unit is equipped with three 3-stage Siemens blowers, each capable of extracting up to 120 cubic feet per minute of air and inducing 22 inches of mercury vacuum. The blowers can be operated individually or in combination to provide a wide range in flow and vacuum capability. The system is permitted by the South Coast Air Quality Management District (SCAQMD) under a various locations permit.

During system operations, the applied vacuum, extraction rates, and vapor phase concentrations were monitored in the field. To quantify mass removal, a vapor sample was collected from the system inlet. The laboratory data were used to provide a calculation of the mass removed. The equation for calculating the mass loading is shown below: The equation for calculating the mass loading is based on the ideal gas law:

$$M_{HC} = \frac{C_{HC} * Q * t * V_{Conv}}{M_{Conv}}$$

where M_{HC} = hydrocarbon loading (lbs)
C_{HC} = vapor phase hydrocarbon concentration (ug/L * EE-6)
Q = volumetric flow rate (cubic feet/hr)
t = time (hrs)
V_{Conv} = volume conversion (28.3 L/1 ft^3)
M_{Conv} = mass conversion (454 g/ 1 lb)

When operational, the SME system is set up in the western parcel of the site, and that parcel is further divided by East 21st Street to a northern and southern lot. Injection and extraction piping in each lot is routed into an equipment compound within that lot; and each compound is thus connected to two arrays of piping (**Figure 3: Site Detail Map, AA&A, March 2014**).

In this way, each lot (northern and southern) has south and north extraction-well array for a total of four arrays. There is no access to any of the individual extraction wells, so they cannot be turned off or adjusted in any way. All of the air extracted from the southern section is transported to the northern compound for treatment. The four areas are accessed through four extraction lines, two for the north area (with the south and north array connected) and two for the south area with a northern and southern array.

3.1 First Period of Interim Remedial Action

On October 23, 2014, the catalytic oxidizer equipment was transported to the site and continuous vapor extraction operations were started. The system was operated using all extraction pipes accessing all four areas at an applied vacuum pressure of about 30 inches of water column (in. WC), producing a consistent well gas flow of about 200 scfm. The flow was adjusted between the two extraction lines to maximize hydrocarbon removal. The system was started using all extraction lines open equally to flow. After one day the relative flow to the south extraction array was reduced as the northern array produced much higher hydrocarbon levels. The northern array extraction lines provided the majority of the flow (75-85%) until the end of the operating period. The system was shut down on November 14, 2014, ending the first operational period. The system operation data is summarized in **Appendix A**.

During operations, the well gas from each area was monitored for VOC content using a photo-ionization detector (PID), and for oxygen and carbon dioxide content using a Mini-Rae multi gas meter. Results of monitoring indicate the northern section of the northern area produced the highest inlet levels with an initial hydrocarbon concentration of 1280 ppm. The southern section of the northern area had 760 ppm initially. In contrast, the two southern areas had 320 and 260 ppm initially. By the end of the operational period the inlet levels from the two northern areas were 1,270 and 635 ppm, and the south area produced about 324 ppm. Results of oxygen and carbon dioxide monitoring indicated the northern area had oxygen levels ranging from 10.4 to 15.3% with carbon dioxide level ranging from 1.5 to 5.2%. The southern area had oxygen levels ranging from 10.6 to 16.8% and carbon dioxide ranging from 2.1 to 4.3%. The extraction array monitoring data is summarized in **Appendix A**.

On October 30, 2014, a vapor sample was collected from the combined system influent to gauge the productivity of the well stream and to calculate the mass removed. The vapor sample was collected using a low flow vacuum pump and the sample was containerized in a Tedlar bag. The sample was analyzed for TPHg and VOC by EPA Methods 8015M and 8260B, by Cal Tech Environmental Laboratories. Results of analysis indicated the sample contained 5,400 ug/L TPHg with 4.3 ug/L benzene, 1.1 ug/L toluene, 2.1 ug/L xylenes, and 4.1 ug/L 1,2 dichloroethane. No other VOC was detected in the sample. These results are summarized in **Table 1**.

This data was used to calculate the contaminant mass removed in vapor phase. A total of 1,822 pounds of TPHg was removed in the treatment period (**Appendix A**). The relationship between mass removed and inlet concentration levels are illustrated in **Figure 2**.

3.2 Second Period of Interim Remedial Action

The second period included intermittent system operations from December 23, 2014 through April 22, 2015. The system was run for about a week at eight different intervals during the period. In each treatment interval, the system was operated continuously using all extraction pipes accessing all four areas at an applied vacuum pressure of about 25 in. WC, producing a consistent well gas flow of about 200 scfm. The flow was adjusted to maximize removal of the higher hydrocarbon concentrations in the northern array extraction lines (about 85% of the total flow) throughout the operating period. The treatment events included system operations from December 23-30, 2014, January 6-12, January 20-26, February 3-10, February 21-28, March 10-17, March 23-28, and April 15-22, 2015. The system operation data is summarized in **Appendix A**.

During operations, the well gas from each area was monitored for VOC content using a photo-ionization detector (PID), and for oxygen and carbon dioxide content using a Mini-Rae multi gas meter. Results of monitoring indicate the northern section of the northern area produced the highest inlet levels with a maximum hydrocarbon concentration of 1,400 ppm. The southern section of the northern area had up to 700 ppm in this period. In contrast, the two southern areas had maximum levels of 350 ppm in this period. By the end of the operational period the inlet levels from the two northern areas were 780 and 290 ppm, and the south area produced about 65 ppm. Results of oxygen and carbon dioxide monitoring indicated the northern area had oxygen levels ranging from 9.8 to 17.0% with carbon dioxide level ranging from 3.0 to >5%. The southern area had oxygen levels ranging from 9.2 to 13.5% and carbon dioxide ranging from 1.3 to 4.5%. The extraction array monitoring data is summarized in **Appendix A**.

During this period, vapor samples were collected each month from the combined system influent to gauge the productivity of the well stream and to calculate the mass removed. Vapor samples were collected on January 20, February 21, March 28, and April 20, 2015.

Results of analysis indicated the TPHg levels were reduced from a maximum of 3,400 ug/L to 2,400 ug/L by April 20, 2015. Low levels of VOC were detected in the sample from January 20, 2015 with 1.2 ug/L xylenes. In addition, the final sample collected on April 20, 2015, had low levels of toluene (1.4 ug/L), ethylbenzene (1.1 ug/L), and xylenes (2.8 ug/L). No other VOC was detected in any of the samples. These results are summarized in **Table 1**.

This data was used to calculate the contaminant mass removed in vapor phase. A total of 3,345 pounds of TPHg was removed in the treatment period (**Appendix A**). The relationship between mass removed and inlet concentration levels are illustrated in **Figure 2**.

3.3 Third Period of Interim Remedial Action

The third period included intermittent system operations from May 1, 2015 through September 5, 2015. The system was run for about a week at seven different intervals during the period. In each treatment interval, the system was operated continuously using all extraction pipes accessing all four areas at an applied vacuum pressure of about 25 in. WC, producing a consistent well gas flow of about 200 scfm. The flow was adjusted to maximize removal of the higher hydrocarbon concentrations in the northern array extraction lines (about 85% of the total flow) throughout the operating period. The treatment events included system operations from May 1-7, May 16-22, May 30-June 5, June 20-27, July 15-21, August 13-21, and August 31-September 5, 2015. The system operation data is summarized in **Appendix A**.

During operations, the well gas from each area was monitored for VOC content using a photo-ionization detector (PID), and for oxygen and carbon dioxide content using a Mini-Rae multi gas meter. Results of monitoring indicate the northern section of the northern area produced the highest inlet levels with a maximum hydrocarbon concentration of 1,520 ppm on June 27, 2015. These levels were reduced to about 200 ppm by the end of the period. Results of oxygen monitoring indicated improving results as the oxygen levels increased from about 12% at the start of the period to about 15% at the end of the period. The extraction array monitoring data is summarized in **Appendix A**.

During this period, vapor samples were collected each month from the combined system influent to gauge the productivity of the well stream and to calculate the mass removed. (No sample was collected in July because only one event was scheduled in this month.) Vapor samples were collected on May 22, June 23, and August 31, 2015. Results of analysis indicated the TPHg levels were reduced from a maximum of 2,000 ug/L in May 2015 to just 238 ug/L TPHg in August 2015. None of the samples had detectable levels of VOC. These results are summarized in **Table 1**.

This data was used to calculate the contaminant mass removed in vapor phase. A total of 2,244 pounds of TPHg was removed in the treatment period, for a total of 7,411 lbs since treatment started. (**Appendix A**). The relationship between mass removed and inlet concentration levels are illustrated in **Figure 2**.

4.0 OPERATION OF SME VAPOR EXTRACTION UNIT

As a result of the Interim Remedial Action program using the catalytic oxidizer unit, the inlet levels to the system were reduced from 5,400 ug/L TPHg initially to just 238 ug/L TPHg. In the last period of operation, none of the vapor samples had detectable levels of VOC, and only TPHg was detected. Based on these data, the levels of hydrocarbon from the extraction system were within range of acceptable treatment using the activated carbon that was initially planned as a polishing action for the SME system. Accordingly, the catalytic oxidizer was removed from the site and the permitted fixed system using activated carbon was prepared for continuous operations.

The SME vapor extraction unit is equipped with a two 5 hp, blowers, each capable of extracting up to 150 cubic feet per minute of air and inducing 10 inches of mercury vacuum. One of the blowers provides vacuum to the south well array and the other blower along the northern well array. The extracted soil gas is initially treated using activated carbon with nine 200 lbs canisters (three aligned in series with 3 parallel trains) followed by three 1,500 lbs canisters in series. This configuration will prolong the life of the carbon, help prevent inadvertent discharges and save money in carbon disposal. The fixed system is permitted by the South Coast Air Quality Management District (SCAQMD).

4.1 First Period of System Operation

The first period included fixed system operations from October 1, 2015 through January 19, 2016. The system was operated continuously during this period except for a brief interval between October 20 and November 2, 2015, when the activated carbon was changed. During this operational period, the system operated with the flow divided roughly evenly between the north and south lines until December 27, 2015, when the flow was increased to the northern lines so that about 2/3 of the net was derived from these lines. In addition, the net well flow was reduced on November 2, 2015, (after restarting the system after the activated carbon change) by allowing dilution air into the well stream to preserve the new activated carbon.

During operations, the net flow through the system was constant at about 110 scfm. In the initial period when no dilution air was used, the system provided 25 in. WC vacuum evenly distributed between north and south lines. The net flow from the subsurface was cut to about 50 scfm when the dilution air was allowed in the system (beginning on November 2, 2015). After adjusting the flow to emphasize the north lines, and slightly reducing the amount of dilution air, the net well gas flow was about 70 scfm under 20 in. WC vacuum. The system operation data is summarized in **Appendix B**.

During operations, the well gas from each area was monitored for VOC content using a photo-ionization detector (PID), and for oxygen and carbon dioxide content using a Multi-Rae multi gas meter. Results of monitoring indicate the northern area produced the highest inlet levels with a maximum hydrocarbon concentration of 321 ppm on October 5, 2015. These levels were reduced to about 225 ppm by the end of the period. Results of oxygen monitoring indicated a consistent oxygen level of about 19%, until December 2015, when the levels decreased to about 14%, then increased to over 16% by the end of the period. The extraction array monitoring data is summarized in **Appendix C**.

During this period, vapor samples were collected each month from the combined system influent to gauge the productivity of the well stream and to calculate the mass removed. Vapor samples were collected on October 5, November 10, December 16, 2015 and January 19, 2016. Results of analysis indicated the TPHg levels were reduced from a maximum of 883 ug/L in October 2015 to just 450 ug/L TPHg in December 2015. The final sample collected in January 2016 with flow directed mostly to the north lines had 1,010 ug/L TPHg. None of the samples had detectable levels of VOC. These results are summarized in **Table 1**.

This data was used to calculate the contaminant mass removed in vapor phase. A total of 193 pounds of TPHg was removed in the treatment period, for a total of 7,604 lbs since treatment started. (**Appendix A**). The relationship between mass removed and inlet concentration levels are illustrated in **Figure 2**. The laboratory reports from vapor sampling are included in **Appendix C**.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The site is impacted by petroleum hydrocarbon contamination derived from former refinery operations dating to 1922. A flow through barrier using subsurface metabolism enhancement (SME) technology was selected as the most appropriate technology to prevent the off-site migration of groundwater contaminants. The installation of the SME system was approved by the LARWQCB in 2012. The system was installed, but unfortunately, shortly after operations began it was discovered that elevated levels of gasoline range hydrocarbons caused the activated carbon to be quickly depleted. It was decided to attempt to reduce the hydrocarbon loading to the system by conducting a limited supplemental interim remedial action that included operation of a vapor extraction system and treatment of the off-gas with a catalytic oxidizer unit.

Three interim treatment periods were conducted using the catalytic oxidizer unit between October 2014 and September 2015. The catalytic system was operated intermittently for about one week at a time, with a rebound period allowed between each event to maximize hydrocarbon removal efficiency. Operations revealed that the inlet levels from the northern area are significantly higher than in the southern area, so flow was focused on the northern piping array. The catalytic oxidizer system was operated 6,222 hours and removed 7,411 lbs of TPHg and the inlet levels to the system were reduced from 5,400 ug/L TPHg initially to just 238 ug/L TPHg by the end of the last treatment period.

In October 2105, the SME fixed system using activated carbon for the well gas treatment media was started for continuous operations. This is the first reporting period for these system operations and the system operated 98 days and removed 193 lbs of TPHg in this period. The system is planned for continuous operations through the next operational period.

TABLE 1
Summary of Vapor Sampling Results (µg/L)

Sample ID	Date	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	1,2 DCA
Interim Remedial Action								
Influent	10/30/14	5,400	4.3	1.1	<0.5	2.1	<1.0	4.1
Influent	1/20/15	3,400	<0.5	<1.0	<0.5	1.2	<1.0	<0.5
Influent	2/21/15	2,800	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5
Influent	3/28/15	1,900	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5
Influent	4/20/15	2,400	<0.5	1.4	1.1	2.8	<1.0	<0.5
Influent	5/22/15	2,000	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5
Influent	6/23/15	1,800	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5
Influent	8/31/15	238	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5
Fixed System Operations								
Influent	10/05/15	883	<0.05	<0.05	<0.05	<0.1	<0.1	--
Influent	11/10/15	645	<0.5	<1.0	<0.5	<1.0	<0.5	<0.5
Influent	12/16/15	450	<0.5	<1.0	<0.5	<1.0	<0.5	<0.5
Influent	1/19/16	1,010	<0.5	<1.0	<0.5	<1.0	<0.5	<0.5

Note: Vapor samples were tested for volatile organics by EPA Method 8260B full scan and TPHg by EPA Method 8015M. No other VOC detected by analysis.

FIGURES

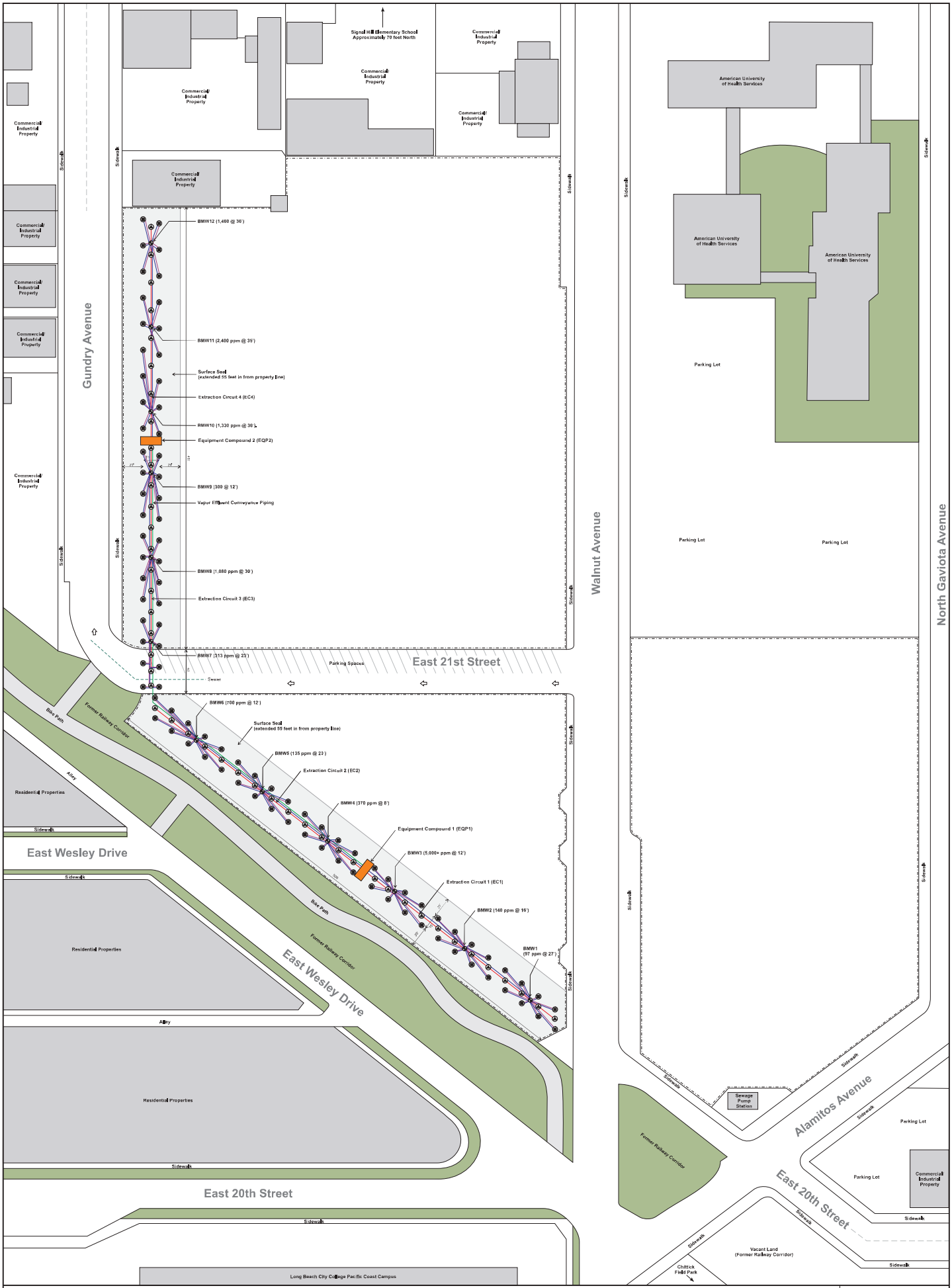

Figure 3: Site Detail Map with Flow-Through Barrier System
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
MRd	March 2014	ChemOilp01

Ami Adini & Associates, Inc.

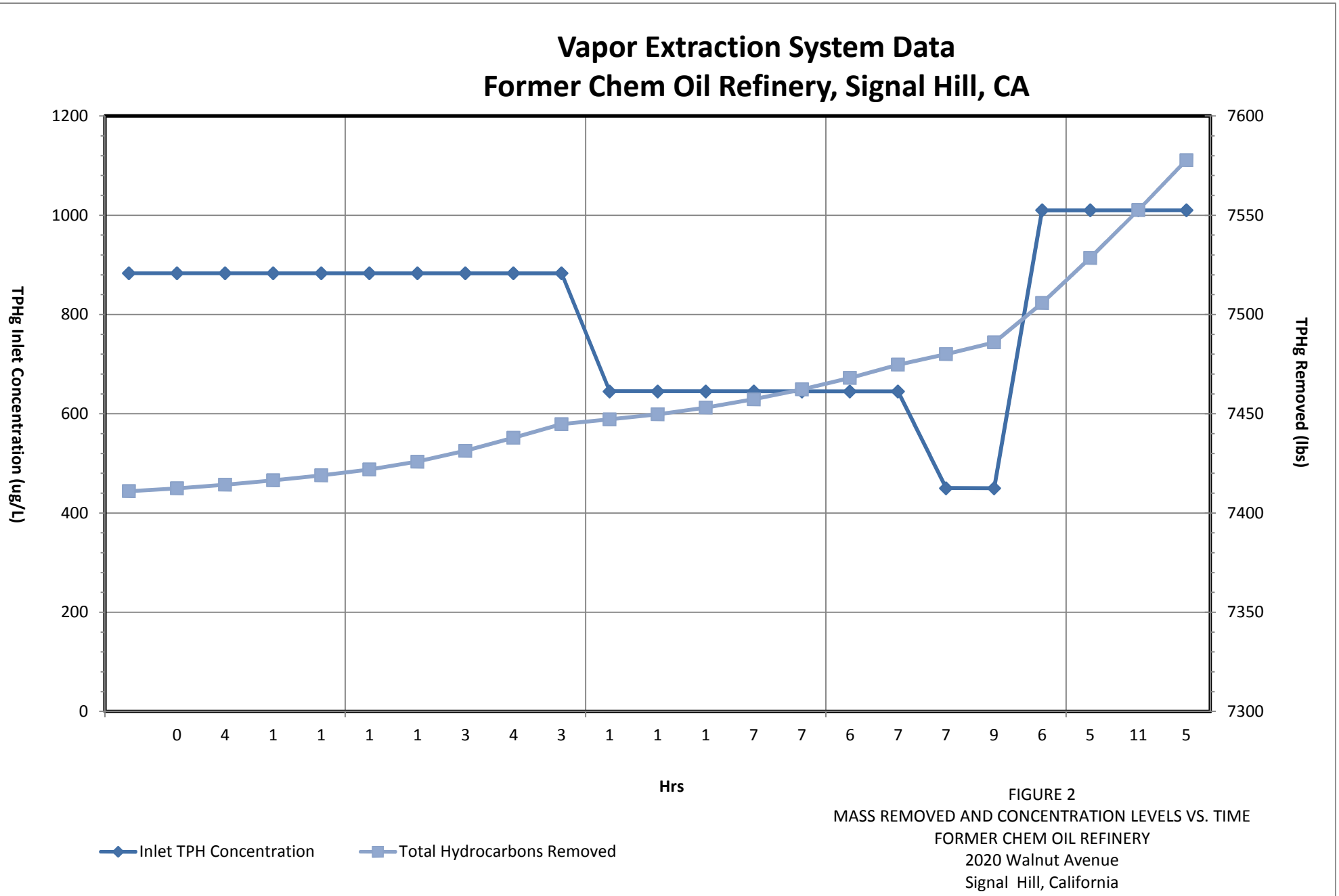

FIGURE 2
MASS REMOVED AND CONCENTRATION LEVELS VS. TIME
FORMER CHEM OIL REFINERY
2020 Walnut Avenue
Signal Hill, California

APPENDIX A

APPENDIX A
System Operating Data
Former Chem Oil Refinery, Signal Hill, CA

Date	Hour Meter (hrs)	Extraction Array	System Operation								Mass Removed		Comments
			Cumul. (hrs)	Period (hrs)	Vac. (*in. WC*)	Well Flow (scfm)	Inf. PID (ppm)	Eff. PID (ppm)	PreHeat (^{o}F)	Exhaust (^{o}F)	TPHg ug/L	TPHg lbs.	
10/23/14	3,537	N (50%) S(50%)	0	0	25	200	800	9.1	650	802	5,400	0	System startup.
10/24/14	3,557	N (75%) S(25%)	20	20	30	200	1,200	8.7	650	820	5,400	81	
10/27/14	3,573	N (75%) S(25%)	36	16	30	200	2,500	10.1	650	892	5,400	145	
10/30/14	3,633	N (85%) S(15%)	96	60	30	200	2,290	8.7	650	908	5,400	388	Vapor Sampling
11/4/14	3,729	N (85%) S(15%)	192	96	30	200	2,000	2.1	650	873	5,400	776	Restart unit, resume operations
11/11/14	3,920	N (85%) S(15%)	383	191	30	200	1,200	3.2	650	868	5,400	1,547	
11/14/14	3,988	N (85%) S(15%)	451	68	30	200	1,200	1.0	650	870	5,400	1,822	End Period. Shut down system.
12/23/2014	3,988	N (85%) S(15%)	451	0	25	200	1,000	2.5	651	762	5,400	1,822	System startup.
12/30/2014	4,154	N (85%) S(15%)	617	166	25	200	1,200	1.7	652	767	5,400	2,492	Shut down system.
1/6/2015	4,154	N (85%) S(15%)	617	0	25	200	1,000	2.6	651	741	5,400	2,492	System startup.
1/12/2015	4,293	N (85%) S(15%)	756	139	25	200	1,200	2.3	651	738	5,400	3,054	Shut down system.
1/20/15	4,293	N (85%) S(15%)	756	0	25	200	900	1.5	652	736	3,400	3,054	System startup.
1/26/15	4,438	N (85%) S(15%)	901	145	25	200	1,100	1.5	651	724	3,400	3,422	Shut down system.
2/3/15	4,438	N (85%) S(15%)	901	0	25	200	800	0.6	650	712	3,400	3,422	System startup.
2/10/15	4,607	N (85%) S(15%)	1,070	169	25	200	720	1.1	650	699	3,400	3,852	Shut down system.
2/21/15	4,607	N (85%) S(15%)	1,070	0	25	200	670	1.2	650	700	2,800	3,852	System startup.
2/28/15	4,773	N (85%) S(15%)	1,236	166	25	200	685	1.2	650	721	2,800	4,200	Shut down system.
3/10/15	4,773	N (85%) S(15%)	1,236	0	25	200	460	1.1	650	680	2,800	4,200	System startup.
3/17/15	4,942	N (85%) S(15%)	1,405	169	25	200	390	0.9	650	660	2,800	4,554	Shut down system.
3/23/15	4,942	N (85%) S(15%)	1,405	0	25	200	415	0.8	650	655	2,800	4,554	System startup.
3/28/15	5,012	N (85%) S(15%)	1,475	70	25	200	580	0.7	650	660	1,900	4,653	Shut down system.
4/15/15	5,012	N (85%) S(15%)	1,475	0	25	200	560	0.7	650	660	1,900	4,653	System startup.
4/20/15	5,133	N (85%) S(15%)	1,596	121	25	200	510	0.6	650	660	2,400	4,871	System operating.
4/22/15	5,177	N (85%) S(15%)	1,761	165	25	200	725	0.6	650	656	2,400	5,167	End Period. Shut down system.
5/1/15	5,177	N (85%) S(15%)	1,761	0	25	200	650	0.6	650	671	2,400	5,167	System startup.
5/3/15	5,220	N (85%) S(15%)	1,804	43	25	200	500	0.7	650	670	2,400	5,244	
5/5/15	5,275	N (85%) S(15%)	1,902	98	25	200	650	0.7	650	668	2,400	5,420	
5/7/15	5,325	N (85%) S(15%)	2,050	148	25	200	700	0.5	650	655	2,400	5,686	Shut down system.
5/16/15	5,325	N (85%) S(15%)	2,050	0	25	200	560	0.6	650	670	2,000	5,686	System startup.
5/18/15	5,370	N (85%) S(15%)	2,095	45	25	200	540	0.7	650	662	2,000	5,753	System operating.
5/20/15	5,416	N (85%) S(15%)	2,186	91	25	200	500	0.7	650	655	2,000	5,889	
5/22/15	5,468	N (85%) S(15%)	2,329	143	25	200	450	0.9	650	661	2,000	6,103	Shut down system.
5/30/15	5,468	N (85%) S(15%)	2,329	0	25	200	680	0.5	650	660	2,000	6,103	System startup.
6/2/15	5,540	N (85%) S(15%)	2,401	72	25	200	480	0.6	650	661	2,000	6,211	
6/5/15	5,613	N (85%) S(15%)	2,546	145	25	200	400	0.5	650	662	2,000	6,428	Shut down system.
6/20/15	5,613	N (85%) S(15%)	2,546	0	25	200	520	0.6	650	663	1,800	6,428	System startup.
6/23/15	5,685	N (85%) S(15%)	2,618	72	25	200	560	0.7	650	665	1,800	6,525	
6/27/15	5,776	N (85%) S(15%)	2,781	163	25	200	650	0.5	650	660	1,800	6,744	Shut down system.
7/15/15	5,776	N (85%) S(15%)	2,781	0	25	200	550	0.5	650	652	1,800	6,744	System startup.
7/21/15	5,920	N (85%) S(15%)	2,925	144	25	200	320	0.7	650	652	1,800	6,938	Shut down system.
8/13/15	5,920	N (85%) S(15%)	2,925	0	25	200	300	0.8	650	655	1,800	6,938	System startup.

APPENDIX A

System Operating Data

Former Chem Oil Refinery, Signal Hill, CA

Date	Hour Meter (hrs)	Extraction Array	System Operation								Mass Removed		Comments
			Cumul. (hrs)	Period (hrs)	Vac. (*in. WC*)	Well Flow (scfm)	Inf. PID (ppm)	Eff. PID (ppm)	PreHeat (^{o}F)	Exhaust (^{o}F)	TPHg ug/L	TPHg lbs.	
8/19/15	6,059	N (85%) S(15%)	3,064	139	25	200	190	1.3	650	652	1,800	7,125	
8/21/15	6,105	N (85%) S(15%)	3,249	185	25	200	96	1.4	650	650	1,800	7,374	Shut down system.
8/31/15	6,105	N (85%) S(15%)	3,249	0	25	200	220	1.4	650	650	238	7,374	System startup.
9/3/15	6,196	N (85%) S(15%)	3,340	91	25	200	150	0.9	650	650	238	7,390	
9/5/15	6,222	N (85%) S(15%)	3,457	117	25	200	140	1.1	650	650	238	7,411	End Period. Shut down system.

NOTE: Vapor Concentrations Interpolated Over Shown Time Range for Mass Removal Calculation.

APPENDIX A1

Monitoring Data

Former Chem Oil Refinery, Signal Hill, CA

Date	Extraction Array	Hours of Operation		System Operation			VOC (ppm)				Oxygen (%)				Carbon Dioxide (%)			
		Period	Total	Vac.	Well Flow	Inf. PID	North n	North s	South n	South s	North n	North s	South n	South s	North n	North s	South n	South s
10/23/2014	N (50%) S(50%)	0	0	25	200	800	1,280	760	320	260								
10/24/2014	N (75%) S(25%)	20	20	30	200	1,200	1,240	730	200	200	10.7	12.8	14.9	13.2	5.2	4.5	3.2	2.9
10/27/2014	N (75%) S(25%)	16	36	30	200	2,500	1,350	680	320	300	14.0	13.6	15.5	10.6	2.7	2.6	2.3	3.8
10/30/2014	N (85%) S(15%)	60	96	30	200	2,290	1,345	780	370	200	11.4	10.4	16.8	12.5	3.8	3.8	2.1	4.3
11/4/2014	N (85%) S(15%)	96	192	30	200	2,000	1,325	775	365		12.8	13.0	15.4		3.8	3.3	3.0	
11/11/2014	N (85%) S(15%)	191	383	30	200	1,200	1,300	650	325		15.3	15.1	15.8		3.2	3.4	3.2	
11/14/2014	N (85%) S(15%)	68	451	30	200	1,200	1,270	635	324		11.7	11.4	15.7		1.5	4.2	2.6	
12/23/2014	N (85%) S(15%)	0	451	25	200	1,000	1,300	635	324		14.1	13.1	15.7	15.7	4.0	4.0	2.8	2.8
12/30/2014	N (85%) S(15%)	166	617	25	200	1,200	1,400	700	350	350	10.2	9.8	13.5	13.5	>5.0	>5.0	4.5	4.5
1/6/2015	N (85%) S(15%)	0	617	25	200	1,000	1,200	550	250	250	15.3	15.3	17.5	17.5	3.7	3.8	1.7	1.7
1/12/2015	N (85%) S(15%)	139	756	25	200	1,200	1,400	700	150	150	11.1	10.1	13.7	13.7	>5	>5	4.1	4.1
1/20/2015	N (85%) S(15%)	0	756	25	200	900	1,400	700	150	150	15.7	15.5	18.8	18.8	4.0	4.0	1.7	1.7
1/26/2015	N (85%) S(15%)	145	901	25	200	1,100	1,400	600	100	100	15.6	15.5	18.6	18.6	4.0	4.0	2.0	2.0
2/3/2015	N (85%) S(15%)	0	901	25	200	800	1,400	700	75	75								
2/10/2015	N (85%) S(15%)	169	1,070	25	200	720	1,380	700	70	73	14.0	10.5	18.7	18.6	>5	>5	2.0	1.9
2/21/2015	N (85%) S(15%)	0	1,070	25	200	670	1,316	692	67	68	16.1	14.1	19.1	19.0	3.9	>5	1.6	1.7
2/28/2015	N (85%) S(15%)	166	1,236	25	200	685	1,280	680	65	65	15.8	14.0	19.2	19.1	4.5	>5	1.3	1.3
3/10/2015	N (85%) S(15%)	0	1,236	25	200	460	700	480	49	48	17.0	14.6	18.8	18.9	3.2	4.9	2.1	2.0
3/17/2015	N (85%) S(15%)	169	1,405	25	200	390												
3/23/2015	N (85%) S(15%)	0	1,405	25	200	415					16.1	14.5	18.9	18.9	3.0	4.7	1.7	1.8
3/28/2015	N (85%) S(15%)	70	1,475	25	200	580												
4/15/2015	N (85%) S(15%)	0	1,475	25	200	560	650	400	58	62	16.8	14.9	18.2	18.2	3.0	4.3	1.5	1.5
4/20/2015	N (85%) S(15%)	121	1,596	25	200	510	780	290	62	65	16.6	14.0	18.6	18.7	3.4	4.6	1.6	1.7
4/22/2015	N (85%) S(15%)	165	1,761	25	200	725					16.9	14.2	18.1	18.0	3.3	4.5	1.9	1.7
5/1/2015	N (85%) S(15%)	0	1,761	25	200	650	725	202	63	63	16.7	14.7	17.1		3.4	>5	3.0	
5/3/2015	N (85%) S(15%)	43	1,804	25	200	500												
5/5/2015	N (85%) S(15%)	98	1,902	25	200	650												
5/7/2015	N (85%) S(15%)	148	2,050	25	200	700	650	400	55		13.5	13.2	19.0		>5	>5	1.5	
5/16/2015	N (85%) S(15%)	0	2,050	25	200	560	700	100	43		16.1	14.6	19.2		4.0	5.0	1.4	
5/18/2015	N (85%) S(15%)	45	2,095	25	200	540	900	550	59		13.7	12.5	19.2		4.0	>5	1.3	
5/20/2015	N (85%) S(15%)	91	2,186	25	200	500												
5/22/2015	N (85%) S(15%)	143	2,329	25	200	450	850	475	44		12.3	12.1	19.3		>5	>5	1.3	
5/30/2015	N (85%) S(15%)	0	2,329	25	200	680	650	350	40		15.3	14.4	19.3		>5	>5	1.3	
6/2/2015	N (85%) S(15%)	72	2,401	25	200	480	700	380	35		14.3	12.9	19.1		4.0	>5	1.3	
6/5/2015	N (85%) S(15%)	145	2,546	25	200	400	727	330	51		13.0	12.4	19.0		>5	>5	1.3	
6/20/2015	N (85%) S(15%)	0	2,546	25	200	520	625	140	72		16.9	15.6	17.2		4.0	>5	3.0	
6/23/2015	N (85%) S(15%)	72	2,618	25	200	560	660	130	75		12.4	12.3	19.2		>5	>5	1.4	
6/27/2015	N (85%) S(15%)	163	2,781	25	200	650	1,520	700	75		11.6	13.3	19.8		>5	>5	0.9	
7/15/2015	N (85%) S(15%)	0	2,781	25	200	550	692	96	92		15.9	15.5	19.2		4.8	4.1	1.3	
7/21/2015	N (85%) S(15%)	144	2,925	25	200	320	430	92	40		17.1	13.4	19.1		4.0	>5	1.4	

APPENDIX A1

Monitoring Data

Former Chem Oil Refinery, Signal Hill, CA

Date	Extraction Array	Hours of Operation		System Operation			VOC (ppm)				Oxygen (%)				Carbon Dioxide (%)			
		Period	Total	Vac.	Well Flow	Inf. PID	North n	North s	South n	South s	North n	North s	South n	South s	North n	North s	South n	South s
8/13/2015	N (85%) S(15%)	0	2,925	25	200	300	180	26	24		17.1	15.1	19.8		3.0	4.6	0.8	
8/19/2015	N (85%) S(15%)	139	3,064	25	200	190	200	20	20		15.5	14.7	19.0		4.0	5.0	1.0	
8/21/2015	N (85%) S(15%)	185	3,249	25	200	96	190	202	12		12.4	11.7	19.8		5.0	5.0	0.8	
8/31/2015	N (85%) S(15%)	0	3,249	25	200	220	200	180	13		15.6	14.1	20.1		5.0	5.0	1.3	
9/3/2015	N (85%) S(15%)	91	3,340	25	200	150	200	170	18		15.0	14.9	17.0		5.0	5.0	0.4	
9/5/2015	N (85%) S(15%)	117	3,457	25	200	140	200	180	20		14.2	11.0	17.4		>5	>5	2.7	

APPENDIX B

APPENDIX B
System Operating Data
Former Chem Oil Refinery, Signal Hill, CA

Date	Extraction Array	System Operation							Mass Removed		Comments
		Period (days)	Total (days)	Vac. (*in. WC*)	Well Flow (scfm)	Inf. PID (ppm)	Int. PID (ppm)	Eff. PID (ppm)	TPHg ug/L	TPHg lbs.	
Conduct Interim Remedial Action with Cat-Ox Unit. Removed 7,411 lbs TPHg.											
10/1/2015	N (50%) S(50%)	0	0	25	110	188.0	0.0	0.0	883	7,411	Start Activated Carbon System
10/5/2015	N (50%) S(50%)	4	4	25	110	193.0	0.0	0.0	883	7,412	Vapor Sampling
10/6/2015	N (50%) S(50%)	1	5	25	110	193.0	0.0	0.0	883	7,414	
10/7/2015	N (50%) S(50%)	1	6	25	110	190.0	0.0	0.0	883	7,416	
10/8/2015	N (50%) S(50%)	1	7	25	110	188.0	0.0	0.0	883	7,419	
10/9/2015	N (50%) S(50%)	1	8	25	110	184.0	0.0	0.0	883	7,422	
10/12/2015	N (50%) S(50%)	3	11	25	110	185.0	8.1	0.0	883	7,426	
10/16/2015	N (50%) S(50%)	4	15	25	110	223.0	12.5	0.0	883	7,431	
10/19/2015	N (50%) S(50%)	3	18	25	110	228.0	13.2	1.1	883	7,438	
10/20/2015	N (50%) S(50%)	1	19	25	110	220.0	80.0	4.0	883	7,445	Shut down system pending carbon change
11/2/2015	N (50%) S(50%)	1	20	11	50	65.0	0.0	0.0	645	7,447	Change Carbon Restart System
11/3/2015	N (50%) S(50%)	1	21	11	50	60.0	0.0	0.0	645	7,450	Allow Dilution Air
11/10/2015	N (50%) S(50%)	7	28	11	50	62.0	0.0	0.0	645	7,453	Vapor Sampling
11/17/2015	N (50%) S(50%)	7	35	11	50	64.0	0.0	0.0	645	7,457	
11/23/2015	N (50%) S(50%)	6	41	11	50	57.5	0.0	0.0	645	7,462	
11/30/2015	N (50%) S(50%)	7	48	11	50	50.1	0.0	0.0	645	7,468	
12/7/2015	N (50%) S(50%)	7	55	11	50	40.7	0.0	0.0	645	7,475	
12/16/2015	N (50%) S(50%)	9	64	11	50	58.0	0.0	0.0	450	7,480	Vapor Sampling
12/22/2015	N (50%) S(50%)	6	70	11	50	64.5	0.0	0.0	450	7,486	
12/27/2015	N (67%) S(33%)	5	75	20	70	100.0	0.0	0.0	1,010	7,506	Shut dilution on North partially
1/7/2016	N (67%) S(33%)	11	86	20	70	92.0	0.0	0.0	1,010	7,529	
1/12/2016	N (67%) S(33%)	5	91	20	70	128.0	0.0	0.0	1,010	7,553	
1/16/2016	N (67%) S(33%)	4	95	20	70	137.0	0.0	0.0	1,010	7,578	
1/19/2016	N (67%) S(33%)	3	98	20	70	132.0	0.0	0.0	1,010	7,604	End Reporting Period, Vapor Sampling.

NOTE:

APPENDIX C

APPENDIX C

Monitoring Data

Former Chem Oil Refinery, Signal Hill, CA

Date	Extraction Array	Days of Operation		System Operation			VOC (ppm)				Oxygen (%)				Carbon Dioxide (%)			
		Total	Period	Vac.	Well Flow	Inf. PID	North n	North s	South n	South s	North n	North s	South n	South s	North n	North s	South n	South s
Conduct Interim Remedial Action with Cat-Ox Unit. Removed 7,411 lbs TPHg.																		
10/1/2015	N (50%) S(50%)	0	0	25	110	188	195	294										
10/5/2015	N (50%) S(50%)	4	4	25	110	193	215	321			18.7	18.5	18.9	19.1	>5	>5	2.1	2.2
10/6/2015	N (50%) S(50%)	5	1	25	110	193	224	209	88	89					>5	>5		
10/7/2015	N (50%) S(50%)	6	1	25	110	190	230	190							>5	>5	2.1	1.9
10/8/2015	N (50%) S(50%)	7	1	25	110	188	212	198							>5	>5		
10/9/2015	N (50%) S(50%)	8	1	25	110	184	200	205	90	91	19.3	19.0	19.7	19.8	>5	>5	2.1	1.9
10/12/2015	N (50%) S(50%)	11	3	25	110	185	165	204			19.2	19.1			>5	>5	2.1	1.9
10/16/2015	N (50%) S(50%)	15	4	25	110	223	173	245			19.2	19.1			>5	>5	2.1	1.9
10/19/2015	N (50%) S(50%)	18	3	25	110	228	200	252			18.9	18.8	19.7	19.8	>5	>5	2.1	1.9
10/20/2015	N (50%) S(50%)	19	1	25	110	220												
11/2/2015	N (50%) S(50%)	20	1	11	50	65												
11/3/2015	N (50%) S(50%)	21	1	11	50	60	105	186	55	48	18.7	18.5	19.7	19.6	>5	>5	1.5	1.4
11/10/2015	N (50%) S(50%)	28	7	11	50	62	100	140										
11/17/2015	N (50%) S(50%)	35	7	11	50	64	90	141			18.4	18.2	19.7	19.8	>5	>5	1.5	1.4
11/23/2015	N (50%) S(50%)	41	6	11	50	58	100	122	22	22	22.2	21.9	20.8	20.7	3.3	>5	1.5	1.4
11/30/2015	N (50%) S(50%)	48	7	11	50	50	110	120	20	20	15.8	13.2	17.8	17.8	2.2	2.9	1.5	1.5
12/7/2015	N (50%) S(50%)	55	7	11	50	41	102	107	26	26								
12/16/2015	N (50%) S(50%)	64	9	11	50	58	139	172	50	50	14.6	14.3	16.8	17.0	3.4	>5	1.4	1.4
12/22/2015	N (50%) S(50%)	70	6	11	50	65	110	162	68	68	14.0	14.2	17.7	17.9	3.6	>5	1.9	1.9
12/27/2015	N (67%) S(33%)	75	5	20	70	100	155	200	90	90	14.7	14.8	17.9	18.8	3.6	4.7	1.9	1.9
1/7/2016	N (67%) S(33%)	86	11	20	70	92	165	220	85	85	15.2	15.4	18.1	19.7	3.5	4.7	1.8	1.8
1/12/2016	N (67%) S(33%)	91	5	20	70	128	187	232	97	97	15.8	16.0	18.3	20.6	3.5	4.5	3.1	3.1
1/16/2016	N (67%) S(33%)	95	4	20	70	137	191	225	89	89	16.4	16.6	18.5	19.7	3.5	4.5	2.9	2.9

APPENDIX D

Alpha Scientific Corporation
Environmental Laboratories

10-08-2015

Mr. Ami Adini
Ami Adini & Associates, Inc.
100 N. Brand Blvd., #628
Glendale, CA 91203

Project: Not Specified
Project Site: Chem Oil
Sample Date: 10-05-2015
Lab Job No.: S510011

Dear Mr. Adini:

Enclosed please find the analytical report for the sample(s) received by Alpha Scientific Corporation on 10-05-2015 and analyzed by the following EPA methods:

TPH-Gasoline
EPA 8260B (BTEX & Oxygenates by GC/MS)

The sample(s) arrived in good conditions and with a chain of custody record attached.

Alpha Scientific Corporation is certified by CA DHS (Certificate Number 2633). Thank you for giving us the opportunity to serve you. Please feel free to call me at (562) 809-8880 if our laboratory can be of further service to you.

Sincerely,

Roger Wang, Ph. D.
Laboratory Director

Enclosures

This cover letter is an integral part of this analytical report.

10-08-2015

Client:	Ami Adini & Associates, Inc.	Lab JoNo.:	S510011
Project:	Not Specified		
Project Site:	Chem Oil	Date ampled:	10-05-2015
Matrix:	Vapor Sample in Tedlar Bag	Date eceived:	10-05-2015
Batch No. for TPH:	EMJ05-GV1	Date Analyzed:	10-05-2015
Batch No. for 8260B:	1005-VOEV1	Date Analyzed:	10-05-2015

EPA Method 8260B (BTEX, Oxygenates) & TPH-Gasoline
Reporting Units: **µg/L**

Lab ID	Method Blank	S510011-1	S510011-2				MDL	PQL
Sample ID		VES-EFF	VES-INF					
DF	1	1	10					
Benzene	ND	ND	ND				0.05	0.1
Toluene	ND	ND	ND				0.05	0.1
Ethylbenzene	ND	ND	ND				0.05	0.1
Total Xylenes	ND	ND	ND				0.1	0.2
MTBE	ND	ND	ND				0.1	0.2
ETBE	ND	ND	ND				0.1	0.2
DIPE	ND	ND	ND				0.1	0.2
TAME	ND	ND	ND				0.1	0.2
TBA	ND	ND	ND				1.0	2.0
TPH-Gasoline*	ND	ND	883				5.0	10

* TPH-G is petroleum hydrocarbons in carbon range C4-C12 analyzed by LUFT GC/MS Method;
MDL=Method Detection Limit; PQL=Practical Quantitation Limit;
DF=Dilution Factor; ND=Not Detected (below DF × MDL);
J=Trace value. Result is lower than PQL but higher than MDL;
d=Result is obtained from a higher dilution analysis.

10-08-2015

EPA 8260B & TPH-G
Batch QA/QC Report

Client:	Ami Adini & Associates, Inc.	Lab Job No.:	S510011
Project:	Not Specified		
Matrix:	Vapor Sample in Tedlar Bags	Lab Sample ID:	S510011-2
Batch No. for 8260B:	1005-VOEV1	Date Analyzed:	10-05-2015
Batch No. for TPHg:	EMJ05-GV1	Date Analyzed:	10-05-2015

I. Sample/Sample Dup Report
Reporting Units: µL/L (ppm/V)

Analyte	MB	Sample Conc.	Sample Duplicate	% RPD	%RPD Accept. Limit
MTBE	ND	ND	ND	0	30
Benzene	ND	ND	ND	0	30
Toluene	ND	ND	ND	0	30
Ethyl Benzene	ND	ND	ND	0	30
Total Xylenes	ND	ND	ND	0	30
TPH-G	ND	883	876	0.8	30

II. LCS Result
Unit: ppb

Analyte	LCS Value	True Value	Rec.%	Accept. Limit
1,1-Dichloroethene	17.8	20.0	89.0	80-120
Benzene	17.9	20.0	89.5	80-120
Trichloro-ethene	20.2	20.0	101.0	80-120
Toluene	18.7	20.0	93.5	80-120
Chlorobenzene	20.8	20.0	104.0	80-120
TPH-g	1,020	1000	102.0	80-120

ND: Not Detected.

ALPHA SCIENTIFIC CORPORATION

CHAIN OF CUSTODY RECORD

Lab Job Number 5510011

Client: AMI ADINI			
Address 100 N BRAND Blvd, #609 GLENDALE CA 91203			
Report Attention AMI ADINI	**Phone** (818)824-8102	**Fax**	**Sampled by** DAN LOOKS
Project Name/No.	**Project Site** CHEM OIL		

Client Sample ID	Lab Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserv	No.,type* & size of container	TPH-Gasoline	TPH-Diesel	8260B (BTEX, Oxygenates)	8260B (VOCs)	8270C (SVOCs)	CAM Metals	8082 (PCBs)	Remark
VES-INF	5510011-2	10/5/15	10:30	AIR	—	TEDLAR	X		X					SYSTEM
VES-EFF	-1	"	10:25	"	"	"	X		X					START UP

T.A.T. Requested: ☐ 8 hrs ☐ 24 hrs ☐ 48 hrs ☐ 3 days ☒ Normal

Sample Condition: ☐ Chilled ☒ Intact ☐ Sample seals

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	AMI	10/5/15	12:00	[signature]	ASC	10-5-15	12:00
Relinquished by	Company	Date	Time	Received by	Company	Date	Time

Container types: M=Metal Tube, A=Air Bag, P=Plastic bottle, G=Glass bottle, V=VOA vial

Alpha Scientific Corporation
16760 Gridley Road
Cerritos, CA 90703

Email: ascorp@verizon.net
Tel: (562) 809-8880
Fax: (562) 809-8801

Note: Samples are discarded 30 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client's expense.
Distribution: WHITE with report, PINK to courier.

A & R Laboratories

Formerly Microbac Southern California

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FDA#	2030513
LA City#	10261
ELAP#'s	2789
	2790
	2122

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CASE NARRATIVE

Authorized Signature Name / Title (print)	Ken Zheng, President
Signature / Date	Ken Zheng, President 11/13/2015 9:46:13
Laboratory Job No. (Certificate of Analysis No.)	1511-00081
Project Name / No.	CHEM OIL
Dates Sampled (from/to)	11/10/15 To 11/10/15
Dates Received (from/to)	11/10/15 To 11/10/15
Dates Reported (from/to)	11/13/15 To 11/13/2015
Chains of Custody Received	Yes

Comments:

Subcontracting

Organic Analyses

No analyses sub-contracted

Sample Condition(s)

All samples intact

Positive Results (Organic Compounds)

Sample	Analyte	Result	Qual	Units	RL	Result	Qual	Units	RL
VES-INFLUENT	C4-C12	645		µg/L	50				

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CERTIFICATE OF ANALYSIS

1511-00081

AMI ADINI & ASSOCIATES
AMI ADINI
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	11/13/15
Date Received	11/10/15
Invoice No.	74631
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 VES-EFFLUENT					Date & Time Sampled:		11/10/15 @ 9:45	
Sample Matrix: Soil Vapor								
[TPH Gasoline by GCMS]								
C4-C12	<50		µg/L	CA LUFT	5	50	11/11/15	AR
[VOCs by GCMS]								
Acetone	<50		µg/L	EPA 8260B	5	50	11/11/15	AR
t-Amyl Methyl Ether (TAME)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Benzene	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
Bromobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Bromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Bromodichloromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Bromoform	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Bromomethane	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
t-Butanol (TBA)	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
2-Butanone (MEK)	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
n-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
sec-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
tert-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Carbon Disulfide	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
Carbon Tetrachloride	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
Chlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Chloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Chloroform	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Chloromethane	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
2-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
4-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Dibromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dibromoethane (EDB)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dibromo-3-Chloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Dibromomethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,3-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,4-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR

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CERTIFICATE OF ANALYSIS

1511-00081

AMI ADINI & ASSOCIATES
AMI ADINI
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	11/13/15
Date Received	11/10/15
Invoice No.	74631
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 001 VES-EFFLUENT — Date & Time Sampled: 11/10/15 @ 9:45
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Dichlorodifluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
cis-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
trans-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,3-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
2,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
cis-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
trans-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Diisopropyl Ether (DiPE)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Ethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Ethyl-t-Butyl Ether (EtBE)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Hexachlorobutadiene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
2-Hexanone	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
Isopropylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
4-Isopropyltoluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Methylene Chloride	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
4-Methyl-2-Pentanone (MIBK)	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
Methyl-t-butyl Ether (MtBE)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Naphthalene	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
n-Propylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Styrene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,1,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,2,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Tetrachloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Toluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2,3-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR

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LA City#	10261
ELAP#'s	2789
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CERTIFICATE OF ANALYSIS

1511-00081

AMI ADINI & ASSOCIATES
AMI ADINI
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	11/13/15
Date Received	11/10/15
Invoice No.	74631
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 VES-EFFLUENT					Date & Time Sampled:		11/10/15 @ 9:45	
Sample Matrix: Soil Vapor								
.....continued								
1,2,4-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,1-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,2-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Trichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2,3-Trichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Trichlorofluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Trichlorotrifluoroethane	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
1,2,4-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,3,5-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Vinyl Chloride	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
m,p-Xylenes	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
o-Xylene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
[VOC Vapor Sampling Tracer]								
Isopropanol (IPA)	<50		µg/L	EPA 8260B	5	50	11/11/15	AR
[VOC Surrogates]								
Dibromofluoromethane	92		%REC	EPA 8260B		70-130	11/11/15	AR
Toluene-D8	94		%REC	EPA 8260B		70-130	11/11/15	AR
Bromofluorobenzene	93		%REC	EPA 8260B		70-130	11/11/15	AR
Sample: 002 VES-INFLUENT					Date & Time Sampled:		11/10/15 @ 10:00	
Sample Matrix: Soil Vapor								
[TPH Gasoline by GCMS]								
C4-C12	645		µg/L	CA LUFT	5	50	11/11/15	AR
[VOCs by GCMS]								
Acetone	<50		µg/L	EPA 8260B	5	50	11/11/15	AR
t-Amyl Methyl Ether (TAME)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Benzene	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
Bromobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Bromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Bromodichloromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Bromoform	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR

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1511-00081

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AMI ADINI
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	11/13/15
Date Received	11/10/15
Invoice No.	74631
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 002 VES-INFLUENT — Date & Time Sampled: 11/10/15 @ 10:00
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Bromomethane	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
t-Butanol (TBA)	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
2-Butanone (MEK)	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
n-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
sec-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
tert-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Carbon Disulfide	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
Carbon Tetrachloride	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
Chlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Chloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Chloroform	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Chloromethane	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
2-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
4-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Dibromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dibromoethane (EDB)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dibromo-3-Chloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Dibromomethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,3-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,4-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Dichlorodifluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
cis-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
trans-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,3-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
2,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR

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100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	11/13/15
Date Received	11/10/15
Invoice No.	74631
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 002 VES-INFLUENT — Date & Time Sampled: 11/10/15 @ 10:00
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
1,1-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
cis-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
trans-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Diisopropyl Ether (DiPE)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Ethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Ethyl-t-Butyl Ether (EtBE)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Hexachlorobutadiene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
2-Hexanone	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
Isopropylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
4-Isopropyltoluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Methylene Chloride	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
4-Methyl-2-Pentanone (MIBK)	<5		µg/L	EPA 8260B	5	5	11/11/15	AR
Methyl-t-butyl Ether (MtBE)	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Naphthalene	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
n-Propylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Styrene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,1,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,2,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Tetrachloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Toluene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2,3-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2,4-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,1-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,1,2-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Trichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,2,3-Trichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Trichlorofluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
Trichlorotrifluoroethane	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
1,2,4-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
1,3,5-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR

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100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	11/13/15
Date Received	11/10/15
Invoice No.	74631
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 002 VES-INFLUENT					Date & Time Sampled:		11/10/15 @ 10:00	
Sample Matrix: Soil Vapor								
.....continued								
Vinyl Chloride	<0.3		µg/L	EPA 8260B	5	0.3	11/11/15	AR
m,p-Xylenes	<1		µg/L	EPA 8260B	5	1	11/11/15	AR
o-Xylene	<0.5		µg/L	EPA 8260B	5	0.5	11/11/15	AR
[VOC Vapor Sampling Tracer]								
Isopropanol (IPA)	<50		µg/L	EPA 8260B	5	50	11/11/15	AR
[VOC Surrogates]								
Dibromofluoromethane	92		%REC	EPA 8260B		70-130	11/11/15	AR
Toluene-D8	95		%REC	EPA 8260B		70-130	11/11/15	AR
Bromofluorobenzene	97		%REC	EPA 8260B		70-130	11/11/15	AR

Respectfully Submitted:

Ken Zheng

Ken Zheng - Lab Director

QUALIFIERS

B = Detected in the associated Method Blank at a concentration above the routine RL.
B1 = BOD dilution water is over specifications . The reported result may be biased high.
D = Surrogate recoveries are not calculated due to sample dilution.
E = Estimated value; Value exceeds calibration level of instrument.
H = Analyte was prepared and/or analyzed outside of the analytical method holding time
I = Matrix Interference.
J = Analyte concentration detected between RL and MDL.
Q = One or more quality control criteria did not meet specifications. See Comments for further explanation.
S = Customer provided specification limit exceeded.

ABBREVIATIONS

DF = Dilution Factor
RL = Reporting Limit, Adjusted by DF
MDL = Method Detection Limit, Adjusted by DF
Qual = Qualifier
Tech = Technician

As regulatory limits change frequently, A & R Laboratories advises the recipient of this report to confirm such limits with the appropriate federal, state, or local authorities before acting in reliance on the regulatory limits provided.

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

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QUALITY CONTROL DATA REPORT

AMI ADINI & ASSOCIATES
AMI ADINI
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

1511-00081

Project: CHEM OIL

Date Reported	**11/13/2015**
Date Received	**11/10/2015**
Date Sampled	**11/10/2015**
Invoice No.	**74631**
Customer #	**G073**
Customer P.O.	

Method # CA LUFT
QC Reference # 50936 Date Analyzed: 11/11/2015 Technician: AR
Samples 001 002

Results

	LCS %REC	LCS %DUP	LCS %RPD
C4-C12	89	92	3

Control Ranges

LCS %REC	LCS %RPD
70 - 130	0 - 25

Method # EPA 8260B
QC Reference # 50937 Date Analyzed: 11/11/2015 Technician: AR
Samples 001 002

Results

	LCS %REC	LCS %DUP	LCS %RPD	BLKSRR %REC
1,1-Dichloroethene	93	98	5	
Benzene	91	92	1	
Bromofluorobenzene				95
Chlorobenzene	92	95	3	
Dibromofluorometha				85
Toluene	95	93	2	
Toluene-D8				89
Trichloroethene	98	92	6	

Control Ranges

LCS %REC	LCS %RPD	BLKSRR %REC
70 - 130	0 - 25	
70 - 130	0 - 25	
		70 - 130
70 - 130	0 - 25	
		70 - 130
70 - 130	0 - 25	
		70 - 130
70 - 130	0 - 25	

No method blank results were above reporting limit

Respectfully Submitted: Ken Zheng

Ken Zheng - President

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

ARL

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CHAIN OF CUSTODY

A & R Work Order #: 1511-0008 | Page 1 of 1

Client Name: AMIADINI + ASSOCIATES
E-mail:
Address: 100 N BRAND BLVD SUIT 600 GLENDALE
Report Attention: AMI ADINI | Phone # 818 824 8102 | Fax: #
Sampled By: N H
Project No./ Name: CHEM OIL
Project Site: 2020 WALNUT SIGNAL HILL

☐ Chilled ☒ Intact ☐ Seal

Analyses Requested

Turn Around Time Requested: ☐ Rush 8 12 24 48 Hours ☒ Normal

Lab # (Lab use)	Client Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserve	No., type* & size of container	EPA8260B (VOCs & Oxygenates)	EPA8260B(BTEX & Oxygenates)	LUFT / 8015 (Gasoline)	LUFT / 8015 (Diesel)	EPA8081A (Organochlorine Pesticides)	EPA 8082 (PCBs)	EPA 8015M (Carbon Chain C4-C40)	EPA 6010B/7000 (CAM 17 Metals)	Micro: Plate Cnt., Coliform, E-Coli	Remarks
1	VES-EFFLUENT	11.10.15	9:45	VAPOR		1	X		X							MONTHLY EFF AIR SAMPLE OUT OF CARBON CANS
2	VES-INFWENT	11-10-15	10:00	VAPOR		1	X		X							

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Neil Hurwit		11-10-15	14:30		AR	11/10	14:30
	AR	11/10	15:30	Cynthia Rojas	AR	11/10	15:30

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.

Matrix Code: DW=Drinking Water; GW=Ground Water; WW=Waste Water; SD=Solid Waste; SL=Sludge; SS=Soil/Sediment; AR=Air; PP=Pure Product

Preservative Code: IC=Ice; HC=HCl; HN=HNO_3; SH=NaOH; ST=$Na_2S_2O_3$; HS=H_2SO_4

*Sample Container Types: T=Tedlar Air Bag; G=Glass Container; ST= Steel Tube; B= Brass Tube; P=Plastic Bottle; V=VOA Vial; E= EnCore

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CASE NARRATIVE

Authorized Signature Name / Title (print)	Ken Zheng, President
Signature / Date	Ken Zheng, President 12/24/2015 10:19:03
Laboratory Job No. (Certificate of Analysis No.)	1512-00144
Project Name / No.	CHEM OIL
Dates Sampled (from/to)	12/16/15 To 12/16/15
Dates Received (from/to)	12/16/15 To 12/16/15
Dates Reported (from/to)	12/24/15 To 12/24/2015
Chains of Custody Received	Yes

Comments:

Subcontracting

Organic Analyses

No analyses sub-contracted

Sample Condition(s)

All samples intact

Positive Results (Organic Compounds)

Sample	Analyte	Result	Qual	Units	RL	Result	Qual	Units	RL
VES-INFLUENT	C4-C12	450		µg/L	50				

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CERTIFICATE OF ANALYSIS

1512-00144

AMI ADINI + ASSOCIATES
DAN LOUKS
16950 AVENIDA DE SANTA YNEZ
PACIFIC PALISADES, CA 90272

Date Reported	12/24/15
Date Received	12/16/15
Invoice No.	74944
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 VES-EFFLUENT					Date & Time Sampled:		12/16/15 @ 10:15	
Sample Matrix: Soil Vapor								
[TPH Gasoline by GCMS]								
C4-C12	<50		µg/L	CA LUFT	5	50	12/17/15	AR
[VOCs by GCMS]								
Acetone	<50		µg/L	EPA 8260B	5	50	12/17/15	KZ
t-Amyl Methyl Ether (TAME)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Benzene	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
Bromobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Bromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Bromodichloromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Bromoform	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Bromomethane	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
t-Butanol (TBA)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
2-Butanone (MEK)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
n-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
sec-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
tert-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Carbon Disulfide	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
Carbon Tetrachloride	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
Chlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Chloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Chloroform	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Chloromethane	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
2-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
4-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Dibromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dibromoethane (EDB)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dibromo-3-Chloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Dibromomethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,3-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,4-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ

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CERTIFICATE OF ANALYSIS

1512-00144

AMI ADINI + ASSOCIATES
DAN LOUKS
16950 AVENIDA DE SANTA YNEZ
PACIFIC PALISADES, CA 90272

Date Reported	12/24/15
Date Received	12/16/15
Invoice No.	74944
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 001 VES-EFFLUENT — Date & Time Sampled: 12/16/15 @ 10:15
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Dichlorodifluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
cis-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
trans-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,3-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
2,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
cis-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
trans-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Diisopropyl Ether (DiPE)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Ethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Ethyl-t-Butyl Ether (EtBE)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Hexachlorobutadiene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
2-Hexanone	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
Isopropylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
4-Isopropyltoluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Methylene Chloride	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
4-Methyl-2-Pentanone (MIBK)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
Methyl-t-butyl Ether (MtBE)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Naphthalene	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
n-Propylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Styrene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,1,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,2,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Tetrachloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Toluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2,3-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ

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CERTIFICATE OF ANALYSIS

1512-00144

AMI ADINI + ASSOCIATES
DAN LOUKS
16950 AVENIDA DE SANTA YNEZ
PACIFIC PALISADES, CA 90272

Date Reported	12/24/15
Date Received	12/16/15
Invoice No.	74944
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 VES-EFFLUENT					Date & Time Sampled:		12/16/15 @ 10:15	
Sample Matrix: Soil Vapor								
.....continued								
1,2,4-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,1-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,2-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Trichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2,3-Trichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Trichlorofluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Trichlorotrifluoroethane	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
1,2,4-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,3,5-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Vinyl Chloride	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
m,p-Xylenes	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
o-Xylene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
[VOC Vapor Sampling Tracer]								
Isopropanol (IPA)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
[VOC Surrogates]								
Dibromofluoromethane	105		%REC	EPA 8260B		70-130	12/17/15	KZ
Toluene-D8	96		%REC	EPA 8260B		70-130	12/17/15	KZ
Bromofluorobenzene	91		%REC	EPA 8260B		70-130	12/17/15	KZ
Sample: 002 VES-INFLUENT					Date & Time Sampled:		12/16/15 @ 10:30	
Sample Matrix: Soil Vapor								
[TPH Gasoline by GCMS]								
C4-C12	450		µg/L	CA LUFT	5	50	12/17/15	AR
[VOCs by GCMS]								
Acetone	<50		µg/L	EPA 8260B	5	50	12/17/15	KZ
t-Amyl Methyl Ether (TAME)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Benzene	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
Bromobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Bromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Bromodichloromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Bromoform	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ

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CERTIFICATE OF ANALYSIS

1512-00144

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DAN LOUKS
16950 AVENIDA DE SANTA YNEZ
PACIFIC PALISADES, CA 90272

Date Reported	12/24/15
Date Received	12/16/15
Invoice No.	74944
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 002 VES-INFLUENT — Date & Time Sampled: 12/16/15 @ 10:30
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Bromomethane	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
t-Butanol (TBA)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
2-Butanone (MEK)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
n-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
sec-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
tert-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Carbon Disulfide	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
Carbon Tetrachloride	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
Chlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Chloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Chloroform	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Chloromethane	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
2-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
4-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Dibromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dibromoethane (EDB)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dibromo-3-Chloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Dibromomethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,3-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,4-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Dichlorodifluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
cis-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
trans-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,3-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
2,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ

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Date Reported	12/24/15
Date Received	12/16/15
Invoice No.	74944
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 002 VES-INFLUENT — Date & Time Sampled: 12/16/15 @ 10:30
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
1,1-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
cis-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
trans-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Diisopropyl Ether (DiPE)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Ethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Ethyl-t-Butyl Ether (EtBE)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Hexachlorobutadiene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
2-Hexanone	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
Isopropylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
4-Isopropyltoluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Methylene Chloride	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
4-Methyl-2-Pentanone (MIBK)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
Methyl-t-butyl Ether (MtBE)	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Naphthalene	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
n-Propylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Styrene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,1,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,2,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Tetrachloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Toluene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2,3-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2,4-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,1-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,1,2-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Trichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,2,3-Trichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Trichlorofluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
Trichlorotrifluoroethane	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
1,2,4-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
1,3,5-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ

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Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 002 VES-INFLUENT					Date & Time Sampled:		12/16/15 @ 10:30	
Sample Matrix: Soil Vapor								
.....continued								
Vinyl Chloride	<0.3		µg/L	EPA 8260B	5	0.3	12/17/15	KZ
m,p-Xylenes	<1		µg/L	EPA 8260B	5	1	12/17/15	KZ
o-Xylene	<0.5		µg/L	EPA 8260B	5	0.5	12/17/15	KZ
[VOC Vapor Sampling Tracer]								
Isopropanol (IPA)	<5		µg/L	EPA 8260B	5	5	12/17/15	KZ
[VOC Surrogates]								
Dibromofluoromethane	97		%REC	EPA 8260B		70-130	12/17/15	KZ
Toluene-D8	95		%REC	EPA 8260B		70-130	12/17/15	KZ
Bromofluorobenzene	87		%REC	EPA 8260B		70-130	12/17/15	KZ

Respectfully Submitted: Ken Zheng

Ken Zheng - Lab Director

QUALIFIERS

B = Detected in the associated Method Blank at a concentration above the routine RL.
B1 = BOD dilution water is over specifications . The reported result may be biased high.
D = Surrogate recoveries are not calculated due to sample dilution.
E = Estimated value; Value exceeds calibration level of instrument.
H = Analyte was prepared and/or analyzed outside of the analytical method holding time
I = Matrix Interference.
J = Analyte concentration detected between RL and MDL.
Q = One or more quality control criteria did not meet specifications. See Comments for further explanation.
S = Customer provided specification limit exceeded.

ABBREVIATIONS

DF = Dilution Factor
RL = Reporting Limit, Adjusted by DF
MDL = Method Detection Limit, Adjusted by DF
Qual = Qualifier
Tech = Technician

As regulatory limits change frequently, A & R Laboratories advises the recipient of this report to confirm such limits with the appropriate federal, state, or local authorities before acting in reliance on the regulatory limits provided.

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

A & R Laboratories

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QUALITY CONTROL DATA REPORT

AMI ADINI + ASSOCIATES
PACIFIC PALISADES, CA 90272

1512-00144

Date Reported	**12/24/2015**
Date Received	**12/16/2015**
Date Sampled	**12/16/2015**
Invoice No.	**74944**
Customer #	**G073**
Customer P.O.	

Project: CHEM OIL

Method # CA LUFT
QC Reference # 51843 Date Analyzed: 12/17/2015 Technician: AR
Samples 001 002

Results	LCS %REC	LCS %DUP	LCS %RPD	Control Ranges LCS %REC	Control Ranges LCS %RPD
C4-C12	95	90	5	70 - 130	0 - 25

Method # EPA 8260B
QC Reference # 51826 Date Analyzed: 12/17/2015 Technician: KZ
Samples 001 002

Results	LCS %REC	LCS %DUP	LCS %RPD	Control Ranges LCS %REC	Control Ranges LCS %RPD
1,1-Dichloroethene	93	94	1	70 - 130	0 - 25
Benzene	101	98	3	70 - 130	0 - 25
Chlorobenzene	92	96	4	70 - 130	0 - 25
Toluene	90	97	7	70 - 130	0 - 25
Trichloroethene	89	95	6	70 - 130	0 - 25

No method blank results were above reporting limit

Respectfully Submitted: Ken Zheng

Ken Zheng - President

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

ARL

A & R Laboratories
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E-mail: office@arlaboratories.com

CHAIN OF CUSTODY

A & R Work Order #: 1512-00144 Page 1 of 1

Client Name: AMI ADINI + ASSOCIATES
E-mail:
Address: 100 GRAND AVE #600 GLENDALE
Report Attention: AMI ADINI
Phone # / Fax #: 818 824 8102
Sampled By: NM
Project No./ Name: CHEM OIL
Project Site: 2020 WALNUT SIGNAL HILL

☐ Chilled ☒ Intact ☐ Seal

Turn Around Time Requested: ☐ Rush 8 12 24 48 Hours ☒ Normal

Lab # (Lab use)	Client Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserve	No., type* & size of container	EPA8260B (VOCs & Oxygenates)	EPA8260B(BTEX & Oxygenates)	LUFT / 8015 (Gasoline)	LUFT / 8015 (Diesel)	EPA8081A (Organochlorine Pesticides)	EPA 8082 (PCBs)	EPA 8015M (Carbon Chain C4-C40)	EPA 6010B/7000 (CAM 17 Metals)	Micro: Plate Cnt., Coliform, E-Coli	Remarks
1	VES-EFFLUENT	12-16-15	10:35	VAPOR		1	X		X							MONTHLY EFF AIR OUT OF CARBON CAN
2	VES-INFLUENT	12-16-15	10:30	VAPOR		1	X		X							CONSISTS OF ALL WELLS OPEN

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Neil Mullen		12-16-15	15:00		AR	12/16	15:01
	AR	12/16	16:00	Cynthia Rojas	AR	12/16	16:00

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.

Matrix Code: DW=Drinking Water; GW=Ground Water; WW=Waste Water; SD=Solid Waste; SL=Sludge; SS=Soil/Sediment; AR=Air; PP=Pure Product

Preservative Code: IC=Ice; HC=HCl; HN=HNO_3; SH=NaOH; ST=$Na_2S_2O_3$; HS=H_2SO_4

Sample Container Types: T=Tedlar Air Bag; G=Glass Container; ST= Steel Tube; B= Brass Tube; P=Plastic Bottle; V=VOA Vial; E= EnCore

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CASE NARRATIVE

Authorized Signature Name / Title (print)	Ken Zheng, President
Signature / Date	Ken Zheng, President 01/25/2016 9:13:38
Laboratory Job No. (Certificate of Analysis No.)	1601-00154
Project Name / No.	CHEM OIL
Dates Sampled (from/to)	01/19/16 To 01/19/16
Dates Received (from/to)	01/19/16 To 01/19/16
Dates Reported (from/to)	01/25/16 To 1/25/2016
Chains of Custody Received	Yes

Comments:

Subcontracting

Organic Analyses

No analyses sub-contracted

Sample Condition(s)

All samples intact

Positive Results (Organic Compounds)

Sample	Analyte	Result	Qual	Units	RL	Result	Qual	Units	RL
VES-INFLUENT	C4-C12	1010		µg/L	50				

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CERTIFICATE OF ANALYSIS

1601-00154

AMI ADINI & ASSOCIATES
DAN LOUKS
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	01/25/16
Date Received	01/19/16
Invoice No.	75187
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 VES-EFFLUENT					Date & Time Sampled:		01/19/16 @ 11:15	
Sample Matrix: Soil Vapor								
[TPH Gasoline by GCMS]								
C4-C12	<50		µg/L	CA LUFT	5	50	01/20/16	AR
[VOCs by GCMS]								
Acetone	<50		µg/L	EPA 8260B	5	50	01/20/16	AR
t-Amyl Methyl Ether (TAME)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Benzene	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
Bromobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Bromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Bromodichloromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Bromoform	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Bromomethane	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
t-Butanol (TBA)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
2-Butanone (MEK)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
n-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
sec-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
tert-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Carbon Disulfide	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
Carbon Tetrachloride	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
Chlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Chloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Chloroform	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Chloromethane	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
2-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
4-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Dibromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dibromoethane (EDB)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dibromo-3-Chloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Dibromomethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,3-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,4-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR

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CERTIFICATE OF ANALYSIS

1601-00154

AMI ADINI & ASSOCIATES
DAN LOUKS
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	01/25/16
Date Received	01/19/16
Invoice No.	75187
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 001 VES-EFFLUENT — Date & Time Sampled: 01/19/16 @ 11:15
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Dichlorodifluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
cis-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
trans-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,3-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
2,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
cis-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
trans-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Diisopropyl Ether (DiPE)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Ethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Ethyl-t-Butyl Ether (EtBE)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Hexachlorobutadiene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
2-Hexanone	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
Isopropylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
4-Isopropyltoluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Methylene Chloride	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
4-Methyl-2-Pentanone (MIBK)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
Methyl-t-butyl Ether (MtBE)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Naphthalene	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
n-Propylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Styrene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,1,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,2,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Tetrachloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Toluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2,3-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR

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CERTIFICATE OF ANALYSIS

1601-00154

AMI ADINI & ASSOCIATES
DAN LOUKS
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	01/25/16
Date Received	01/19/16
Invoice No.	75187
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 VES-EFFLUENT					Date & Time Sampled:		01/19/16 @ 11:15	
Sample Matrix: Soil Vapor								
.....continued								
1,2,4-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,1-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,2-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Trichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2,3-Trichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Trichlorofluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Trichlorotrifluoroethane	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
1,2,4-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,3,5-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Vinyl Chloride	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
m,p-Xylenes	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
o-Xylene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
[VOC Vapor Sampling Tracer]								
Isopropanol (IPA)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
[VOC Surrogates]								
Dibromofluoromethane	125		%REC	EPA 8260B		70-130	01/20/16	AR
Toluene-D8	108		%REC	EPA 8260B		70-130	01/20/16	AR
Bromofluorobenzene	87		%REC	EPA 8260B		70-130	01/20/16	AR
Sample: 002 VES-INFLUENT					Date & Time Sampled:		01/19/16 @ 11:30	
Sample Matrix: Soil Vapor								
[TPH Gasoline by GCMS]								
C4-C12	1010		µg/L	CA LUFT	5	50	01/20/16	AR
[VOCs by GCMS]								
Acetone	<50		µg/L	EPA 8260B	5	50	01/20/16	AR
t-Amyl Methyl Ether (TAME)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Benzene	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
Bromobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Bromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Bromodichloromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Bromoform	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR

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CERTIFICATE OF ANALYSIS

1601-00154

AMI ADINI & ASSOCIATES
DAN LOUKS
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	01/25/16
Date Received	01/19/16
Invoice No.	75187
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 002 VES-INFLUENT — Date & Time Sampled: 01/19/16 @ 11:30
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Bromomethane	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
t-Butanol (TBA)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
2-Butanone (MEK)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
n-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
sec-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
tert-Butylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Carbon Disulfide	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
Carbon Tetrachloride	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
Chlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Chloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Chloroform	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Chloromethane	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
2-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
4-Chlorotoluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Dibromochloromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dibromoethane (EDB)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dibromo-3-Chloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Dibromomethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,3-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,4-Dichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Dichlorodifluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
cis-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
trans-1,2-Dichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,3-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
2,2-Dichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR

A & R Laboratories

Formerly Microbac Southern California

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FDA#	2030513
LA City#	10261
ELAP#'s	2789
	2790
	2122

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FOOD · COSMETICS · WATER · SOIL · SOIL VAPOR · WASTES

CERTIFICATE OF ANALYSIS

1601-00154

AMI ADINI & ASSOCIATES
DAN LOUKS
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	01/25/16
Date Received	01/19/16
Invoice No.	75187
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Sample: 002 VES-INFLUENT — Date & Time Sampled: 01/19/16 @ 11:30
Sample Matrix: Soil Vapor
.....continued

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
1,1-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
cis-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
trans-1,3-Dichloropropene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Diisopropyl Ether (DiPE)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Ethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Ethyl-t-Butyl Ether (EtBE)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Hexachlorobutadiene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
2-Hexanone	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
Isopropylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
4-Isopropyltoluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Methylene Chloride	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
4-Methyl-2-Pentanone (MIBK)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
Methyl-t-butyl Ether (MtBE)	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Naphthalene	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
n-Propylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Styrene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,1,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,2,2-Tetrachloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Tetrachloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Toluene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2,3-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2,4-Trichlorobenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,1-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,1,2-Trichloroethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Trichloroethene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,2,3-Trichloropropane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Trichlorofluoromethane	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
Trichlorotrifluoroethane	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
1,2,4-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
1,3,5-Trimethylbenzene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR

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CERTIFICATE OF ANALYSIS

1601-00154

AMI ADINI & ASSOCIATES
DAN LOUKS
100 N. BRAND BLVD., #600
GLENDALE, CA 91203

Date Reported	01/25/16
Date Received	01/19/16
Invoice No.	75187
Cust #	G073
Permit Number	
Customer P.O.	

Project: CHEM OIL

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 002 VES-INFLUENT					Date & Time Sampled:		01/19/16 @ 11:30	
Sample Matrix: Soil Vapor								
.....continued								
Vinyl Chloride	<0.3		µg/L	EPA 8260B	5	0.3	01/20/16	AR
m,p-Xylenes	<1		µg/L	EPA 8260B	5	1	01/20/16	AR
o-Xylene	<0.5		µg/L	EPA 8260B	5	0.5	01/20/16	AR
[VOC Vapor Sampling Tracer]								
Isopropanol (IPA)	<5		µg/L	EPA 8260B	5	5	01/20/16	AR
[VOC Surrogates]								
Dibromofluoromethane	125		%REC	EPA 8260B		70-130	01/20/16	AR
Toluene-D8	109		%REC	EPA 8260B		70-130	01/20/16	AR
Bromofluorobenzene	99		%REC	EPA 8260B		70-130	01/20/16	AR

Respectfully Submitted: Ken Zheng

Ken Zheng - Lab Director

QUALIFIERS

B = Detected in the associated Method Blank at a concentration above the routine RL.
B1 = BOD dilution water is over specifications . The reported result may be biased high.
D = Surrogate recoveries are not calculated due to sample dilution.
E = Estimated value; Value exceeds calibration level of instrument.
H = Analyte was prepared and/or analyzed outside of the analytical method holding time
I = Matrix Interference.
J = Analyte concentration detected between RL and MDL.
Q = One or more quality control criteria did not meet specifications. See Comments for further explanation.
S = Customer provided specification limit exceeded.

ABBREVIATIONS

DF = Dilution Factor
RL = Reporting Limit, Adjusted by DF
MDL = Method Detection Limit, Adjusted by DF
Qual = Qualifier
Tech = Technician

As regulatory limits change frequently, A & R Laboratories advises the recipient of this report to confirm such limits with the appropriate federal, state, or local authorities before acting in reliance on the regulatory limits provided.

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

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FDA#	2030513
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QUALITY CONTROL DATA REPORT

AMI ADINI & ASSOCIATES
PACIFIC PALISADES, CA 90272

1601-00154

Date Reported	**01/25/2016**
Date Received	**01/19/2016**
Date Sampled	**01/19/2016**
Invoice No.	**75187**
Customer #	**G073**
Customer P.O.	

Project: CHEM OIL

Method # CA LUFT
QC Reference # 52630 Date Analyzed: 1/20/2016 Technician: AR
Samples 001 002

Results	LCS %REC	LCS %DUP	LCS %RPD	Control Ranges LCS %REC	Control Ranges LCS %RPD
C4-C12	98	93	5	70 - 130	0 - 25

Method # EPA 8260B
QC Reference # 52629 Date Analyzed: 1/20/2016 Technician: AR
Samples 001 002

Results	LCS %REC	LCS %DUP	LCS %RPD	Control Ranges LCS %REC	Control Ranges LCS %RPD
1,1-Dichloroethene	90	92	2	70 - 130	0 - 25
Benzene	92	92	0	70 - 130	0 - 25
Chlorobenzene	91	93	2	70 - 130	0 - 25
Toluene	93	89	4	70 - 130	0 - 25
Trichloroethene	85	88	4	70 - 130	0 - 25

No method blank results were above reporting limit

Respectfully Submitted: Ken Zheng

Ken Zheng - President

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

ARL

A & R Laboratories
1650 S. Grove Ave., Ste C, Ontario, CA 91761
Tel: 951-779-0310 / 909-781-6335 Fax: 951-779-0344
E-mail: office@arlaboratories.com

CHAIN OF CUSTODY

A & R Work Order #: 1601-00154

Client Name: AMI ADINI + ASSOCIATES
E-mail: gsaengineering@verizon.net
Address: 100 N BRAND BLVD #600 GLENDALE
Report Attention: DAN L. | Phone # / Fax #: 818 824 8102 | Sampled By: NH
Project No./ Name: CHEM OIL | Project Site: 2020 WALNUT AVE SIGNAL HILL

☐ Chilled ☒ Intact ☐ Seal

Turn Around Time Requested: ☐ Rush 8 12 24 48 Hours ☒ Normal

Lab # (Lab use)	Client Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserve	No., type* & size of container	EPA8260B (VOCs & Oxygenates)	EPA8260B(BTEX & Oxygenates)	LUFT / 8015 (Gasoline)	LUFT / 8015 (Diesel)	EPA8081A (Organochlorine Pesticides)	EPA 8082 (PCBs)	EPA 8015M (Carbon Chain C4-C40)	EPA 6010B/7000 (CAM 17 Metals)	Micro: Plate Cnt., Coliform, E-Coli	Remarks
1	VES - EFFLUENT	1-19-16	11:15	VAPOR		1	X		X							monthly Eff Air Sample out of CARBON CANS
2	VES - INFLUENT	1-19-16	11:30	VAPOR		1	X		X							

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
Neil Hullet		1-19-16	14:00				
Relinquished By	Company	Date	Time	Received By	Company	Date	Time
					ARL	1/19/16	14:00

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.

Matrix Code: DW=Drinking Water; GW=Ground Water; WW=Waste Water; SD=Solid Waste; SL=Sludge; SO=Soil/Sediment; AR=Air; PP=Pure Product

Preservative Code: IC=Ice; HC=HCl; HN=HNO_3; SH=NaOH; ST=$Na_2S_2O_3$; HS=H_2SO_4

Sample Container Types: T=Tedlar Air Bag; G=Glass Container; ST= Steel Tube; B= Brass Tube; P=Plastic Bottle; V=VOA Vial; E= EnCore

APPENDIX F

Air Injection Field Log

Air Injection Field Log

Name:	*Project*	
Chemoil.p01	*Address: 2020 Walnut Ave, Signal Hill, CA*	*Date:3/10/14*

Applied Pressure from Compressor 1 (points AI1 through AI50): 9 psi	Applied Pressure from Compressor 2 (points AI51 through AI92): 10 psi

Observation Data

Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)
AI1	12	AI22	10	AI43	10	AI51	12	AI72	13
AI2	12	AI23	13	AI44	10	AI52	13	AI73	12
AI3	15	AI24	10	AI45	10	AI53	12	AI74	14
AI4	18	AI25	15	AI46	13	AI54	13	AI75	14
AI5	13	AI26	10	AI47	13	AI55	12	AI76	12
AI6	8	AI27	12	AI48	15	AI56	12	AI77	14
AI7	10	AI28	15	AI49	14	AI57	13	AI78	14
AI8	12	AI29	12	AI50	12	AI58	13	AI79	12
AI9	12	AI30	14			AI59	15	AI80	10
AI10	10	AI31	10			AI60	14	AI81	10
AI11	10	AI32	15			AI61	14	AI82	13
AI12	15	AI33	10			AI62	12	AI83	14
AI13	10	AI34	10			AI63	12	AI84	14
AI14	15	AI35	9			AI64	12	AI85	14
AI15	14	AI36	12			AI65	14	AI86	10
AI16	13	AI37	12			AI66	12	AI87	12
AI17	10	AI38	10			AI67	12	AI88	13
AI18	6	AI39	12			AI68	14	AI89	10
AI19	3	AI40	14			AI69	13	AI90	10
AI20	10	AI41	12			AI70	13	AI91	12
AI21	10	AI42	12			AI71	14	AI92	12

Notes:

Initials: _____

Air Injection Field Log

Name:	*Project*	
Chemoil.p01	*Address: 2020 Walnut Ave, Signal Hill, CA*	*3/10/2016*

Applied Pressure from Compressor 1 (points AI1 through AI50):	Applied Pressure from Compressor 2 (points AI51 through AI92):

Observation Data

Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)	Well ID	Flow Rate (CFH)
AI1	40	AI22	15	AI43	Na	AI51	0	AI72	15
AI2	40	AI23	15	AI44	Na	AI52	0	AI73	0
AI3	0	AI24	5	AI45	Na	AI53	0	AI74	15
AI4	5	AI25	15	AI46	Na	AI54	0	AI75	Na
AI5	0	AI26	10	AI47	Na	AI55	0	AI76	Na
AI6	0	AI27	15	AI48	Na	AI56	40	AI77	Na
AI7	5	AI28	10	AI49	Na	AI57	40	AI78	Na
AI8	20	AI29	15	AI50	Na	AI58	40	AI79	Na
AI9	15	AI30	15			AI59	20	AI80	Na
AI10	40	AI31	15			AI60	10	AI81	10
AI11	15	AI32	20			AI61	20	AI82	15
AI12	0	AI33	15			AI62	15	AI83	0
AI13	5	AI34	0			AI63	40	AI84	40
AI14	0	AI35	5			AI64	40	AI85	10
AI15	0	AI36	15			AI65	40	AI86	40
AI16	15	AI37	20			AI66	40	AI87	10
AI17	0	AI38	0			AI67	10	AI88	10
AI18	5	AI39	15			AI68	5	AI89	10
AI19	10	AI40	0			AI69	10	AI90	15
AI20	0	AI41	Na			AI70	10	AI91	10
AI21	5	AI42	Na			AI71	15	AI92	10

Notes: *Inj Well tubing from 51-55 filled with water, ball cannot be observed*

Na = plastic body of the regulator weathered, ball position cannot be observed

0 Flow = Ball stuck at 0; Flow 40 = Ball stuck at 40

Initials: _____ D. Louks

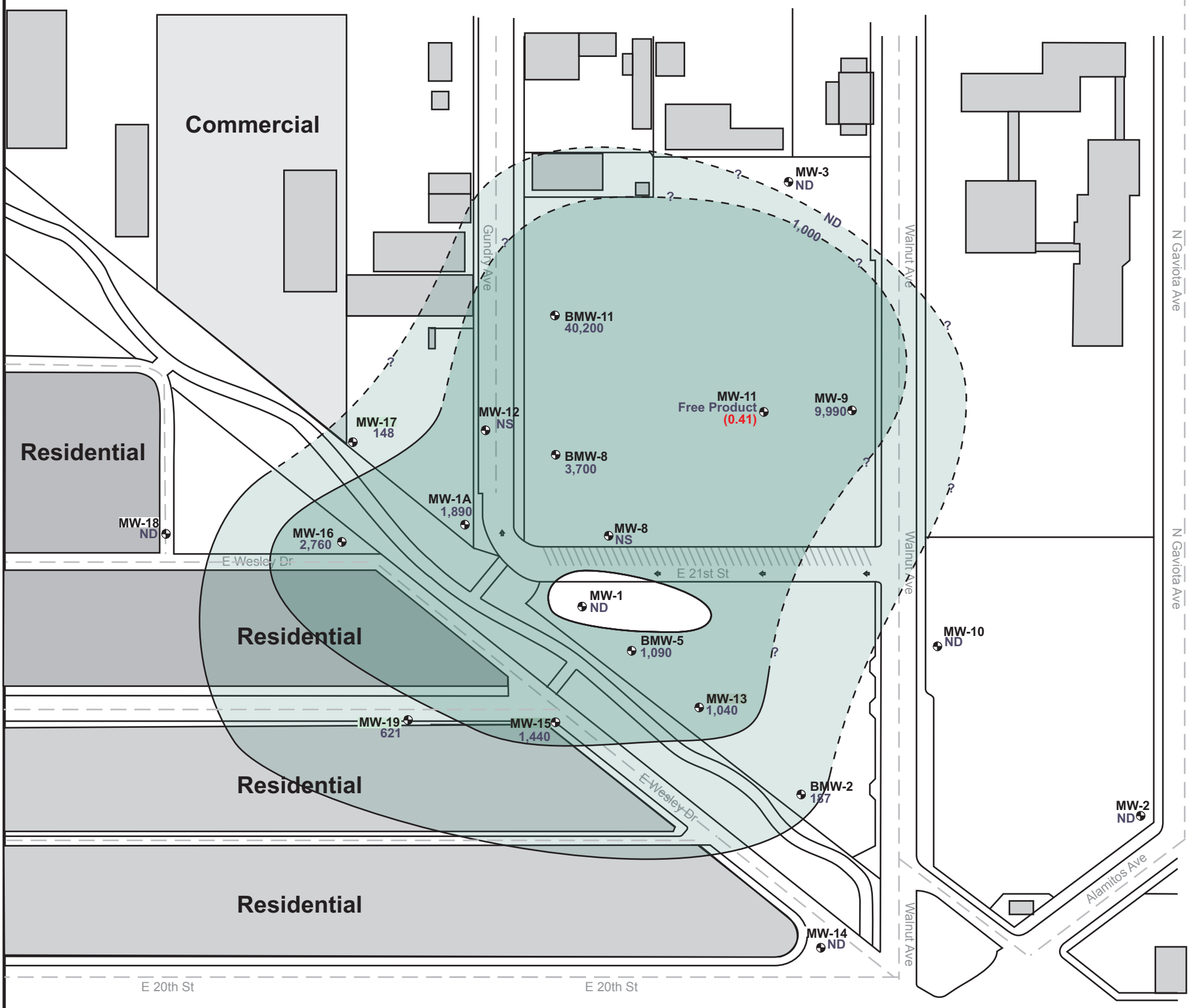
APPENDIX G

Summary of Historical Groundwater Monitoring Data

Appendix G - Part 1

Groundwater Monitoring Data:

1) Iso-concentration Maps TPH-g & TPH-d for 2Q13 to 4Q15
2) Historical Analytical Data for 3Q12 to 4Q15
3) Graphs of Contaminant concentration over Time for 3Q12 to 4Q15



N

0 200 400

Approximate Scale in Feet

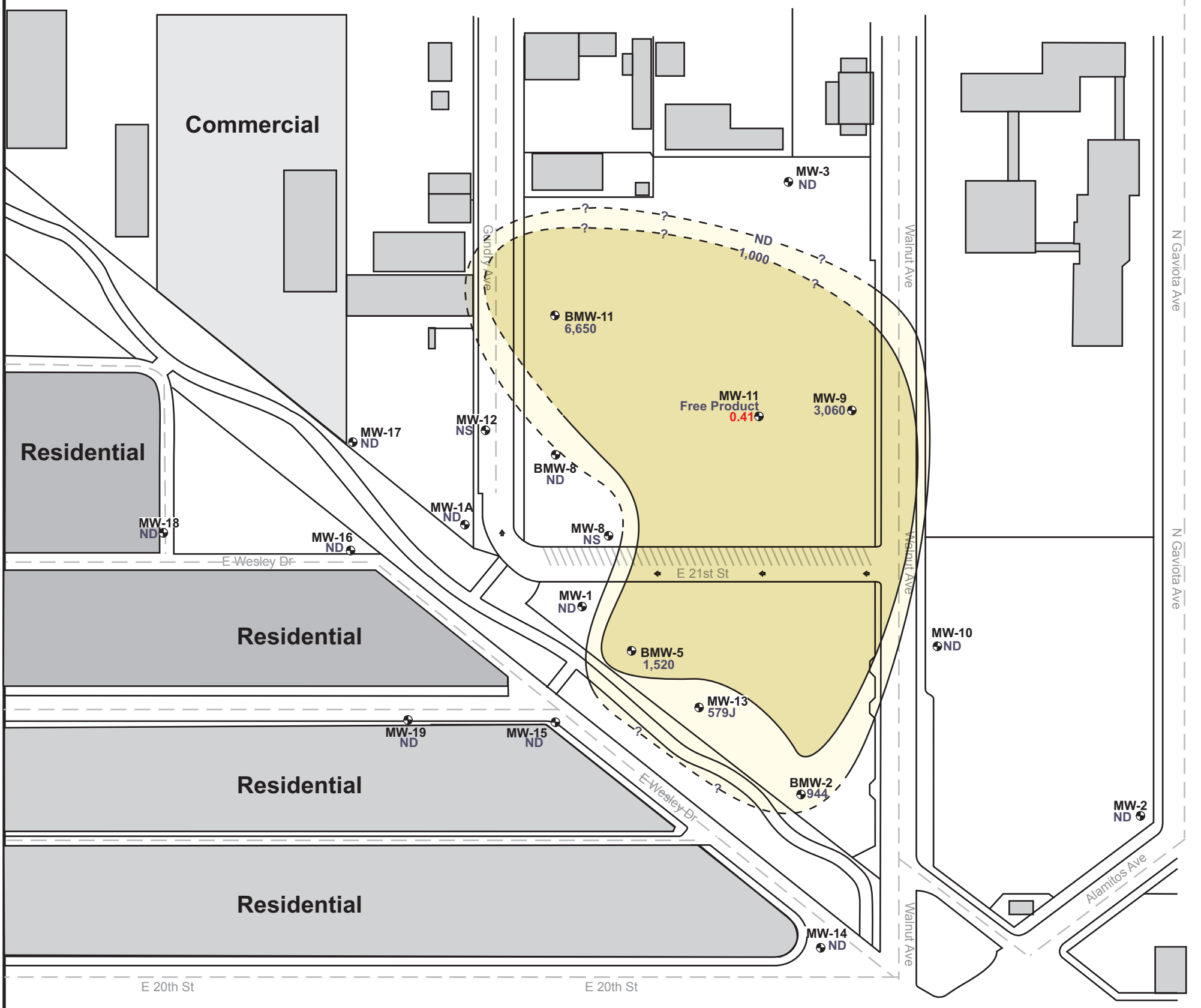
Legend

BMW-11	Groundwater monitoring well (AA&A, 2013)
MW-19	Groundwater monitoring well (1987-2011)
———	TPHg isoconcentration contour
– – – –	Apparent TPHg isoconcentration contour
40,200	TPHg concentration in micrograms per liter (µg/L)
ND	Not detected at or above laboratory detection limits
NS	Not sampled

Figure 4: Concentration of TPHg in Groundwater 4Q13
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM	December 2014	ChemOil.p01

Ami Adini & Associates, Inc.



N

0 200 400

Approximate Scale in Feet

Legend

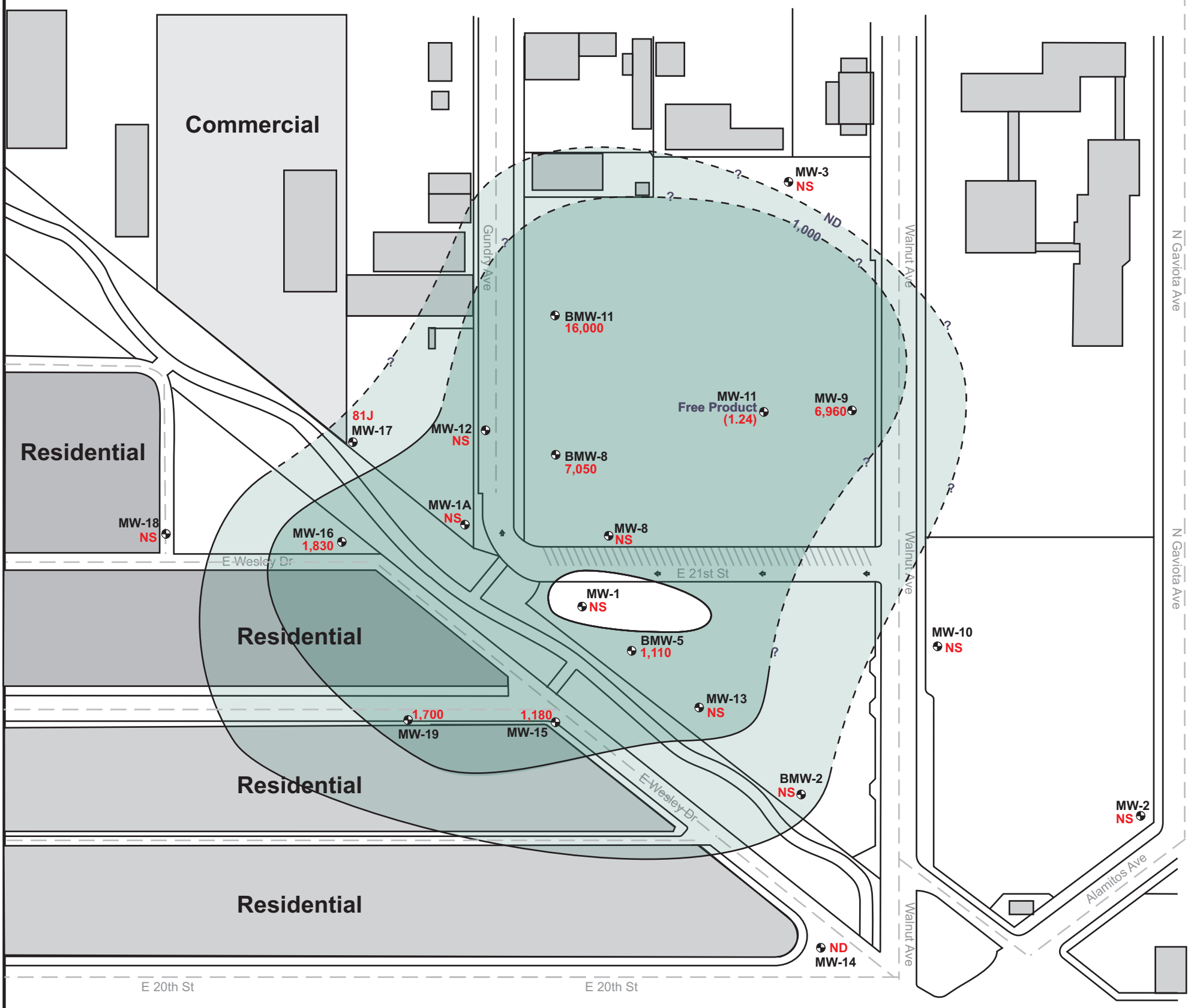
BMW-11	Groundwater monitoring well (AA&A, 2013)
MW-19	Groundwater monitoring well (1987-2013)
———	TPHd isoconcentration contour
– – –	Barrier monitoring well
6,650	TPHd concentration in micrograms per liter (µg/L)
ND	Not detected at or above laboratory detection limits
NS	Not sampled

Figure 5: Concentrations of TPHd in Groundwater 4Q13

Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM	December 2014	ChemOil.p01

Ami Adini & Associates, Inc.



Legend

BMW-11 Groundwater monitoring well (AA&A, 2013)

MW-19 Groundwater monitoring well (1987-2011)

TPHg isoconcentration contour

Apparent TPHg isoconcentration contour

16,000 TPHg concentration in micrograms per liter (µg/L)

BMW-11 Groundwater monitoring well (AA&A, 2013)

ND Not detected at or above laboratory detection limits

NS Not sampled

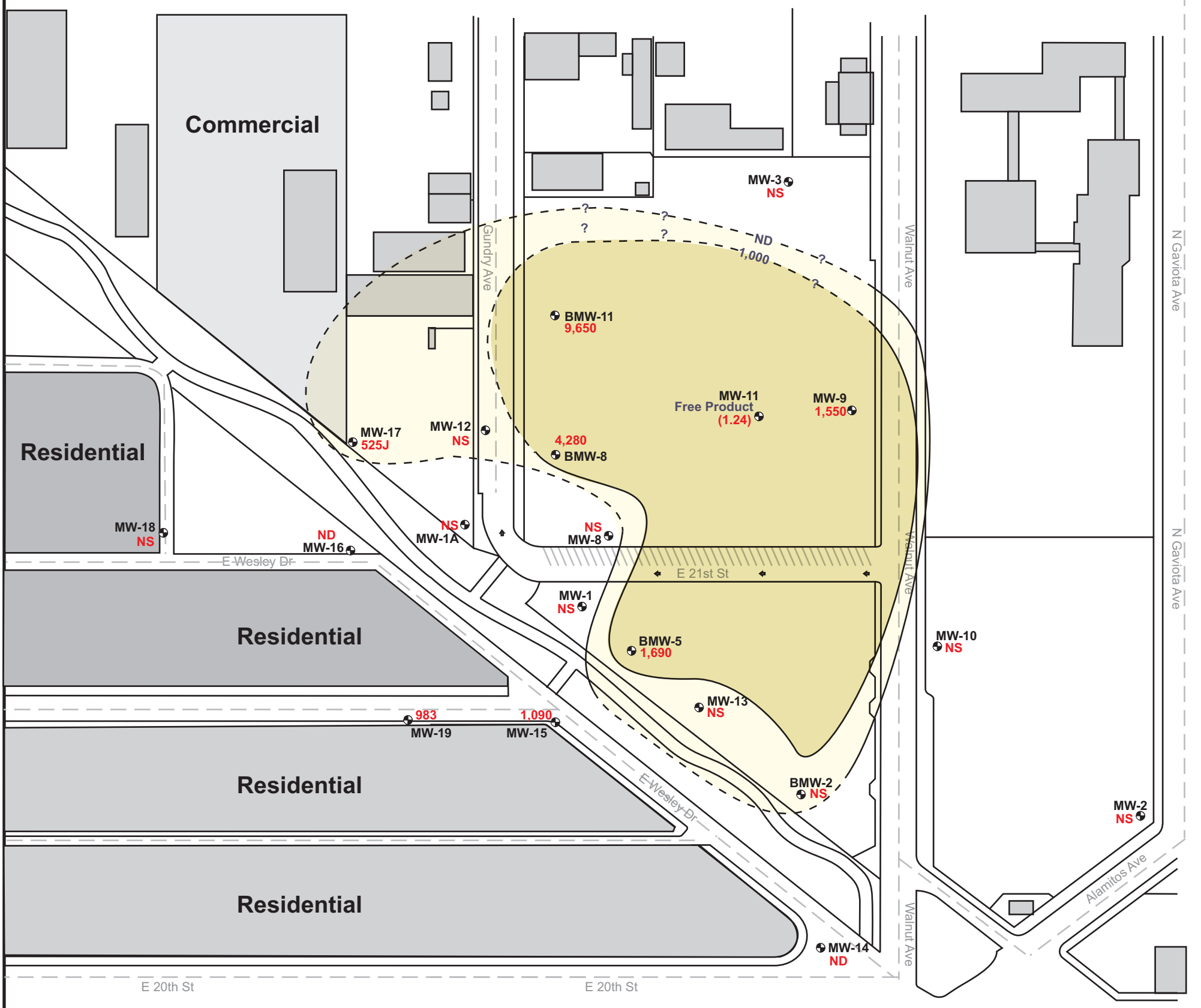
1.24 Free product thickness in feet

J Estimated value between the method detection limit and practical quantitation limit

Figure 4: TPHg Concentrations in Groundwater 2Q14
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM/AP	July 2014	ChemOil.p01

Ami Adini & Associates, Inc.



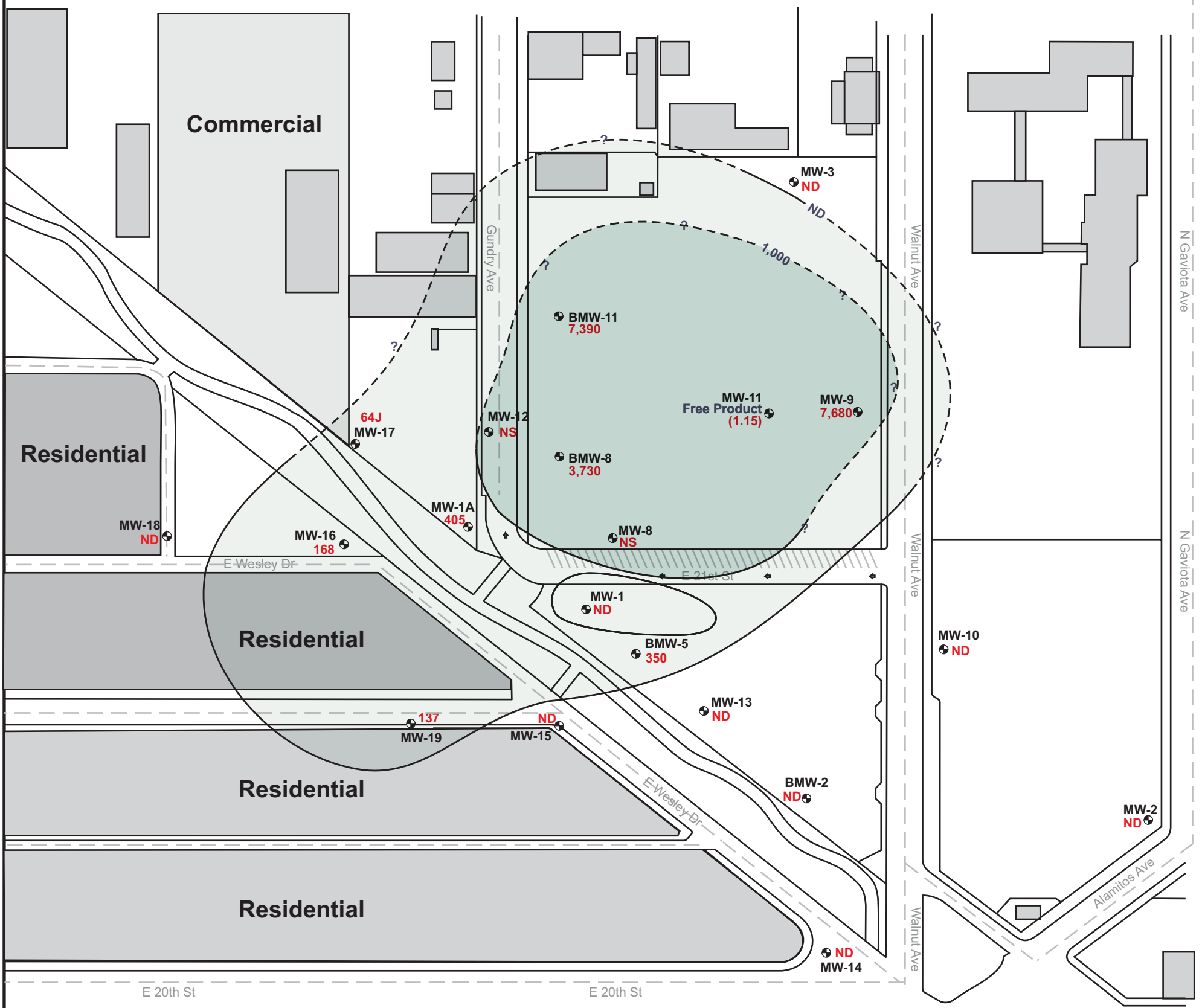
Legend

- BMW-11 — Groundwater monitoring well (AA&A, 2013)
- MW-19 — Groundwater monitoring well (1987-2011)
- ——— TPHd isoconcentration contour
- – – – – Apparent TPHd isoconcentration contour
- 9,650 — TPHd concentration in micrograms per liter (µg/L)
- ND — Not detected at or above laboratory detection limits
- NS — Not sampled
- 1.24 — Free product thickness in feet
- J — Estimated value between the method detection limit and practical quantitation limit

Figure 6: TPHd Concentrations in Groundwater 2Q14
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM/AP	July 2014	ChemOil.p01

Ami Adini & Associates, Inc.



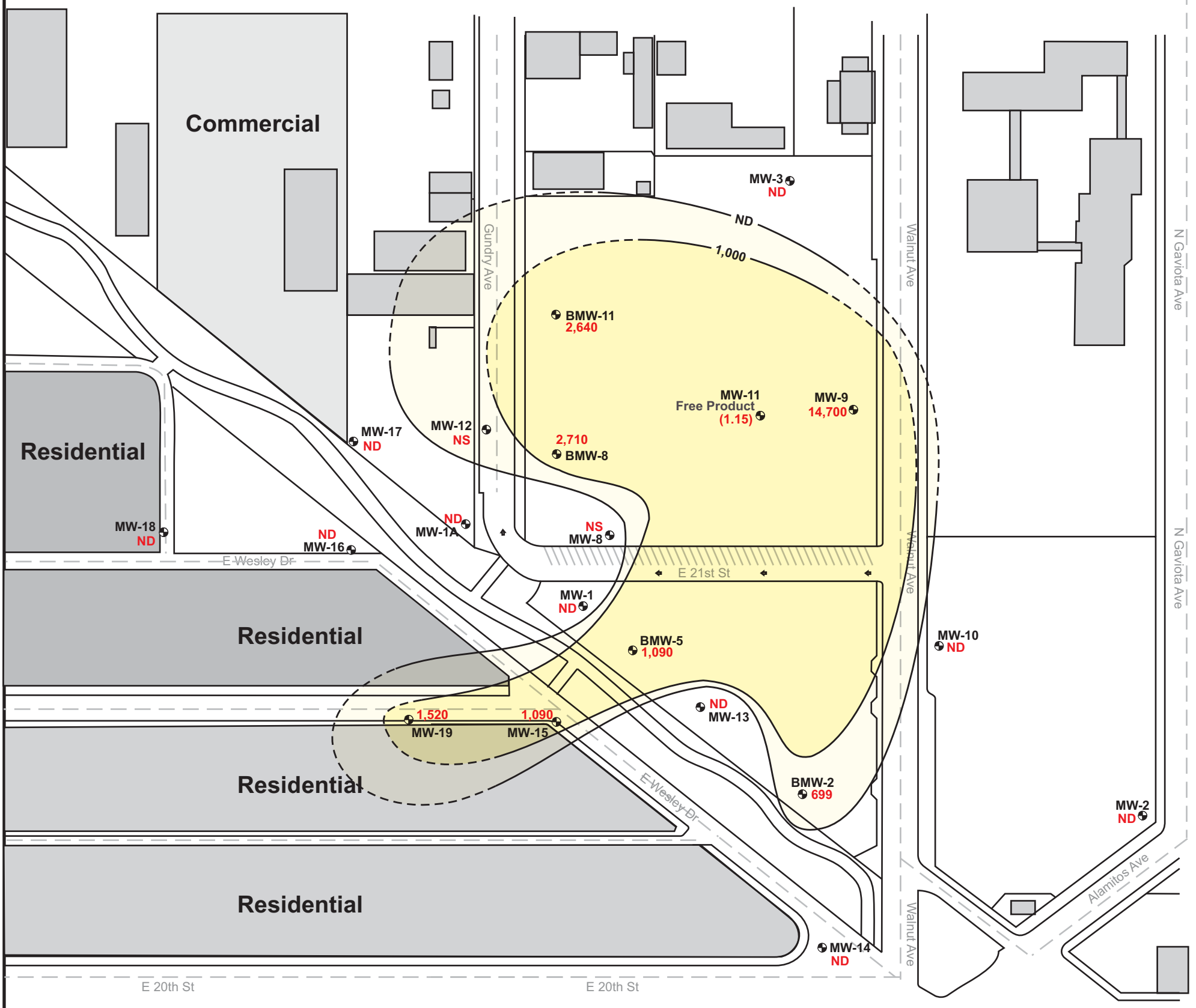
Legend

- BMW-11 — Groundwater monitoring well (AA&A, 2013)
- MW-19 — Groundwater monitoring well (1987-2011)
- ——— TPHg isoconcentration contour
- – – – – Apparent TPHg isoconcentration contour
- 7,390 — TPHg concentration in micrograms per liter (µg/L)
- ND — Not detected at or above laboratory detection limits
- NS — Not sampled
- 1.15 — Free product thickness in feet
- J — Estimated value between the method detection limit and practical quantitation limit

Figure 4: TPHg Concentrations in Groundwater 4Q14
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM/AP	January 2015	ChemOil.p01

Ami Adini & Associates, Inc.



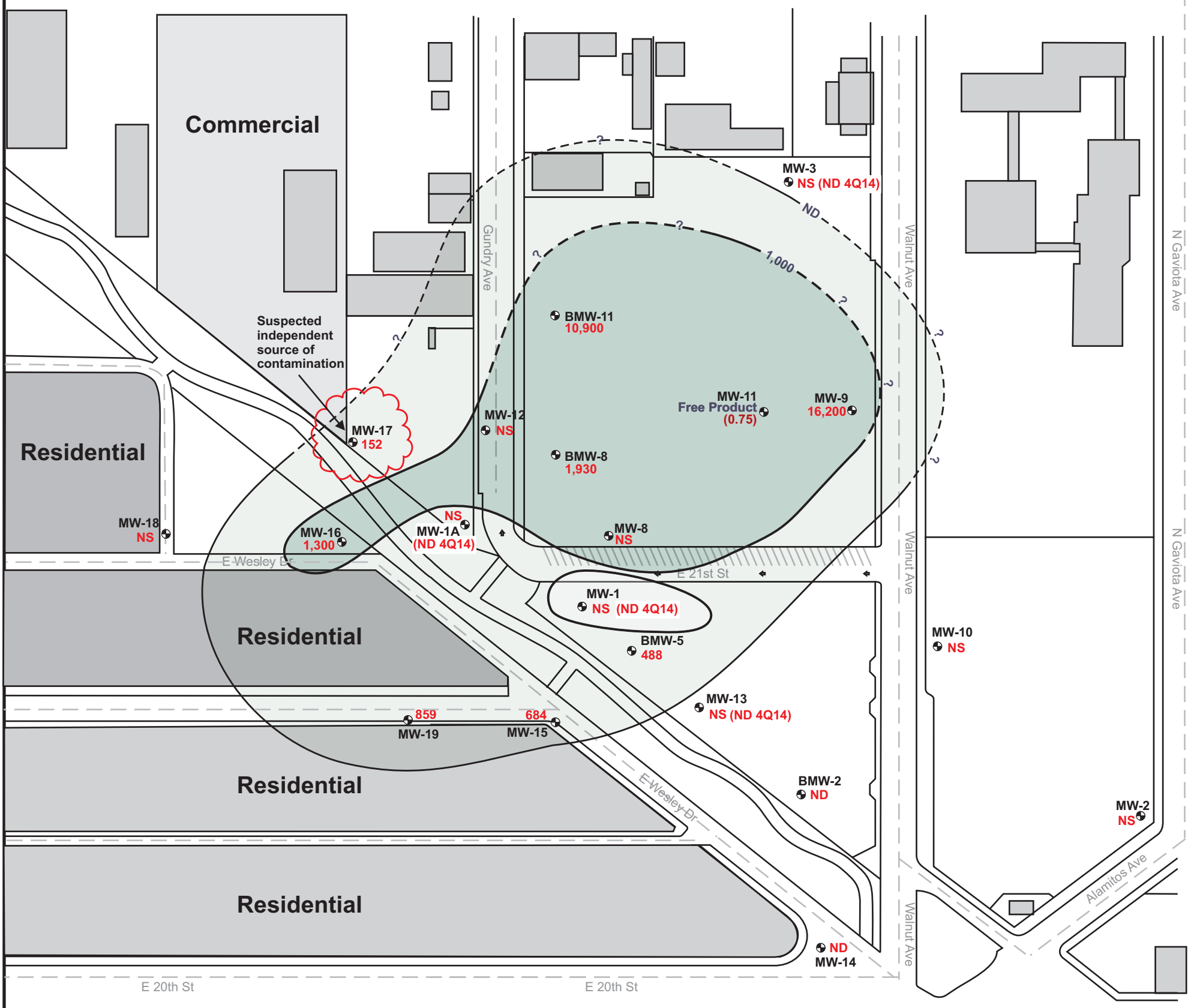
Legend

- BMW-11 — Groundwater monitoring well (AA&A, 2013)
- MW-19 — Groundwater monitoring well (1987-2011)
- ——— TPHd isoconcentration contour
- – – – – Apparent TPHd isoconcentration contour
- 14,700 — TPHd concentration in micrograms per liter (µg/L)
- ND — Not detected at or above laboratory detection limits
- NS — Not sampled
- 1.15 — Free product thickness in feet

Figure 5: TPHd Concentrations in Groundwater 4Q14
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM/AP	January 2015	ChemOil.p01

Ami Adini & Associates, Inc.



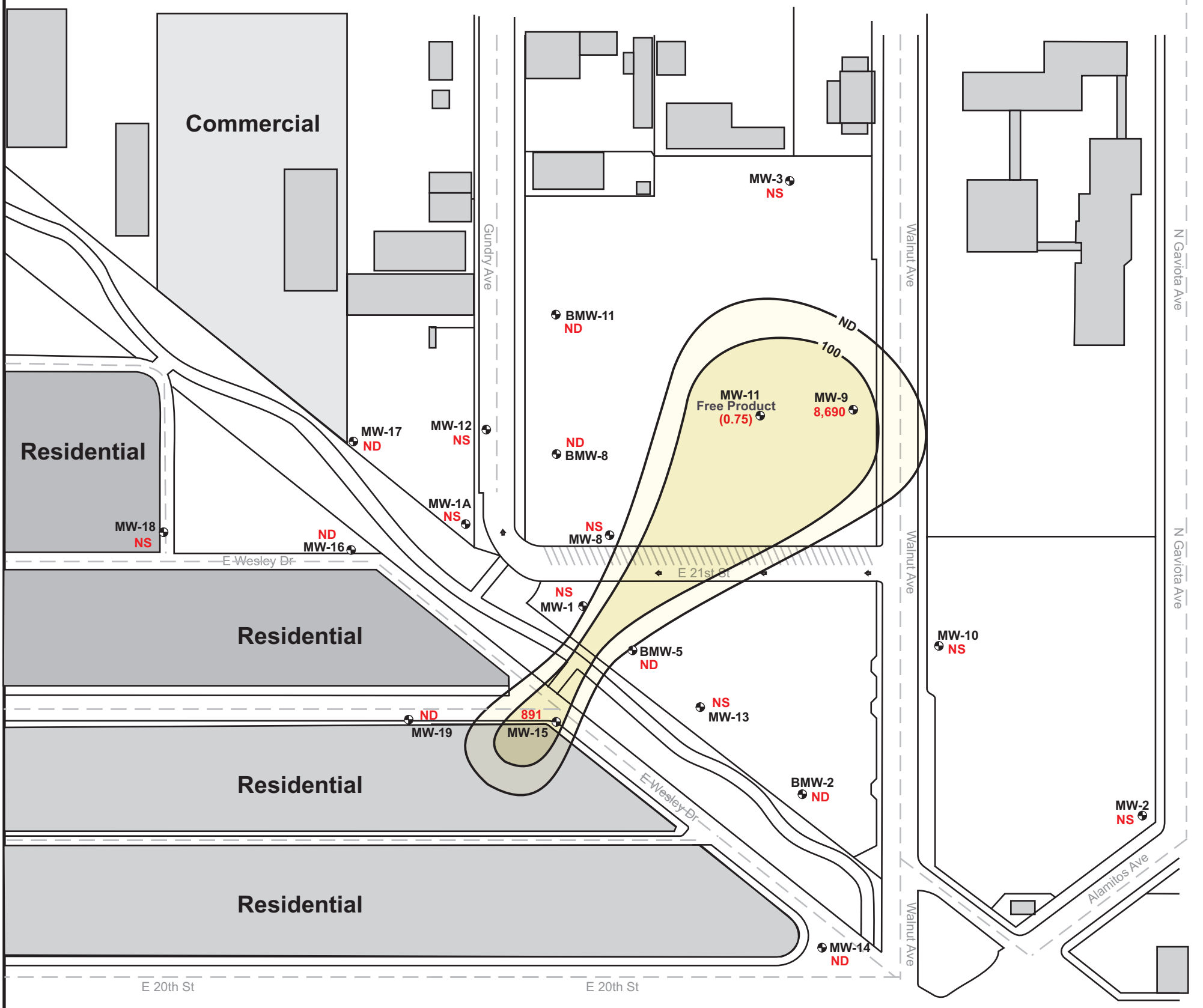
Legend

- BMW-11 — Groundwater monitoring well (AA&A, 2013)
- MW-19 — Groundwater monitoring well (1987-2011)
- ——— TPHg isoconcentration contour
- – – – – Apparent TPHg isoconcentration contour
- 10,900 TPHg concentration in micrograms per liter (µg/L)
- Note: Isoconcentration contours are based on past and present measurements
- ND Not detected at or above laboratory detection limits
- NS Not sampled
- 0.75 Free product thickness in feet

Figure 4: TPHg Concentrations in Groundwater 2Q15
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM/AP	June 2015	ChemOil.p01

Ami Adini & Associates, Inc.



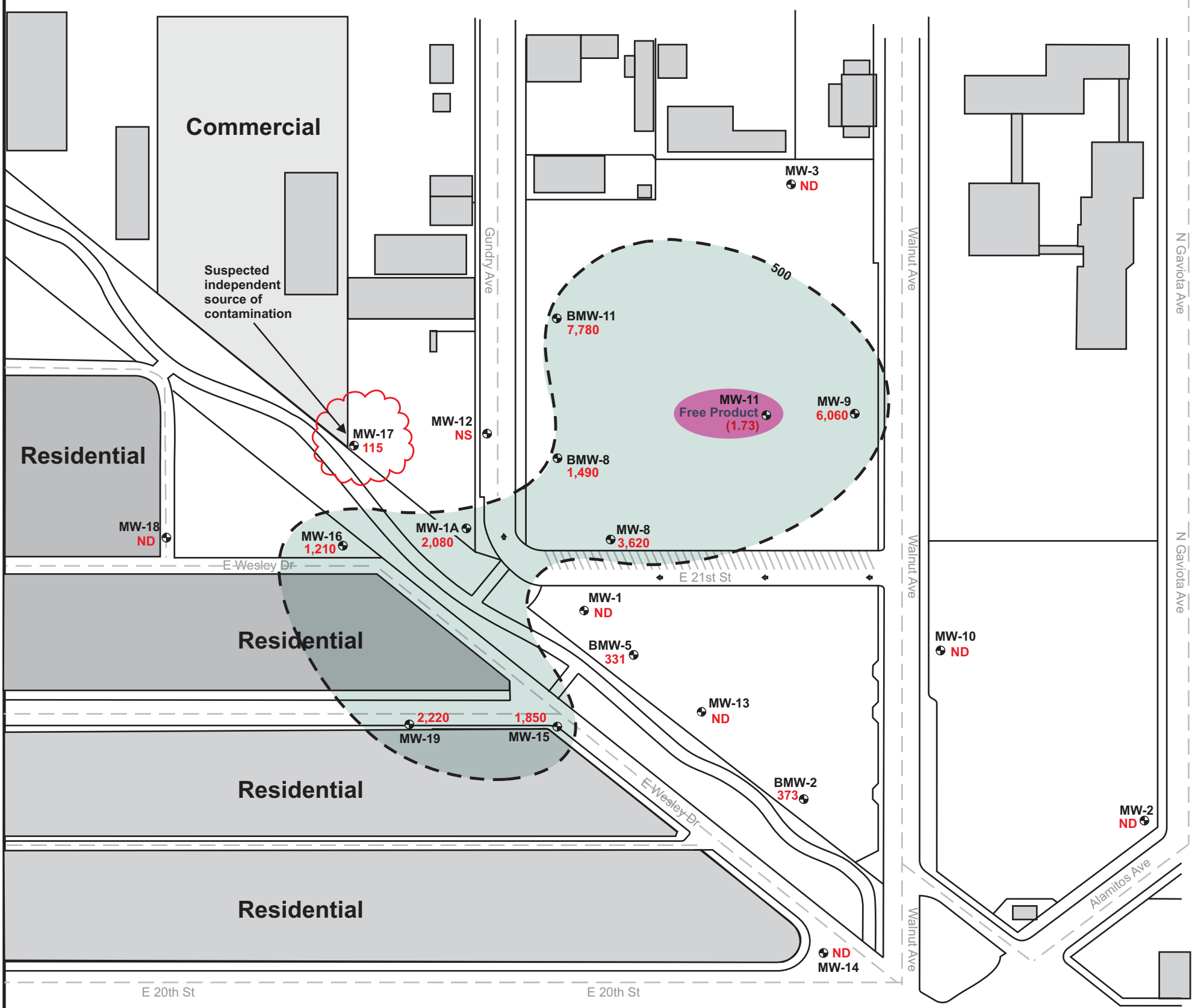
Legend

- BMW-11 — Groundwater monitoring well (AA&A, 2013)
- MW-19 — Groundwater monitoring well (1987-2011)
- ——— TPHd isoconcentration contour
- – – – – Apparent TPHd isoconcentration contour
- 8,690 — TPHd concentration in micrograms per liter (µg/L)
- ND — Not detected at or above laboratory detection limits
- NS — Not sampled
- 0.75 — Free product thickness in feet

Figure 6: TPHd Concentrations in Groundwater 2Q15
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
PM/AP	June 2015	ChemOil.p01

Ami Adini & Associates, Inc.



4Q2015

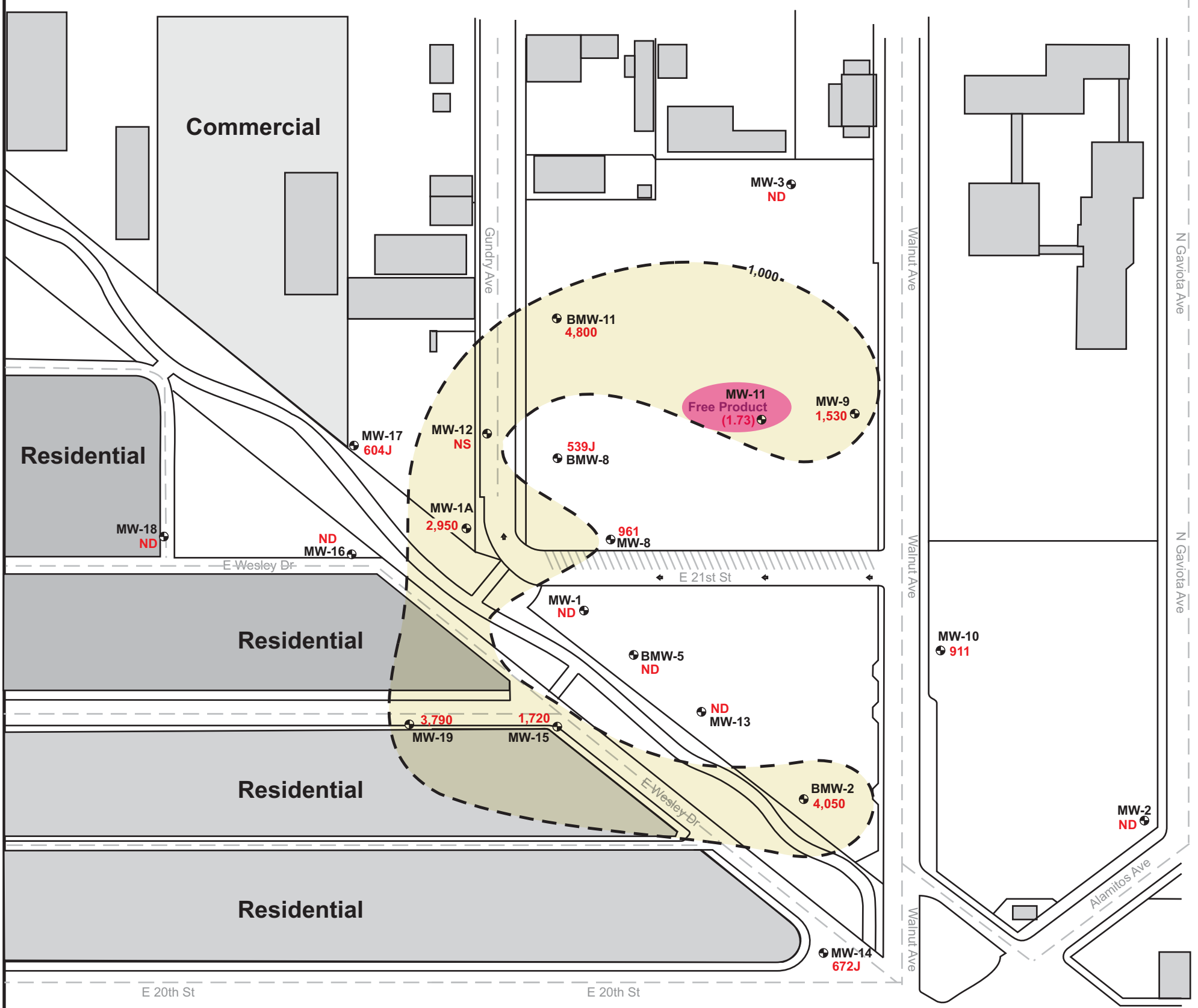
Legend

- BMW-11 — Groundwater monitoring well (AA&A, 2013)
- MW-19 — Groundwater monitoring well (1987-2011)
- – – – – Apparent TPHg isoconcentration contour
- 7,780 — TPHg concentration in micrograms per liter (µg/L)
- ND — Not detected at or above laboratory detection limits
- NS — Not sampled
- (1.73) — Free product thickness in feet

Figure 4: TPHg Concentrations in Groundwater
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
AP	December 2015	ChemOil.p01

Ami Adini & Associates, Inc.



4Q2015

Legend

- BMW-11 — Groundwater monitoring well (AA&A, 2013)
- MW-19 — Groundwater monitoring well (1987-2011)
- – – – – Apparent TPHd isoconcentration contour
- 4,800 — TPHd concentration in micrograms per liter (µg/L)
- J — Estimated value between the method detection limit and practical quantitation limit
- ND — Not detected at or above laboratory detection limits
- NS — Not sampled
- (1.73) — Free product thickness in feet

Figure 5: TPHd Concentrations in Groundwater
Former Chem-Oil Refinery
2020 Walnut Avenue
Signal Hill, California

DRAWN BY:	DATE:	PROJECT:
AP	December 2015	ChemOil.p01

Ami Adini & Associates, Inc.

Table 2
Historical Groundwater Data
Former ChemOil Refinery
2020 Walnut Ave, Signal Hill, California 90755

Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation		GW Gradient (ft/ft)	Flow Direction	DO (mg/L)	ORP (mV)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	1,2-DCA (µg/L)	CIS 1,2 - DCE (µg/L)	1,3,5-TMB (µg/L)	1,2,4-TMB (µg/L)	Naphthalene (µg/L)
MW-1																													
09/07/12	22.22	4	30-60	17.40	4.82	0.00	—	4.82		—	—	1.21	-54	150	6,700	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	—	<1	<1	<1	21
12/09/12	22.22	4	30-60	17.00	5.22	0.00	—	5.22	(H)	—	—	1.67	37	60	2,600	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	<0.5	<1	<1	<1	0.7
12/27/13	22.22	4	30-60	19.25	2.97	0.00	—	2.97		0.0029	SSE	0.79	-121	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
06/13/14	22.22	4	30-60	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	22.22	4	30-60	20.18	2.04	0.00	—	2.04	(L)	0.0020	South	2.77	16	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	22.22	4	30-60	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	22.22	4	30-60	19.77	2.45	0.00	—	2.45		0.0016	SE	7.22	41	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
MW-1A																													
09/07/12	23.02	4	14-34	17.20	5.82	0.00	—	5.82	(H)	—	—	1.02	-54	920	3,000	<0.5	<0.5	<0.5	<1	7.5	—	<1	—	—	—	<1	<1	<1	59
12/09/12	23.02	4	14-34	18.00	5.02	0.00	—	5.02		—	—	1.66	55	880	1,700	<0.5	<0.5	<0.5	<1	7.7	—	<1	—	—	<0.5	<1	<1	<1	72
12/27/13	23.02	4	14-34	19.73	3.29	0.00	—	3.29		0.0029	SSE	0.00	-170	1,890	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	69.6
06/13/14	23.02	4	14-34	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	23.02	4	14-34	20.18	2.84	0.00	—	2.84		0.0020	South	2.17	35	405	<500	<0.5	<0.5	<0.5	<1	4.7	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	23.02	4	14-34	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	23.02	4	14-34	20.41	2.61	0.00	—	2.61	(L)	0.0016	SE	3.18	-15	2,080	2,950	<1	<1	<1	<2	4.1	<2	<2	<2	<20	<1	<2	<2	<2	75.4
MW-2																													
09/07/12	29.99	4	28-58	25.20	4.79	0.00	—	4.79		—	—	3.55	80	<50	370	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	—	<1	<1	<1	<1
12/09/12	29.99	4	28-58	22.20	7.79	0.00	—	7.79	(H)	—	—	2.45	48	<50	480	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	<0.5	<1	<1	<1	<1
12/27/13	29.99	4	28-58	28.65	1.34	0.00	—	1.34	(L)	0.0029	SSE	2.28	30	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
06/13/14	29.99	4	28-58	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	29.99	4	28-58	28.22	1.77	0.00	—	1.77		0.0020	South	2.78	26	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	29.99	4	28-58	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	29.99	4	28-58	28.48	1.51	0.00	—	1.51		0.0016	SE	6.21	7	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
MW-3																													
09/07/12	48.02	4	41-71	41.60	6.42	0.00	—	6.42		—	—	2.43	-142	70	590	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	—	<1	<1	<1	<1
12/09/12	48.02	4	41-71	41.50	6.52	0.00	—	6.52	(H)	—	—	1.77	139	60	330	<0.5	<0.5	<0.5	<1	0.68	—	<1	—	—	<0.5	<1	<1	<1	0.68
12/27/13	48.02	4	41-71	43.05	4.97	0.00	—	4.97		0.0029	SSE	0.80	-143	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
06/13/14	48.02	4	41-71	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	48.02	4	41-71	43.52	4.50	0.00	—	4.50		0.0020	South	2.37	62	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	48.02	4	41-71	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	48.02	4	41-71	43.91	4.11	0.00	—	4.11	(L)	0.0016	SE	7.80	50	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3

Table 2
Historical Groundwater Data
Former ChemOil Refinery
2020 Walnut Ave, Signal Hill, California 90755

Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation		GW Gradient (ft/ft)	Flow Direction	DO (mg/L)	ORP (mV)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	1,2-DCA (µg/L)	CIS 1,2 - DCE (µg/L)	1,3,5-TMB (µg/L)	1,2,4-TMB (µg/L)	Naphthalene (µg/L)
MW-8																													
09/07/12	25.90	4	20-50	21	4.90	0.00	—	4.90		—	—	1.19	-2	1500	5,900	<0.5	<0.5	<0.5	1	29	—	<1	—	—	—	<1	<1	<1	86
12/09/12	25.90	4	20-50	20.8	5.10	0.00	—	5.10	(H)	—	—	1.65	24	1200	3,700	<0.5	<0.5	<0.5	1	31	—	2	—	—	<0.5	<1	<1	<1	31
12/27/13	25.90	4	20-50	NS	—	0.00	—	—		0.0029	SSE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
06/13/14	25.90	4	20-50	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	25.90	4	20-50	NS	—	0.00	—	—		0.0020	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
05/28/15	25.90	4	20-50	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	25.90	4	20-50	21.89	4.01	0.00	—	4.01	(L)	0.0016	SE	3.01	94	3,620	961	<1.25	<1.25	<1.25	<2.5	18.7	<2.5	<2.5	<2.5	196	<1.25	<2.5	<2.5	<2.5	68.5
MW-9																													
09/07/12	36.88	4	29-49	31.80	5.08	0.00	—	5.08	(H)	—	—	0.83	-66	9,200	5,000	48	<0.5	25	42	<1	—	2.1	—	—	—	3.2	2.3	4.9	92
12/09/12	36.88	4	29-49	31.80	5.08	0.00	—	5.08	(H)	—	—	0.87	24	5,300	2,800	21	<0.5	10	42	1	—	2.1	—	—	<0.5	3.6	2.3	4.9	1
12/27/13	36.88	4	29-49	33.40	3.48	0.00	—	3.48		0.0029	SSE	2.83	-138	9,990	3,060	124	3.5	64.5	80.4	<1	<1	<1	<1	<10	<0.5	<1	6.9J	15.2	151
06/13/14	36.88	4	29-49	33.53	3.35	0.00	—	3.35		0.0008	South	1.37	-48	6,960	1,550	670	9.9J	199	143	<10	<10	<10	<10	<100	<5	<10	19.8J	63.6	207
12/07/14	36.88	4	29-49	33.68	3.20	0.00	—	3.20		0.0020	South	2.42	-37	7,680	14,700	28.7	1.6	<0.5	28.0	<1	<1	<1	<1	<10	<0.5	<1	2.3J	1.4J	1.2J
05/28/15	36.88	4	29-49	33.78	3.10	0.00	—	3.10		0.0012	SE	1.10	-19	16,200	8,690	13.1	1.7J	18.7	29.0	<2	<2	<2	<2	<20	<1	<2	2.3J	4.4J	15.4
12/10/15	36.88	4	29-49	34.14	2.74	0.00	—	2.74	(L)	0.0016	SE	5.35	35	6,060	1,530	31.6	3.2J	23.0	34.8	<2	<2	<2	<2	33.9	<1	<2	3.0J	7.1	132
MW-10																													
09/07/12	31.60	4	26-46	26.70	4.90	0.00	—	4.90		—	—	2.37	-119	80	5,700	<0.5	<0.5	<0.5	0.6	<1	—	<1	—	—	—	<1	<1	<1	1.5
12/09/12	31.60	4	26-46	26.40	5.20	0.00	—	5.20	(H)	—	—	1.88	89	80	2,500	<0.5	<0.5	<0.5	0.6	<1	—	<1	—	—	<0.5	<1	<1	<1	<0.5
12/27/13	31.60	4	26-46	29.05	2.55	0.00	—	2.55		0.0029	SSE	4.89	-169	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	130	<0.5	<1	<1	<1	<3
06/13/14	31.60	4	26-46	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	31.60	4	26-46	29.31	2.29	0.00	—	2.29		0.0020	South	1.93	-62	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	31.60	4	26-46	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	31.60	4	26-46	29.50	2.10	0.00	—	2.10	(L)	0.0016	SE	50.00	-54	<50	911	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
MW-11																													
09/07/12	33.06	4	23-33	27.50	5.56	0.00	—	5.56		—	—	2.12	58	9800	18,000	2,300	<0.5	180	90	40	—	5.2	—	—	—	45	30	65	230
12/09/12	33.06	4	23-33	27.40	5.66	0.00	—	5.66	(H)	—	—	1.65	91	15000	9,100	1,600	1,600	210	90	40	—	5.4	—	—	<0.5	33	30	65	40
12/27/13	33.06	4	23-33	29.36	3.70	0.41	4.11	4.02		0.0029	SSE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
06/13/14	33.06	4	23-33	30.35	2.71	1.24	3.95	3.68		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	33.06	4	23-33	29.51	3.55	1.15	4.70	4.45		0.0020	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
05/28/15	33.06	4	23-33	NS	—	0.75	-	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	33.06	4	23-33	31.14	1.92	1.73	3.65	3.28	(L)	0.0016	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2
Historical Groundwater Data
Former ChemOil Refinery
2020 Walnut Ave, Signal Hill, California 90755

Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation		GW Gradient (ft/ft)	Flow Direction	DO (mg/L)	ORP (mV)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	1,2-DCA (µg/L)	CIS 1,2 - DCE (µg/L)	1,3,5-TMB (µg/L)	1,2,4-TMB (µg/L)	Naphthalene (µg/L)
MW-12																													
09/07/12	24.04	4	13-30	18.30	5.74	0.00	—	5.74	(H)	—	—	1.08	-74	7100	15,000	1.2	<0.5	60	19	10	—	1.9	—	—	—	<1	5.7	190	290
12/09/12	24.04	4	13-30	18.30	5.74	0.00	—	5.74	(H)	—	—	1.65	65	8200	7,400	1.3	1.3	56	19	15	—	2.8	—	—	<0.5	<1	5.7	190	15
12/27/13	24.04	4	13-30	NS	—	0.00	—	—		0.0029	SSE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
06/13/14	24.04	4	13-30	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	24.04	4	13-30	NS	—	0.00	—	—		0.0020	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
05/28/15	24.04	4	13-30	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	24.04	4	13-30	NS	—	0.00	—	—		0.0016	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-13																													
09/07/12	21.33	4	10-25	16.00	5.33	0.00	—	5.33		—	—	1.28	-31	500	11,000	<0.5	<0.5	<0.5	<1	18	—	<1	—	—	—	<1	<1	<1	160
12/09/12	21.33	4	10-25	15.70	5.63	0.00	—	5.63	(H)	—	—	1.65	27	520	4,900	1	1	1	<1	23	—	<1	—	—	<0.5	<1	<1	<1	23
12/27/13	21.33	4	10-25	20.84	0.49	0.00	—	0.49	(L)	0.0029	SSE	2.37	-185	1040	579J	<0.5	<0.5	<0.5	<1	49.9	<1	<1	<1	128	<0.5	<1	<1	1.1J	52.4
06/13/14	21.33	4	10-25	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	21.33	4	10-25	20.48	0.85	0.00	—	0.85		0.0020	South	4.10	27	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	21.33	4	10-25	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	21.33	4	10-25	20.22	1.11	0.00	—	1.11		0.0016	SE	6.44	28	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
MW-14																													
09/07/12	16.81	4	5-25	11.80	5.01	0.00	—	5.01		—	—	1.90	165	<50	310	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	—	<1	<1	<1	<1
12/09/12	16.81	4	5-25	11.70	5.11	0.00	—	5.11	(H)	—	—	2.11	135	<50	120	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	<0.5	<1	<1	<1	<0.5
12/27/13	16.81	4	5-25	15.53	1.28	0.00	—	1.28	(L)	0.0029	SSE	1.19	121	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
06/13/14	16.81	4	5-25	14.23	2.58	0.00	—	2.58		0.0008	South	4.03	34	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
12/07/14	16.81	4	5-25	14.71	2.10	0.00	—	2.10		0.0020	South	1.81	12	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	16.81	4	5-25	14.29	2.52	0.00	—	2.52		0.0012	SE	1.41	-21	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<1
12/10/15	16.81	4	5-25	14.84	1.97	0.00	—	1.97		0.0016	SE	4.55	35	<50	672J	<0.5	<0.5	<0.5	<1	76.2	<1	<1	<1	<10	<0.5	<1	<1	<1	<1
MW-15																													
09/07/12	17.17	4	6-26	11.90	5.27	0.00	—	5.27	(H)	—	—	0.76	-104	660	7,800	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	—	<1	<1	<1	<1
12/09/12	17.17	4	6-26	12.00	5.17	0.00	—	5.17		—	—	0.98	87	500	3,400	<0.5	<0.5	<0.5	<1	<1	—	59	—	—	<0.5	<1	<1	<1	<0.5
12/27/13	17.17	4	6-26	14.33	2.84	0.00	—	2.84	(L)	0.0029	SSE	0.27	-172	1,440	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	6.9
06/13/14	17.17	4	6-26	14.11	3.06	0.00	—	3.06		0.0008	South	1.94	8	1,180	1,090	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	2.3J
12/07/14	17.17	4	6-26	14.32	2.85	0.00	—	2.85		0.0020	South	0.71	-82	<50	1,090	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	17.17	4	6-26	13.97	3.20	0.00	—	3.20		0.0012	SE	1.17	-54	684	891	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	1.8J
12/10/15	17.17	4	6-26	14.07	3.10	0.00	—	3.10		0.0016	SE	9.07	-49	1,850	1,720	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	6.2

Table 2
Historical Groundwater Data
Former ChemOil Refinery
2020 Walnut Ave, Signal Hill, California 90755

Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation		GW Gradient (ft/ft)	Flow Direction	DO (mg/L)	ORP (mV)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	1,2-DCA (µg/L)	CIS 1,2 - DCE (µg/L)	1,3,5-TMB (µg/L)	1,2,4-TMB (µg/L)	Naphthalene (µg/L)
MW-16																													
09/07/12	18.41	4	7-27	13.00	5.41	0.00	—	5.41		—	—	0.97	-90	1,800	2,900	<0.5	<0.5	<0.5	<1	62	—	32	—	—	—	<1	<1	<1	8.4
12/09/12	18.41	4	7-27	12.80	5.61	0.00	—	5.61	(H)	—	—	1.45	77	1,300	840	<0.5	<0.5	<0.5	<1	30	—	32	—	—	<0.5	<1	<1	<1	30
12/27/13	18.41	4	7-27	14.75	3.66	0.00	—	3.66		0.0029	SSE	0.11	-147	2,760	<500	<0.5	<0.5	<0.5	1.9J	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	20.1
06/13/14	18.41	4	7-27	15.03	3.38	0.00	—	3.38		0.0008	South	4.88	55	1,830	<500	<0.5	<0.5	<0.5	<1	2.8	<1	<1	<1	<10	<0.5	<1	<1	<1	2.3J
12/07/14	18.41	4	7-27	15.19	3.22	0.00	—	3.22		0.0020	South	2.18	-36	168	<500	<0.5	<0.5	<0.5	<1	15.0	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	18.41	4	7-27	14.06	4.35	0.00	—	4.35		0.0012	SE	0.87	-42	1,300	<500	<0.5	<0.5	<0.5	<1	4.5	<1	<1	<1	<10	<0.5	<1	<1	<1	4.7J
12/10/15	18.41	4	7-27	15.46	2.95	0.00	—	2.95	(L)	0.0016	SE	50.00	-59	1,210	<500	<0.5	<0.5	<0.5	<1	1.8J	<1	<1	<1	<10	<0.5	<1	<1	<1	2.6J
MW-17																													
09/07/12	21.93	4	8-23	16.90	5.03	0.00	—	5.03		—	—	1.21	-63	160	2,600	<0.5	<0.5	<0.5	1	160	—	<1	—	—	—	<1	<1	<1	<1
12/09/12	21.93	4	8-23	16.30	5.63	0.00	—	5.63	(H)	—	—	1.75	40	260	1,500	<0.5	<0.5	<0.5	1	85	—	1	—	—	<0.5	<1	<1	<1	85
12/27/13	21.93	4	8-23	18.45	3.48	0.00	—	3.48		0.0029	SSE	6.06	-159	148	<500	<0.5	<0.5	<0.5	<1	111	<1	<1	<1	<10	<0.5	<1	<1	<1	5.2
06/13/14	21.93	4	8-23	18.80	3.13	0.00	—	3.13		0.0008	South	2.91	24	81J	525J	<0.5	<0.5	<0.5	<1	135	<1	<1	<1	<10	<0.5	<1	<1	<1	1.3J
12/07/14	21.93	4	8-23	18.81	3.12	0.00	—	3.12		0.0020	South	2.17	-15	64J	<500	<0.5	<0.5	<0.5	<1	152	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	21.93	4	8-23	18.32	3.61	0.00	—	3.61		0.0012	SE	1.12	-32	152	<500	<0.5	<0.5	<0.5	<1	92	<1	<1	<1	<10	<0.5	<1	<1	<1	4.0J
12/10/15	21.93	4	8-23	19.64	2.29	0.00	—	2.29	(L)	0.0016	SE	4.69	18	115	604J	<0.5	<0.5	<0.5	<1	131	<1	<1	<1	75.5	<0.5	<1	<1	<1	<3
MW-18																													
09/07/12	17.72	4	6-23	12.80	4.92	0.00	—	4.92		—	—	1.97	51	<50	220	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	—	<1	<1	<1	<1
12/09/12	17.72	4	6-23	12.50	5.22	0.00	—	5.22	(H)	—	—	2.88	39	<50	70	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	<0.5	<1	<1	<1	<0.5
12/27/13	17.72	4	6-23	14.42	3.30	0.00	—	3.30		0.0029	SSE	1.79	-138	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
06/13/14	17.72	4	6-23	NS	—	0.00	—	—		0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14	17.72	4	6-23	14.58	3.14	0.00	—	3.14		0.0020	South	2.11	-14	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	17.72	4	6-23	NS	—	0.00	—	—		0.0012	SE	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/10/15	17.72	4	6-23	15.16	2.56	0.00	—	2.56	(L)	0.0016	SE	15.08	-9	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
MW-19																													
09/07/12	16.46	4	3-20	11.50	4.96	0.00	—	4.96		—	—	1.29	-90	890	4,000	<0.5	<0.5	<0.5	<1	<1	—	<1	—	—	—	<1	<1	<1	240
12/09/12	16.46	4	3-20	11.30	5.16	0.00	—	5.16	(H)	—	—	1.65	91	900	2,500	<0.5	<0.5	<0.50	<1	<1	—	<1	—	—	<0.5	<1	<1	<1	<0.5
12/27/13	16.46	4	3-20	13.75	2.71	0.00	—	2.71		0.0029	SSE	0.17	-178	621	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	41.1
06/13/14	16.46	4	3-20	13.62	2.84	0.00	—	2.84		0.0008	South	2.35	12	1,700	983	<1	<1	<1	<2	<2	<2	<2	<2	<20	<1	<2	<2	<2	94.9
12/07/14	16.46	4	3-20	13.83	2.63	0.00	—	2.63		0.0020	South	1.22	-65	137	1,520	<0.5	<0.5	<0.5	<1	3.8	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/28/15	16.46	4	3-20	13.71	2.75	0.00	—	2.75		0.0012	SE	1.67	-37	859	<500	<0.5	<0.5	<0.5	<1	1.8J	<1	<1	<1	<10	<0.5	<1	<1	<1	1.9J
12/10/15	16.46	4	3-20	14.02	2.44	0.00	—	2.44	(L)	0.0016	SE	15.71	-36	2,220	3,790	<0.5	<0.5	<0.5	<1	1.8	<1	<1	<1	<10	<0.5	<1	<1	<1	1.2J

Table 2
Historical Groundwater Data
Former ChemOil Refinery
2020 Walnut Ave, Signal Hill, California 90755

Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation	GW Gradient (ft/ft)	Flow Direction	DO (mg/L)	ORP (mV)	TPHg (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	1,2-DCA (µg/L)	CIS 1,2 - DCE (µg/L)	1,3,5-TMB (µg/L)	1,2,4-TMB (µg/L)	Naphthalene (µg/L)
BMW-2																												
					—	0.00	—	—	NS	NS	—	—	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/27/13				18.86	—	0.00	—	—	0.0029	SSE	3.01	-138	187	944	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	24.4
06/13/14				NS	—	0.00	—	—	0.0008	South	—	—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/07/14				18.57	—	0.00	—	—	0.0020	South	2.20	40	<50	699	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
05/29/15				18.26	—	0.00	—	—	0.0012	SE	1.43	35	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<1
12/10/15				19.09	—	0.00	—	—	0.0016	SE	7.30	-83	373	4,050	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	6.6
BMW-5																												
					—	0.00	—	—	NS	NS	—	—	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/27/13				21.89	—	0.00	—	—	0.0029	SSE	50.00	-135	1,090	1,520	0.6J	<0.5	<0.5	1.1J	<1	<1	<1	<1	67.7	<0.5	<1	<1	<1	80.1
06/13/14				20.11	—	0.00	—	—	0.0008	South	0.98	-0.5	1,110	1,690	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	1,120	<0.5	<1	<1	<1	8.6
12/07/14				20.32	—	0.00	—	—	0.0020	South	1.36	37.0	350	1,090	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	654	<0.5	<1	<1	<1	<3
05/29/15				20.17	—	0.00	—	—	0.0012	SE	1.22	-52	488	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	2.2J
12/10/15				20.28	—	0.00	—	—	0.0016	SE	29.72	-2	331	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	<3
BMW-8																												
					—	0.00	—	—	NS	NS	—	—	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/27/13				22.45	—	—	—	—	0.0029	SSE	1.94	-124	3,700	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	<1	72
06/13/14				22.82	—	0.00	—	—	0.0008	South	0.87	-10	7,050	4,280	186	1.3J	82.0	64.5	<2	<2	<2	<2	208	<1	<2	10.2	28.8	141
12/07/14				23.29	—	0.00	—	—	0.0020	South	0.91	-20	3,730	2,710	30.2	<1	18.5	7.7	<2	<2	<2	<2	265	<1	<2	<2	3.8J	83.2
05/29/15				22.89	—	0.00	—	—	0.0012	SE	1.02	-5	1,930	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<0.5	<1	<1	11.1	5.3
12/10/15				23.76	—	0.00	—	—	0.0016	SE	2.78	-7	1,490	539J	<0.5	<0.5	30.8	9.3	<1	<1	<1	<1	<10	<0.5	<1	<1	9.8	10.7
BMW-11																												
					—	0.00	—	—	NS	NS	—	—	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
12/27/13				31.39	—	0.00	—	—	0.0029	SSE	1.27	-125	40,200	6,650	2,840	<0.5	1,020	454	<1	<1	<1	<1	<10	<0.5	<1	207	625	1750
06/13/14				30.01	—	0.00	—	—	0.0008	South	1.04	2	16,000	9,650	3,770	<12.5	443	280	<25	<25	<25	<25	<250	<12.5	<25	100J	233	196
12/07/14				29.32	—	0.00	—	—	0.0020	South	0.64	-57	7,390	2,640	2,350	<12.5	531	322	<25	<25	<25	<25	<250	<12.5	<25	113J	290	128
05/29/15				31.29	—	0.00	—	—	0.0012	SE	1.32	-42	10,900	<500	470	<2.5	498	201	<5	<5	<5	<5	<50	<2.5	<5	69.5	187	117
12/10/15				31.57	—	0.00	—	—	0.0016	SE	12.27	-21	7,780	4,800	692	5.0	341	86.0	<5	<5	<5	<5	<50	<2.5	<5	55.4	145	126

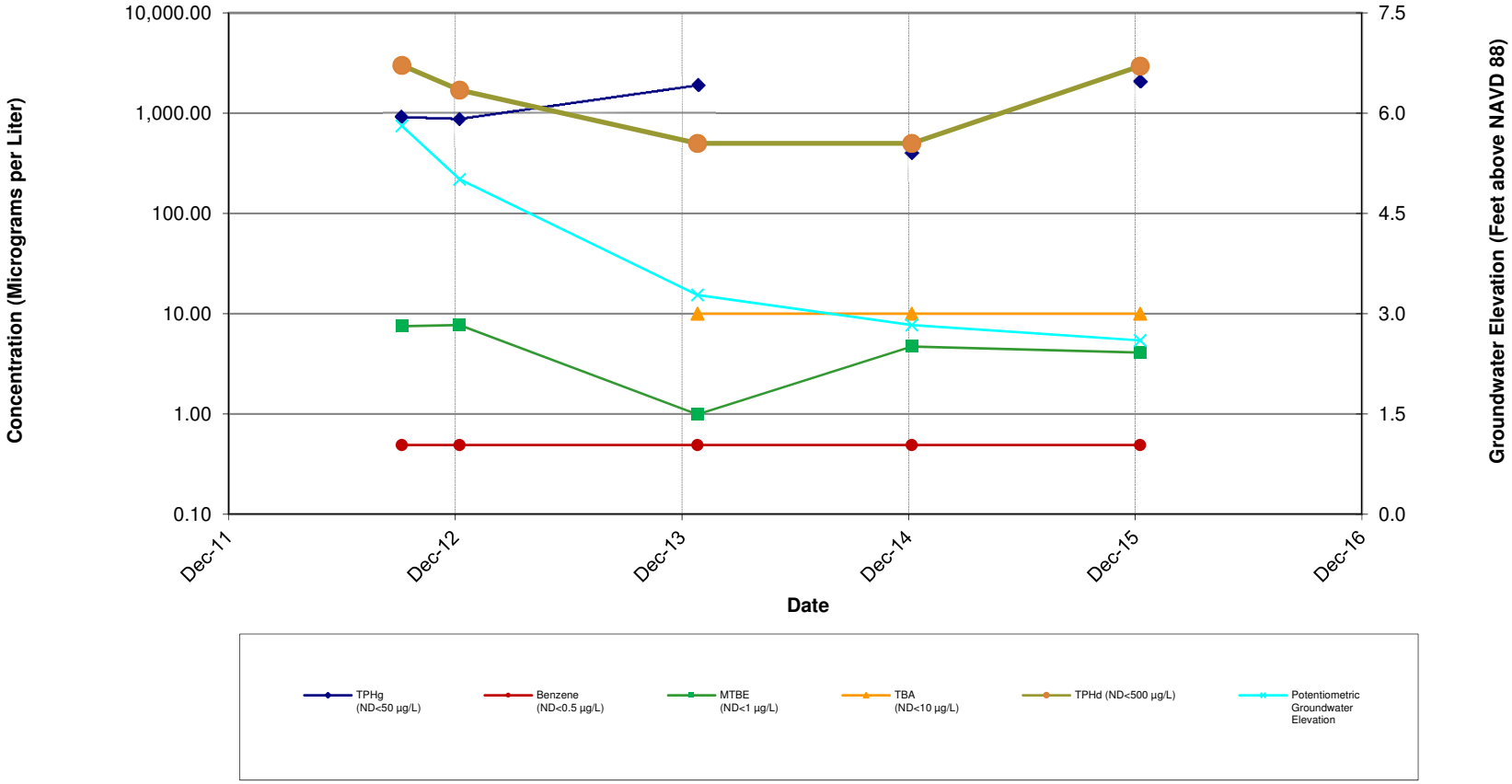
Notes:
MW1, MW2, etc. are monitoring well designations
TOC = Top of casing
GW = Groundwater
DO = Dissolved oxygen
ORP = Oxidation reduction potential
TPHg = Total petroleum hydrocarbons as gasoline (EPA 8015M)
TPHd = Total petroleum hydrocarbons as diesel (EPA 8015M)
MTBE = Methyl tertiary butyl ether (EPA Method 8260B)
DIPE = Di-isopropyl ether (EPA Method 8260B)
ETBE = Ethyl tertiary butyl ether (EPA Method 8260B)
TAME = Tertiary amyl methyl ether (EPA Method 8260B)
TBA = Tertiary butyl alcohol (EPA Method 8260B)
DCA = Dichloroethane (EPA Method 8260B)
DCE = Dichloroethene (EPA Method 8260B)
PCE = Tetrachloroethene (EPA Method 8260B)
TMB = Trimethylbenzene (EPA Method 8260B)
ft = Feet
mg/L = Milligrams per liter
mV = Millivolt
µg/L = Micrograms per liter
— = Not measured or not applicable
J = Estimated value between the method detection and practical quantitation limits
(H) = Highest historical groundwater elevation
(L) = Lowest historical groundwater elevation
* = Result from a higher dilution analysis

All elevation data in feet above the North American Vertical Datum of 1988 (NAVD 88).
MW-1 through MW-19 surveyed by DOUGLAS BOYNTON PLS, LS4787 1/23/2008 for Testa Environmental.
Survey results pending for BMW wells.

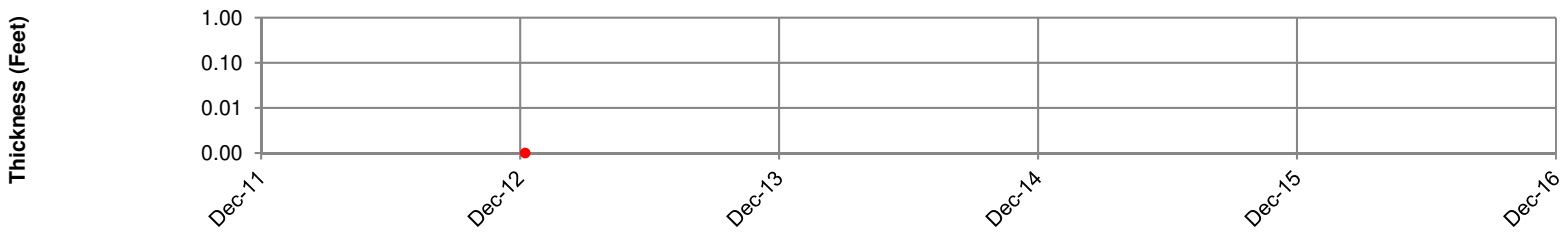
Other detected contaminant concentrations (µg/L) during this event:
Isopropylbenzene: 52.2 (MW-1A), 84.8 (MW-9), 1.0J (MW-10), 55.6 (MW-15), 17.3 (MW-16), 55.0 (MW-19), 6.6 (BMW-2), 8.4 (BMW-5), 11.7 (BMW-8), 82.0 (BMW-11)
n-Propylbenzene: 21.6 (MW-1A), 71.3 (MW-8), 74.5 (MW-9), 2.6J (MW-15), 2.5J (MW-16), 2.0J (BMW-2), 3.1J (BMW-5), 11.5 (BMW-8), 64.0 (BMW-11)
sec-Butylbenzene: 6.7J (MW-1A), 17.0 (MW-8), 13.2 (MW-9), 16.3 (MW-15), 7.2 (MW-16), 6.9 (MW-19), 2.2J (BMW-2), 2.8J (BMW-5), 4.5J (BMW-8), 12.1J (BMW-11)
n-Butylbenzene: 4.5J (MW-8), 9.7 (MW-9), 2.3J (MW-15), 1.1J (MW-19), 1.7J (BMW-8), 12.1J (BMW-11)

Concentrations over Time in Well MW-1A (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755

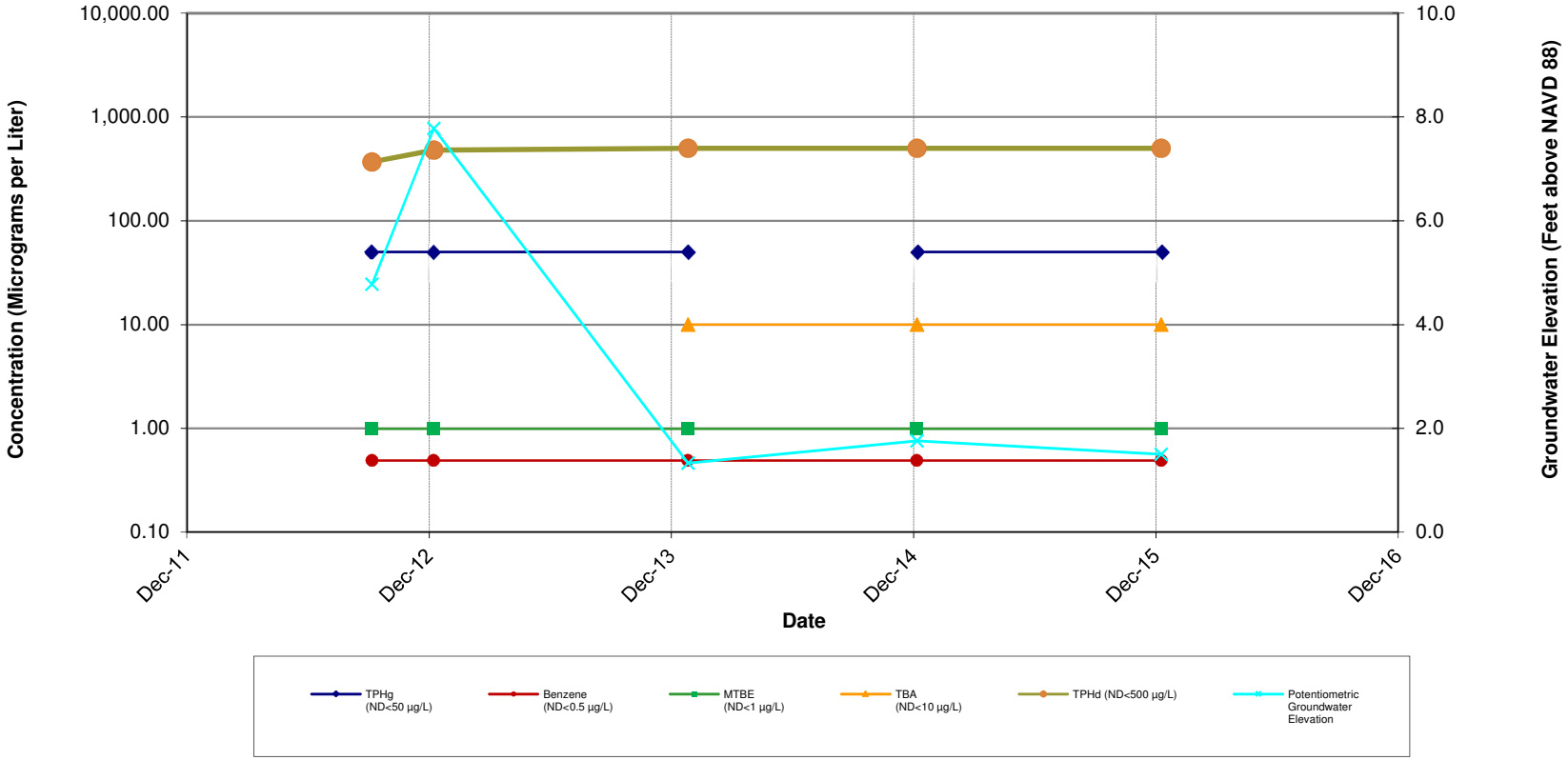


Free-Product Thickness

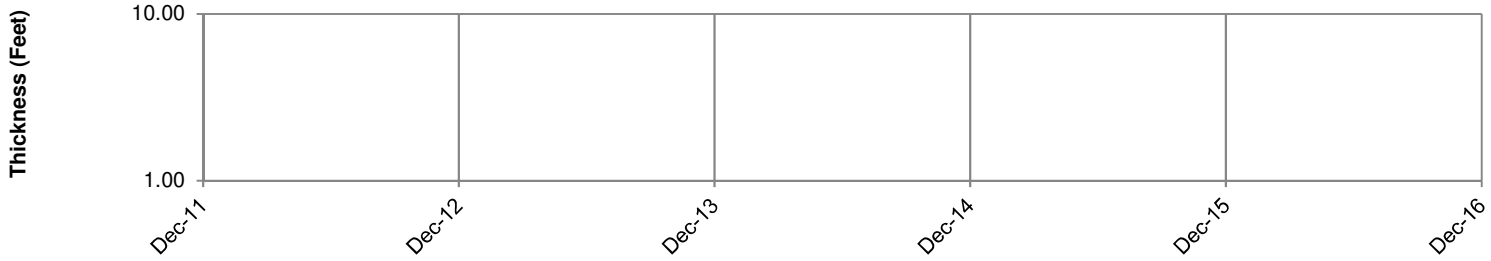


Concentrations over Time in Well MW-2 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755

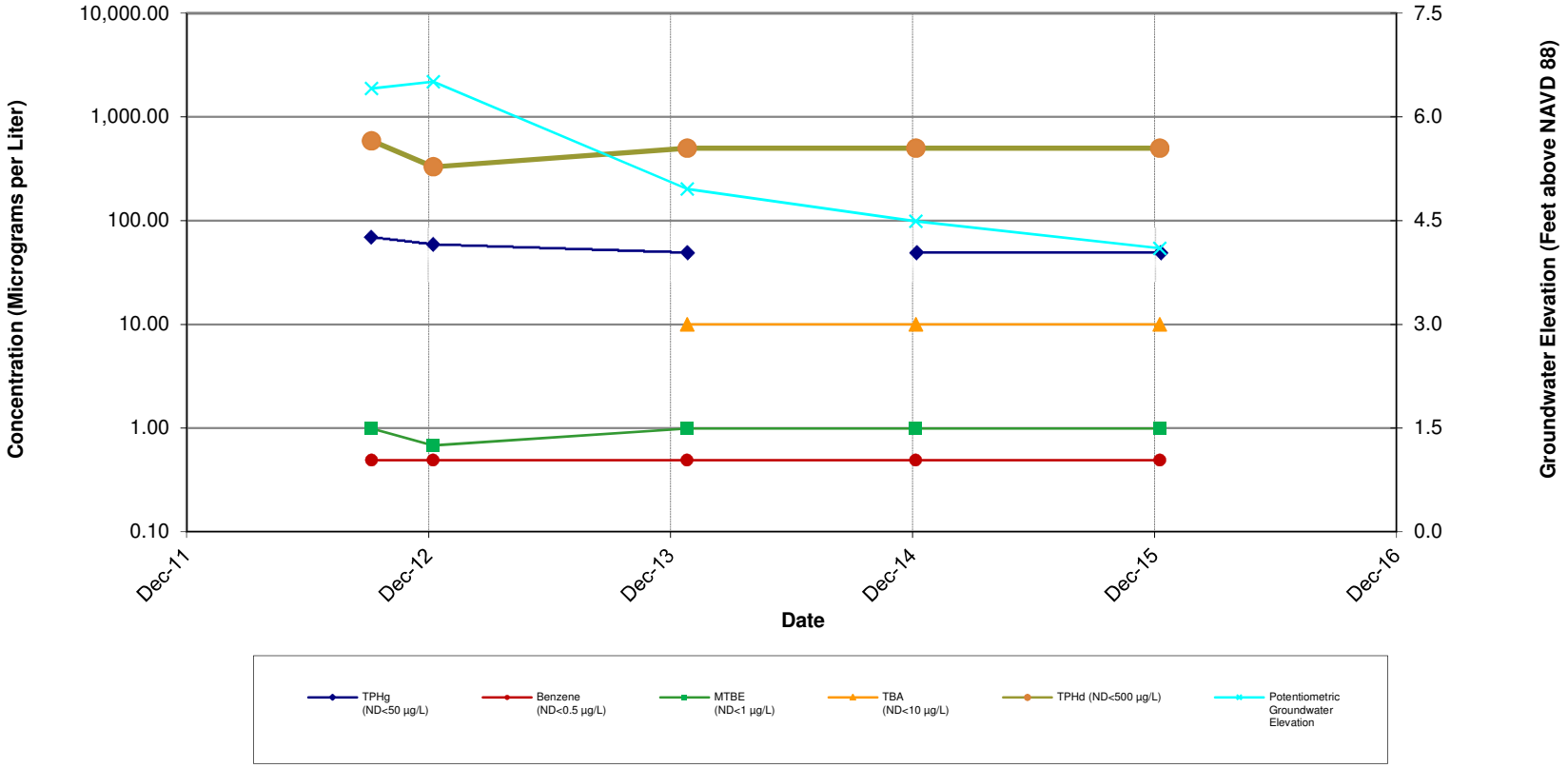


Free-Product Thickness



Concentrations over Time in Well MW-3 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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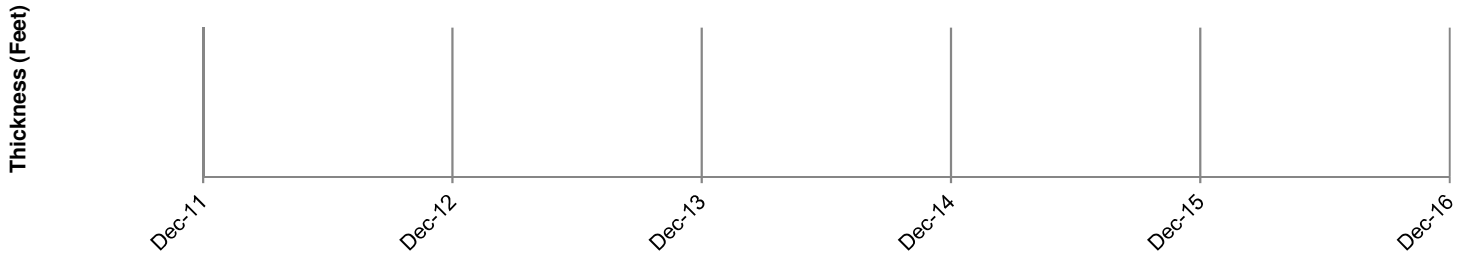
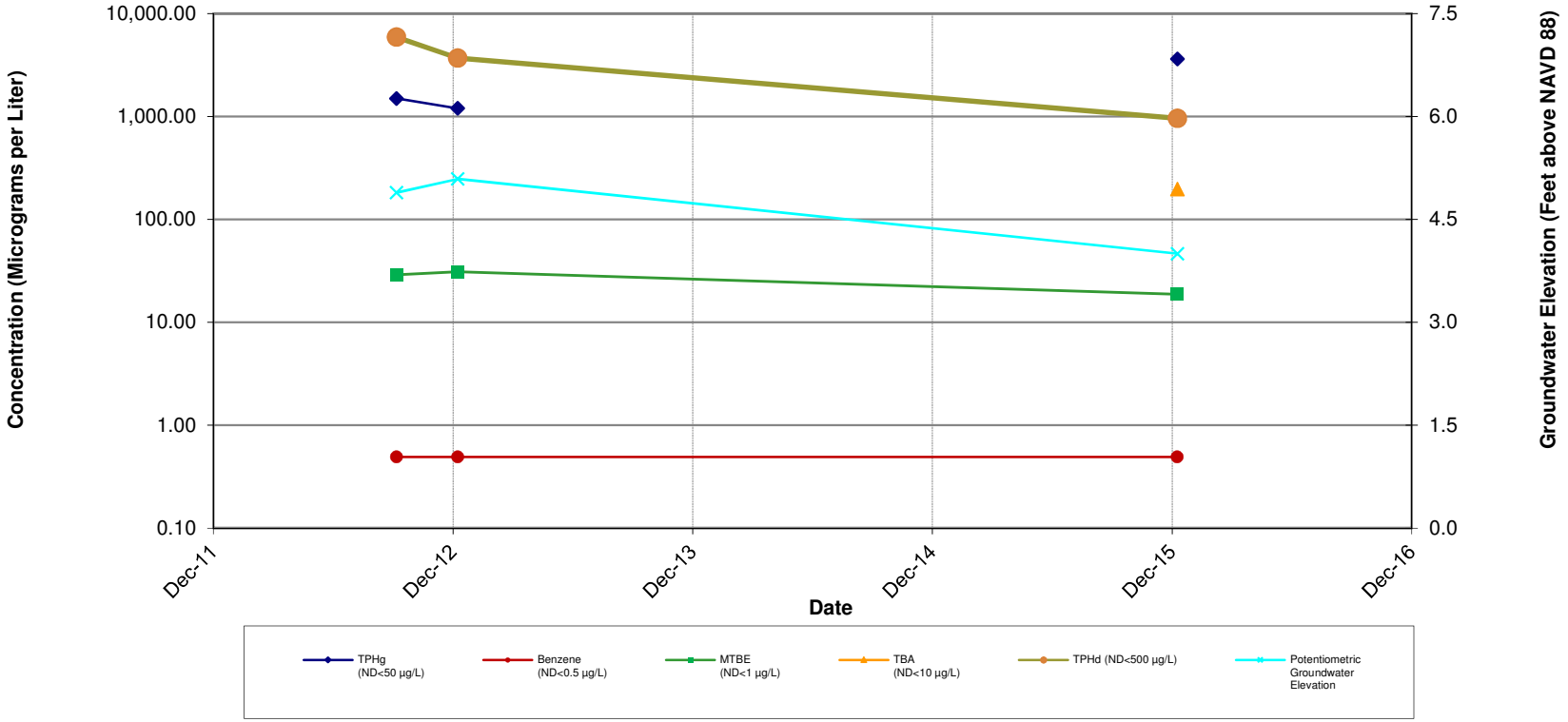


Concentrations over Time in Well MW-8 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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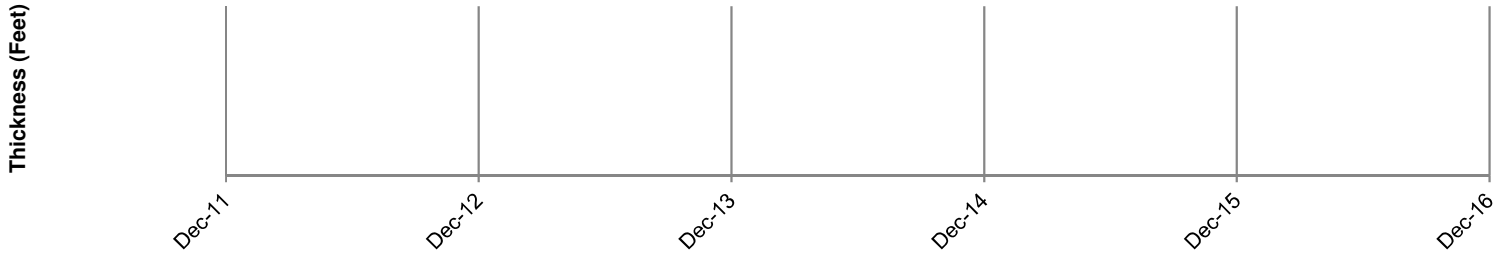
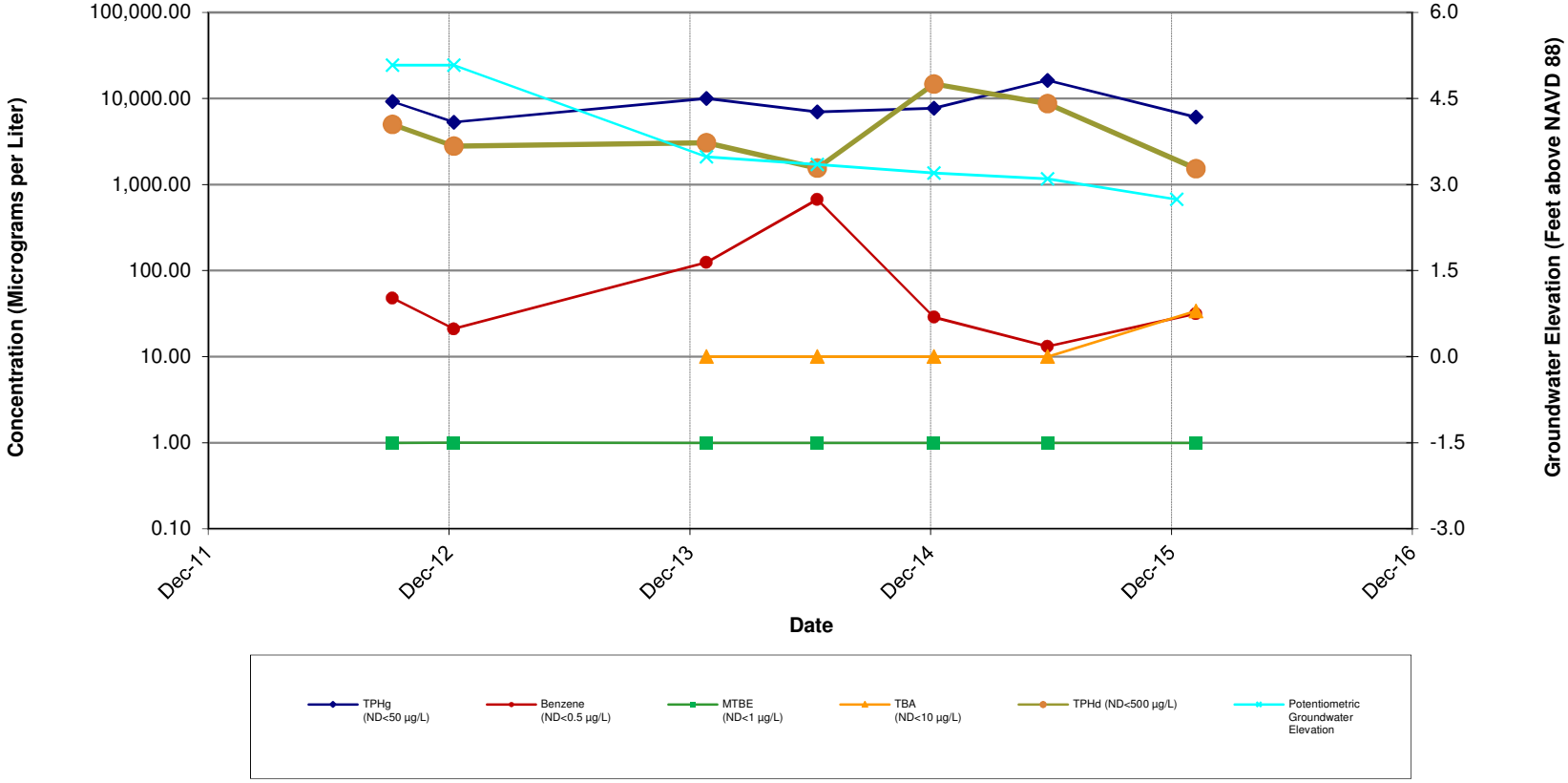


Concentrations over Time in Well MW-9 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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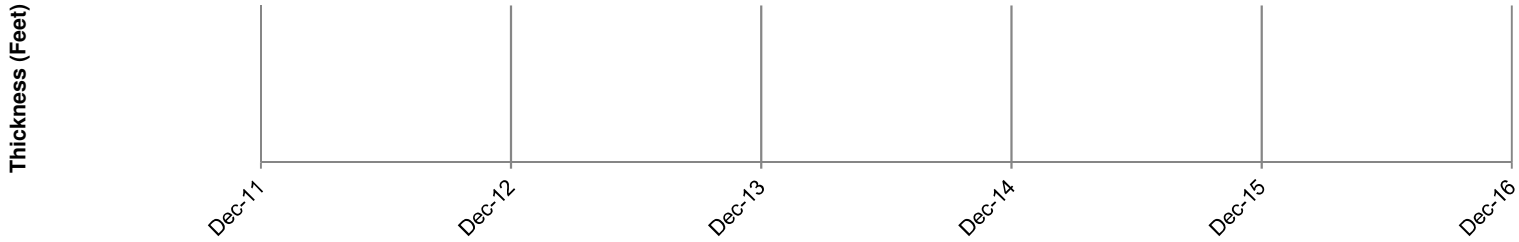
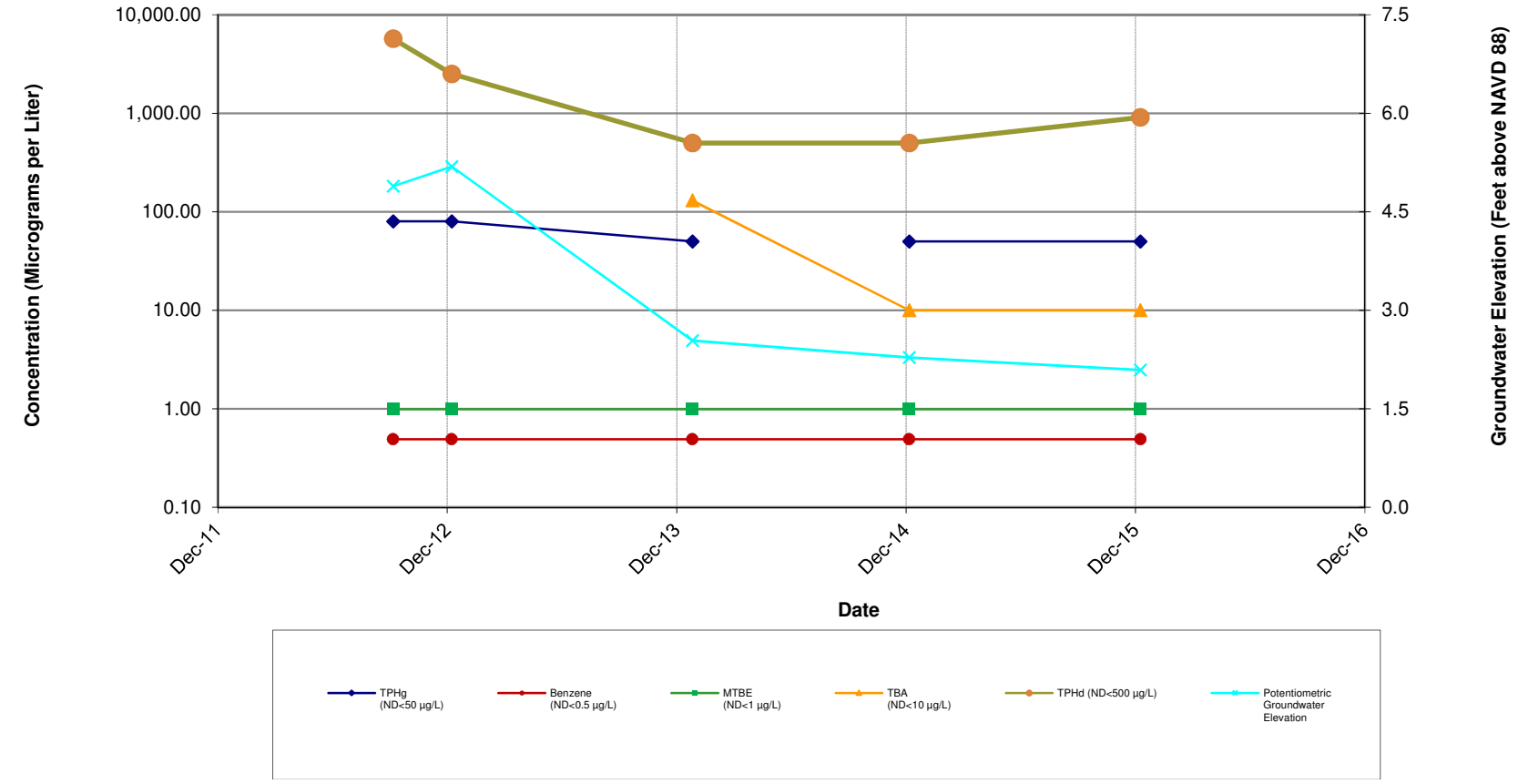


Concentrations over Time in Well MW-10 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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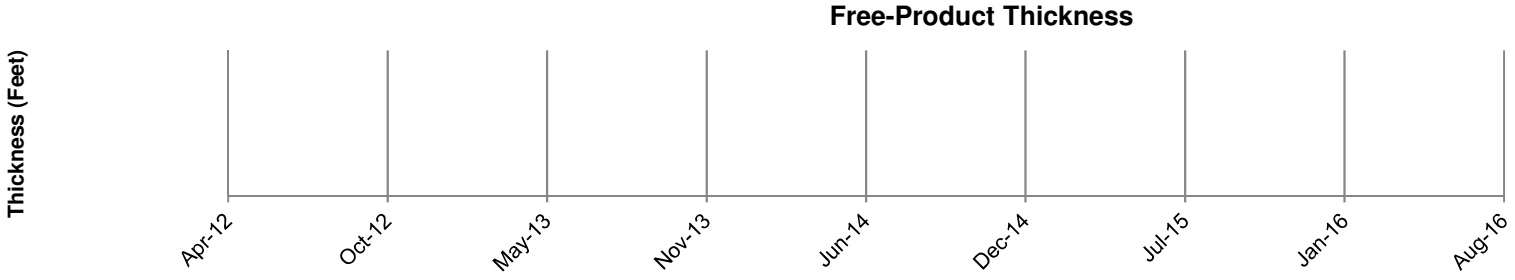
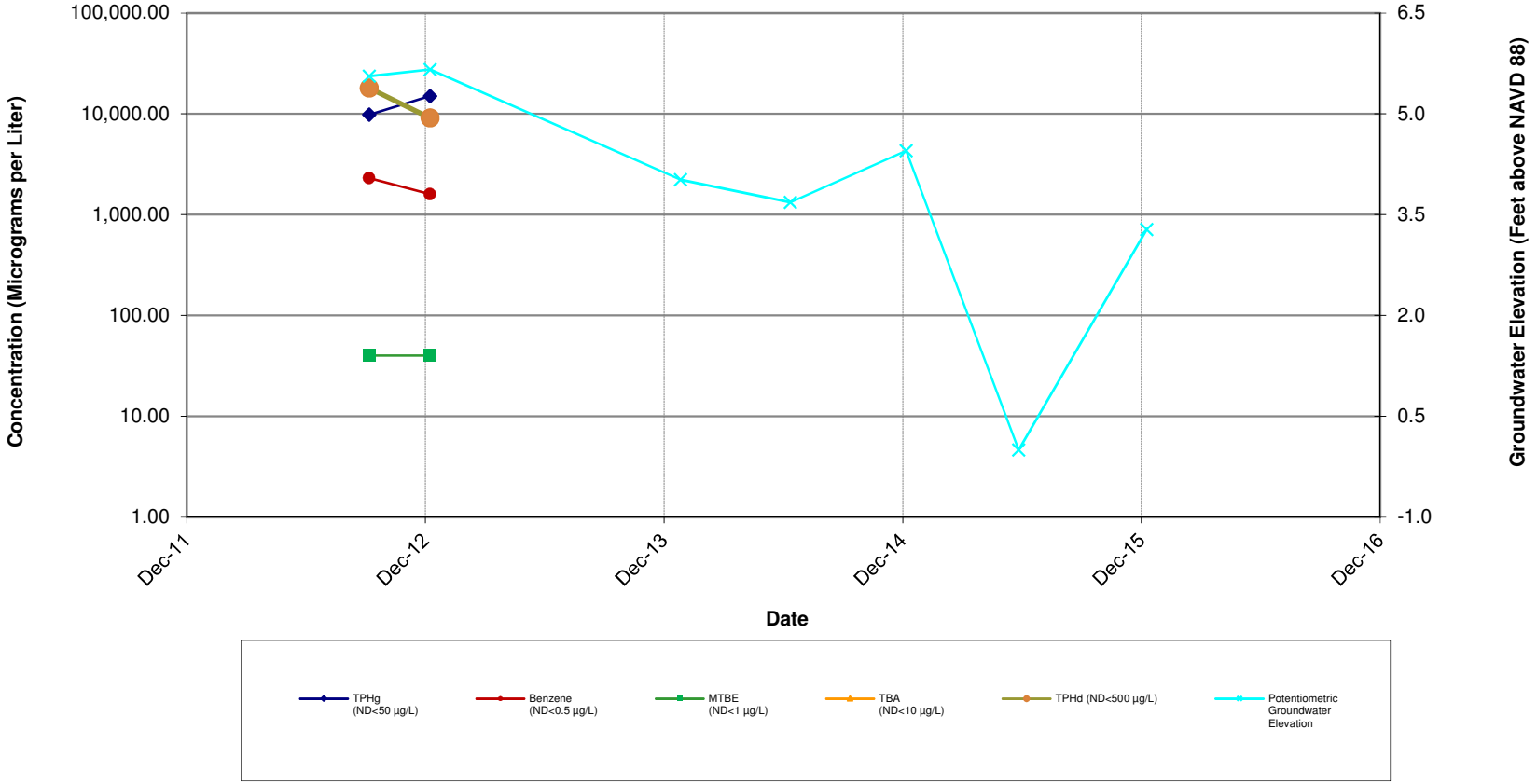


Concentrations over Time in Well MW-11 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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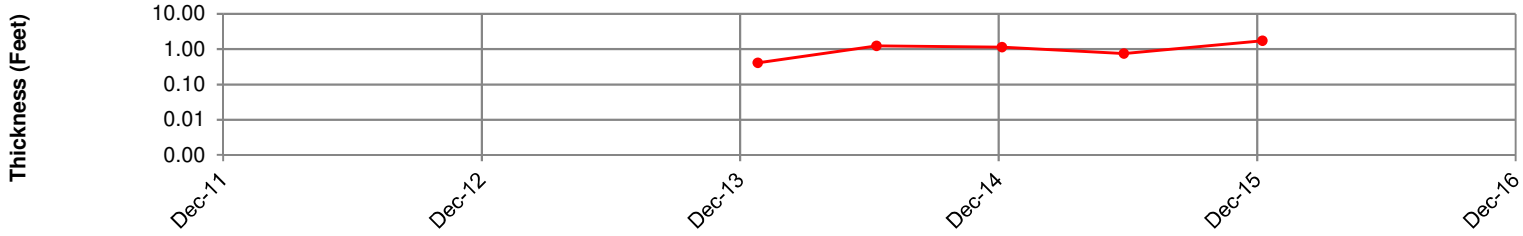
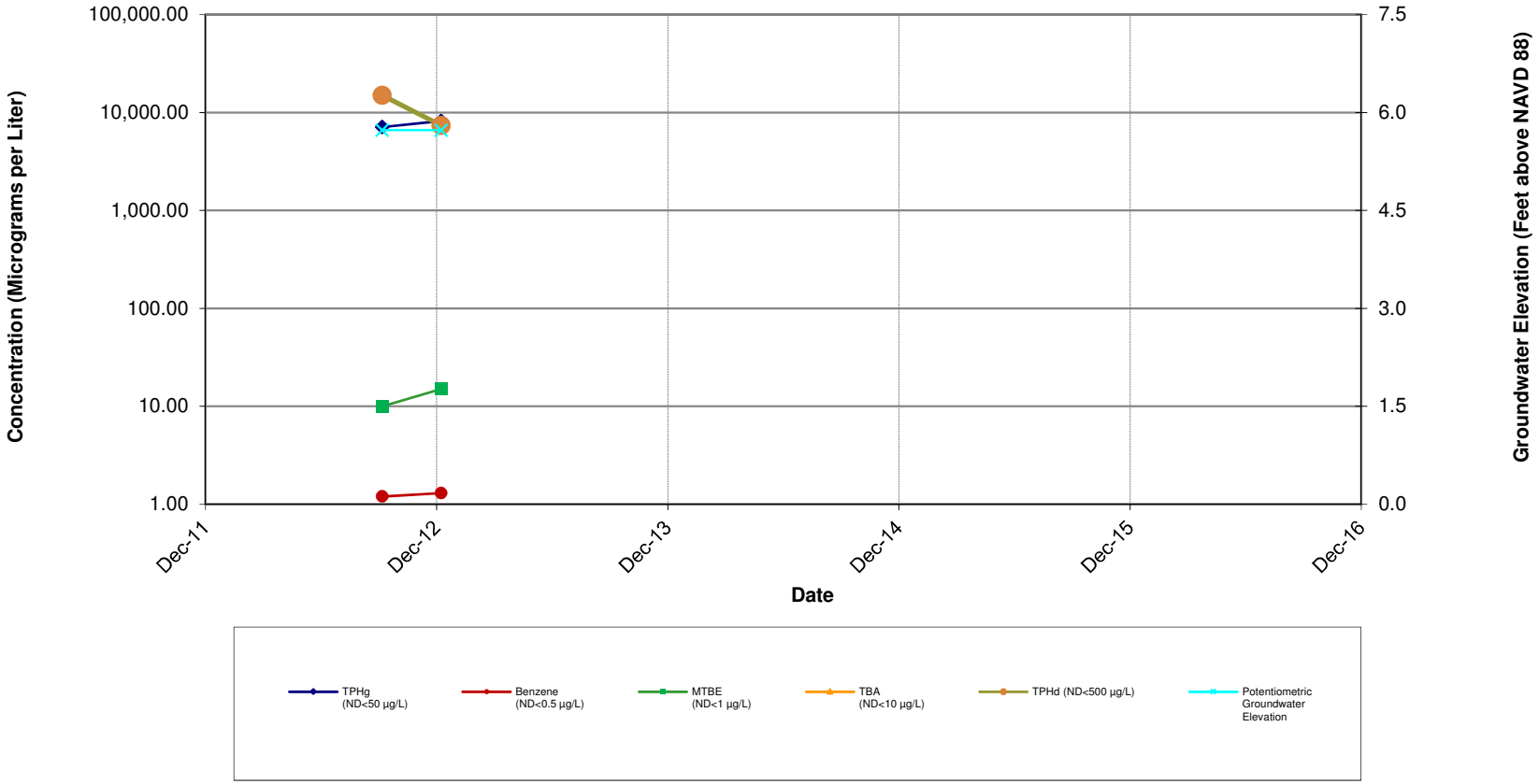


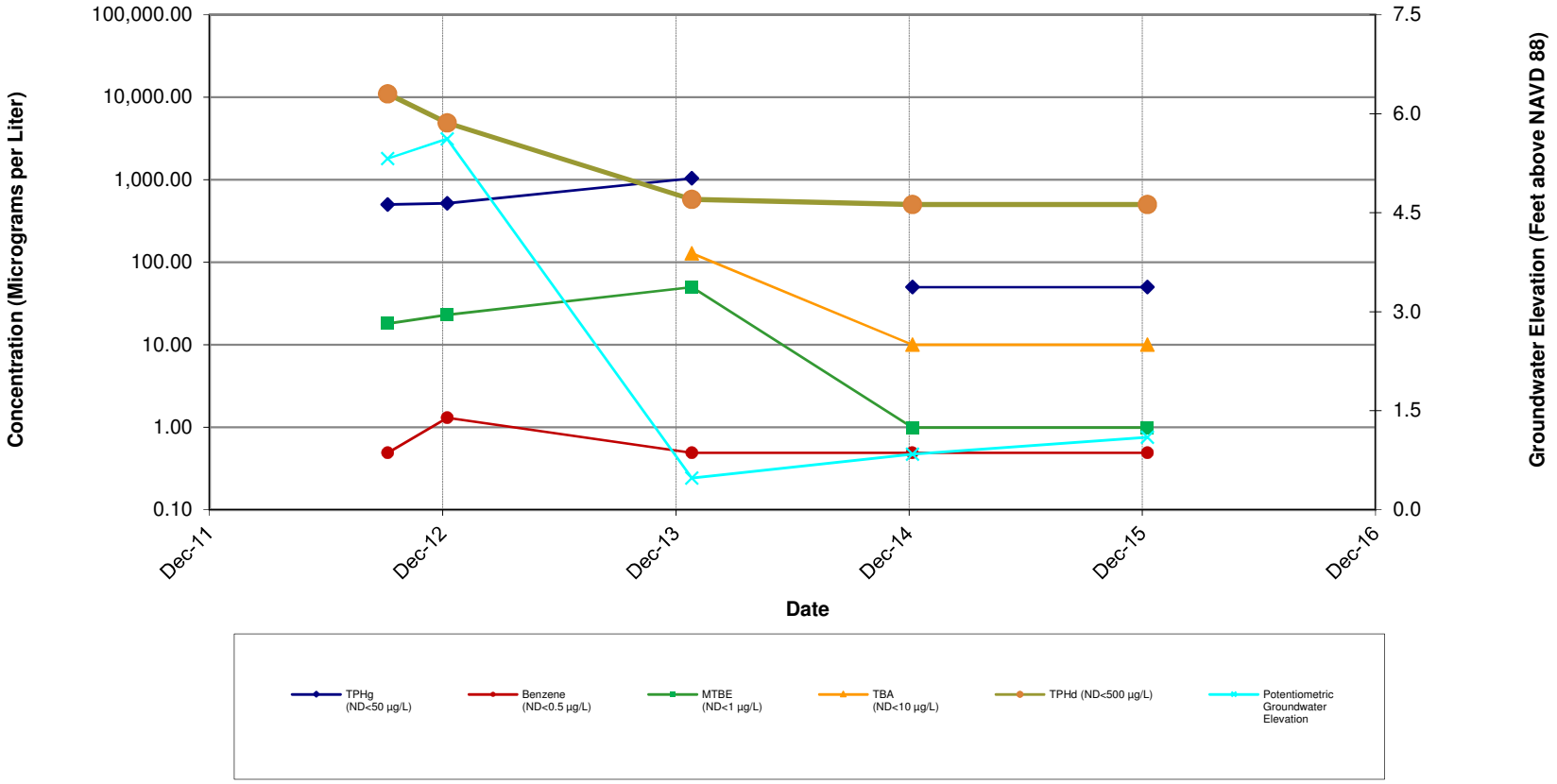
Concentrations over Time in Well MW-12 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



Concentrations over Time in Well MW-13 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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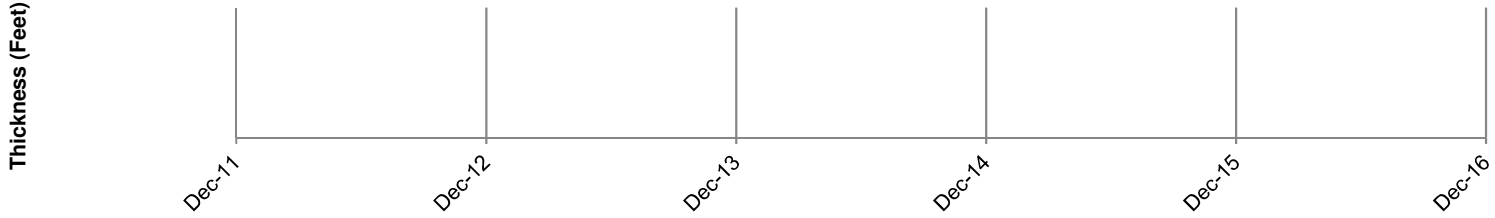
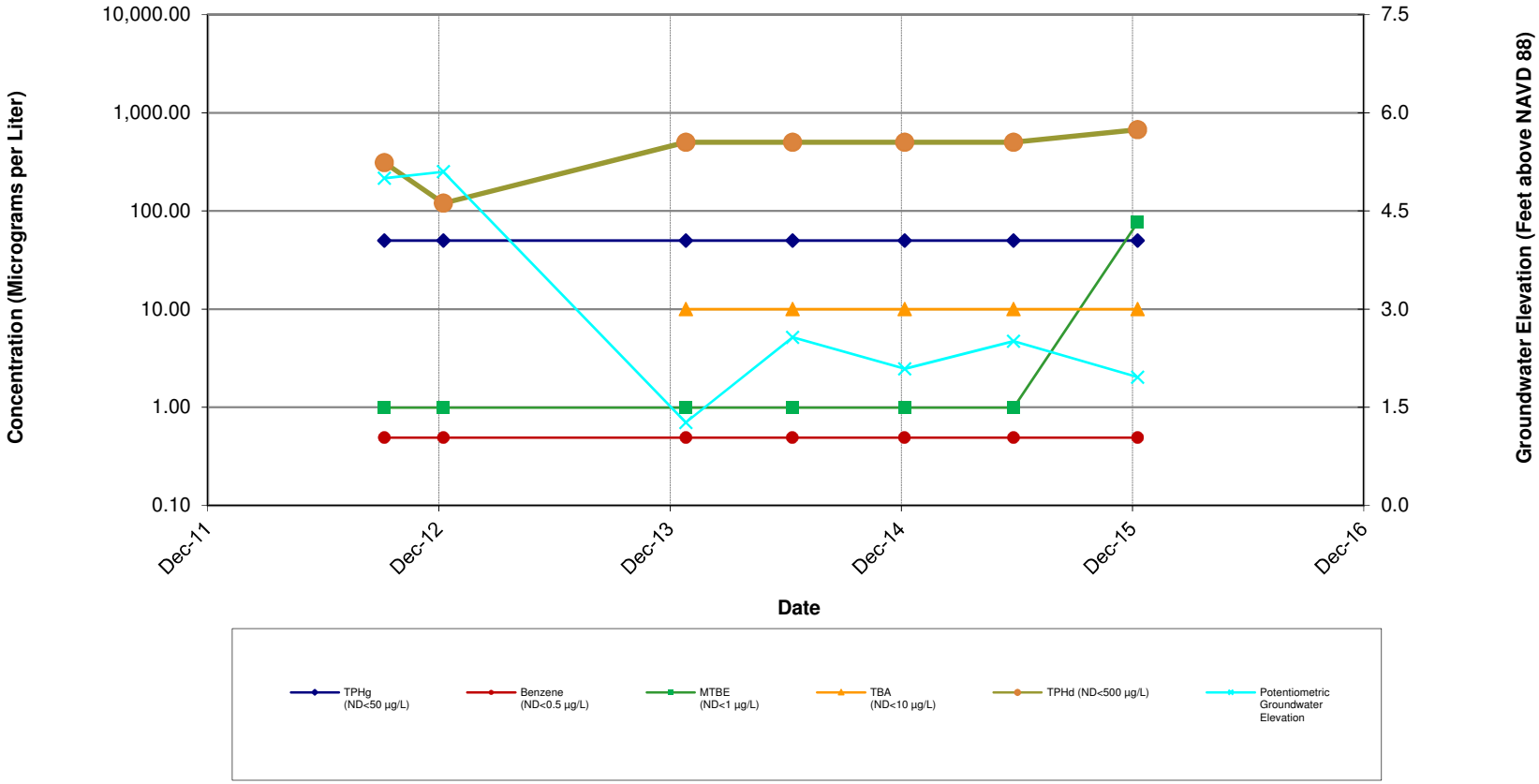


Concentrations over Time in Well MW-14 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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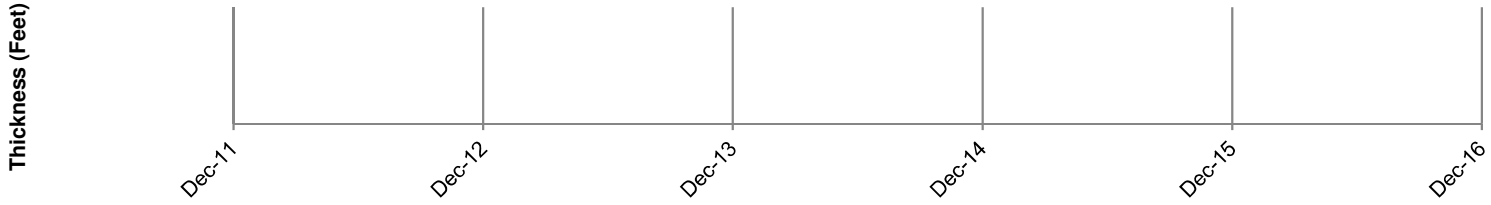
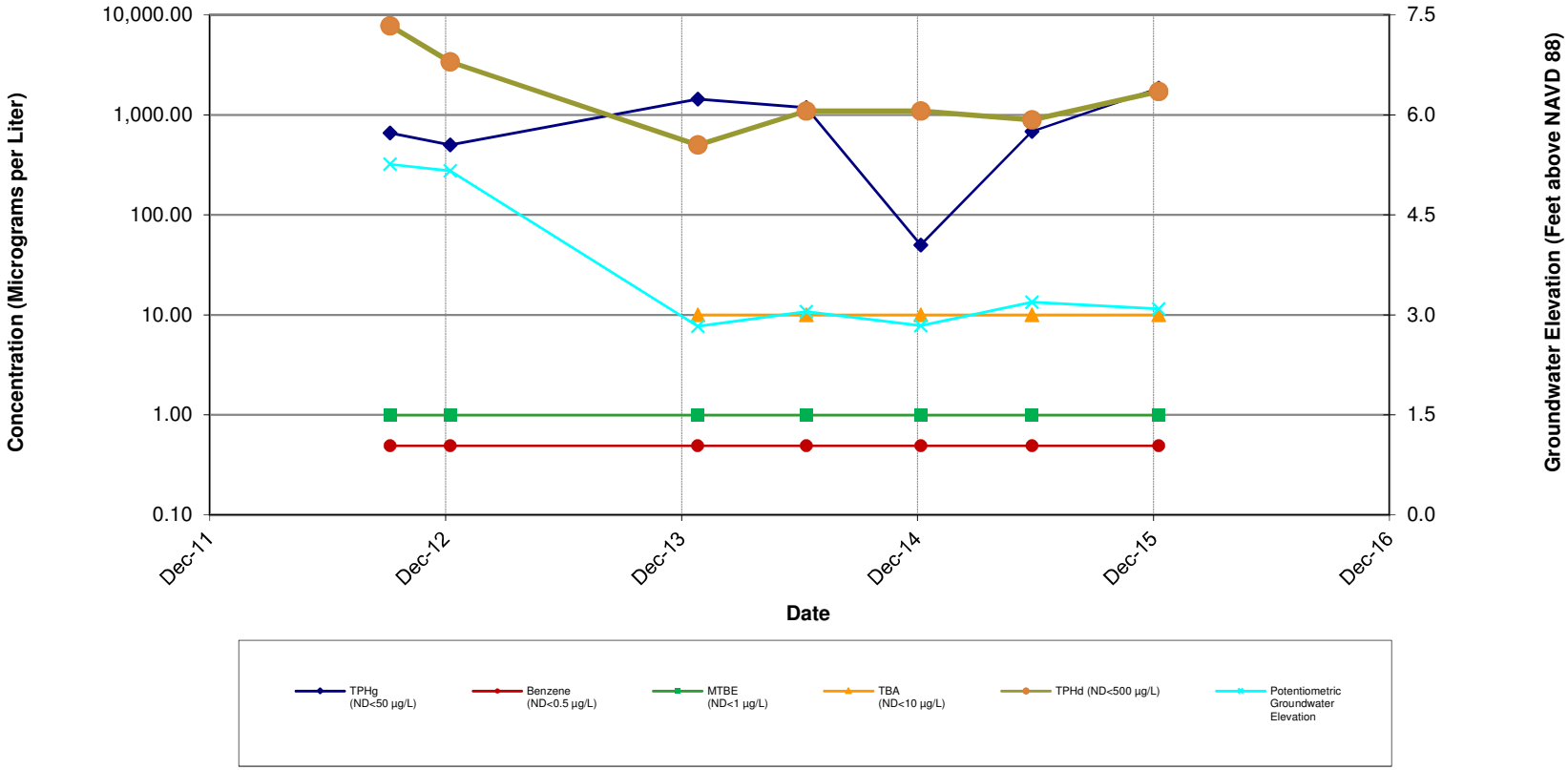


Concentrations over Time in Well MW-15 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



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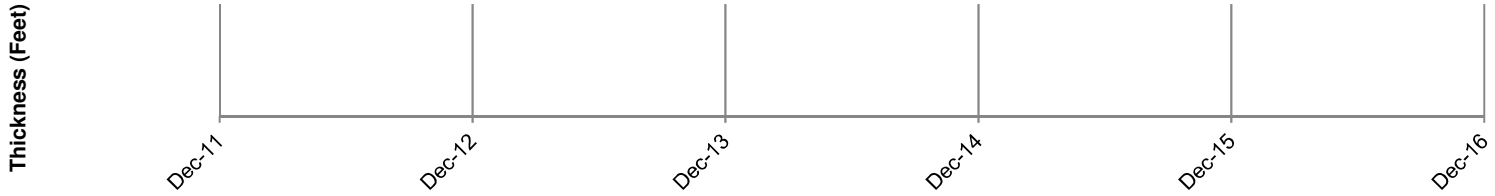
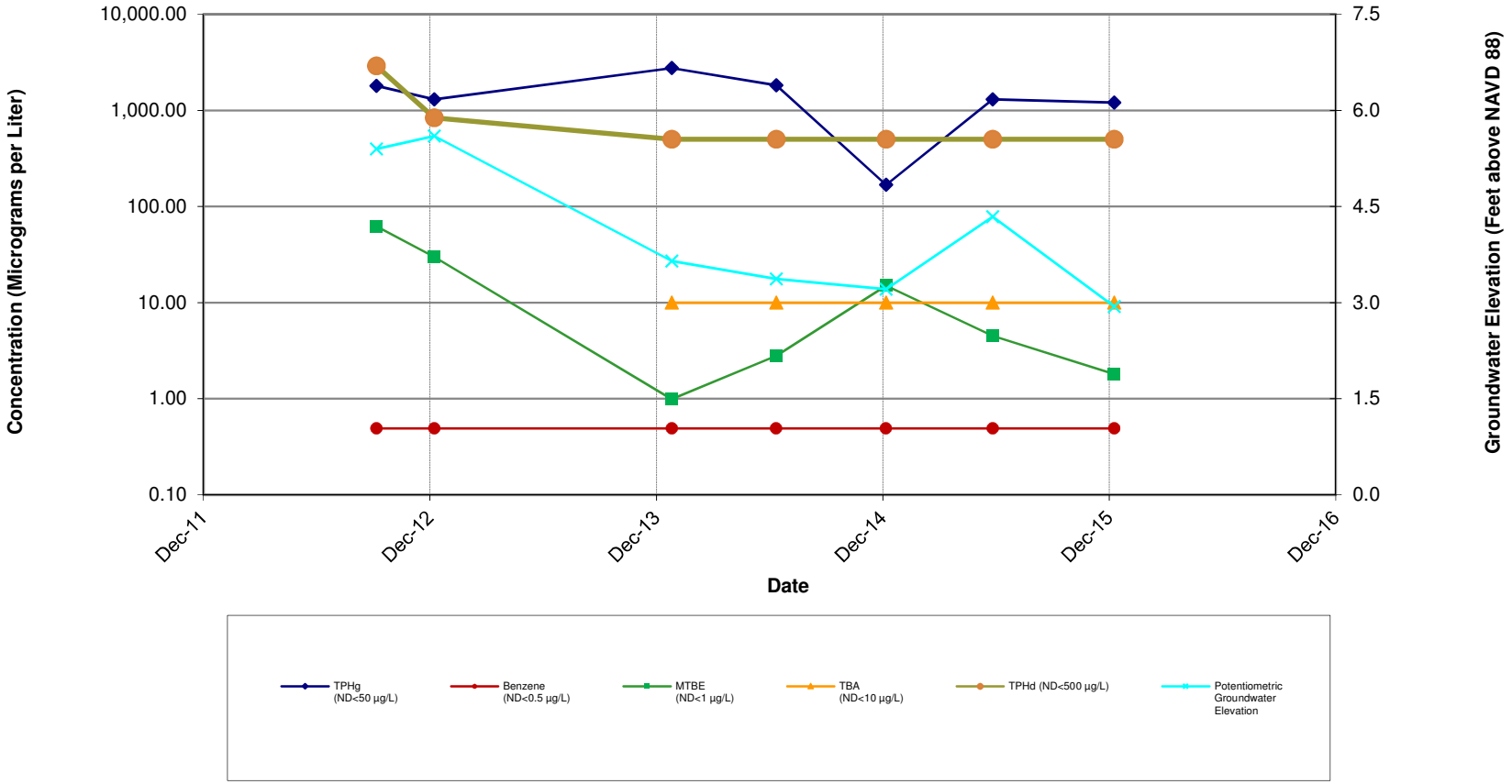


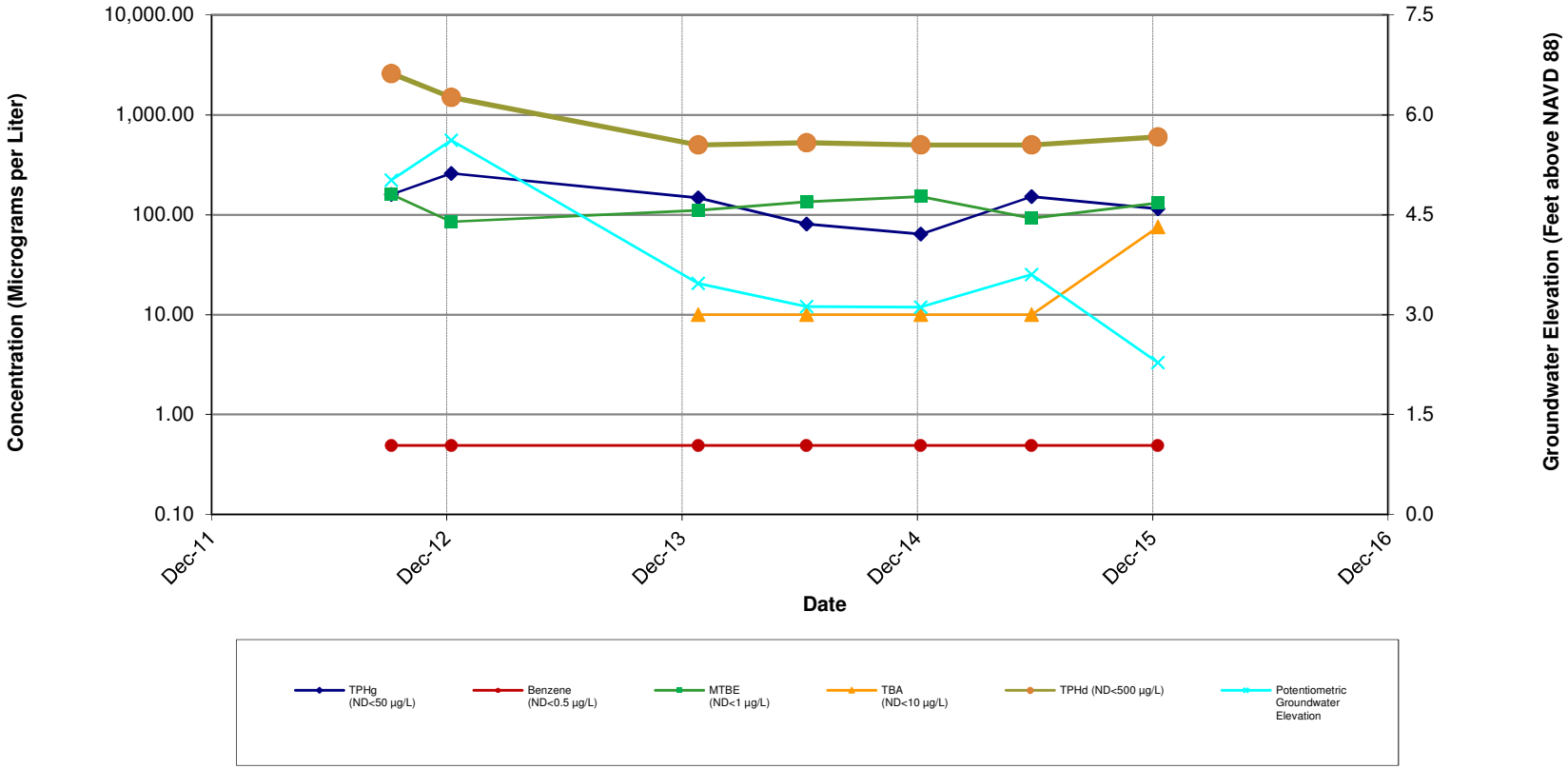
Concentrations over Time in Well MW-16 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755

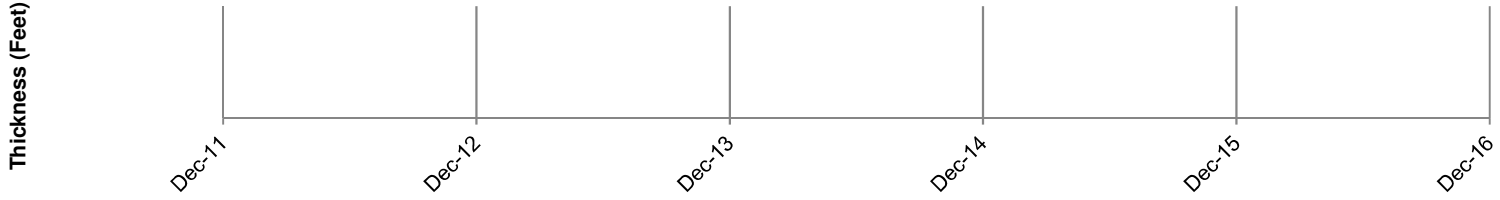


Concentrations over Time in Well MW-17 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755

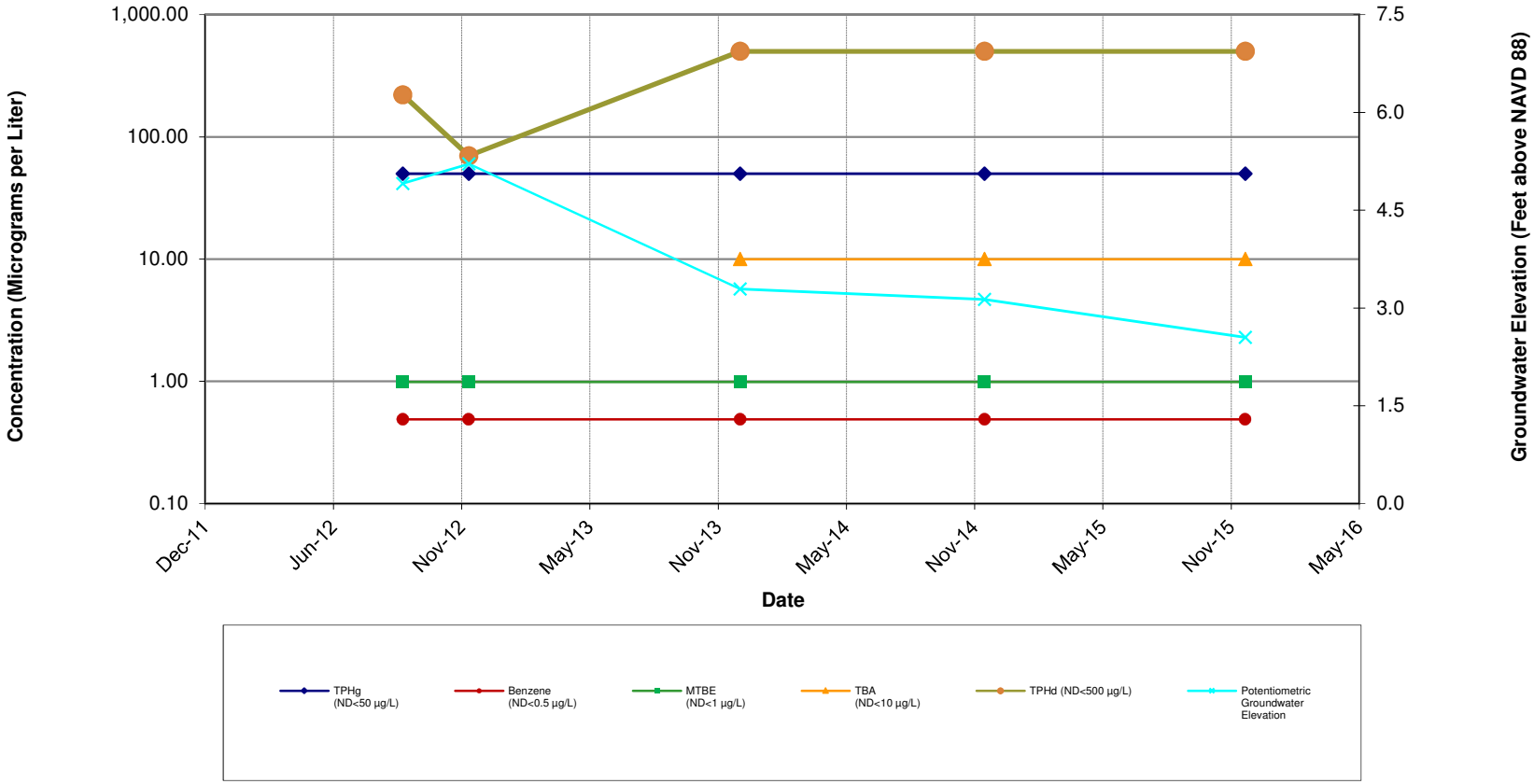


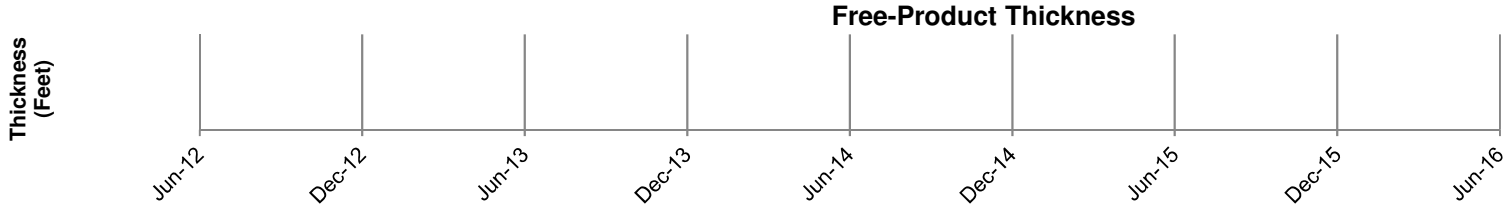
Free-Product Thickness



Concentrations over Time in Well MW-18 (Fourth Quarter 2015)

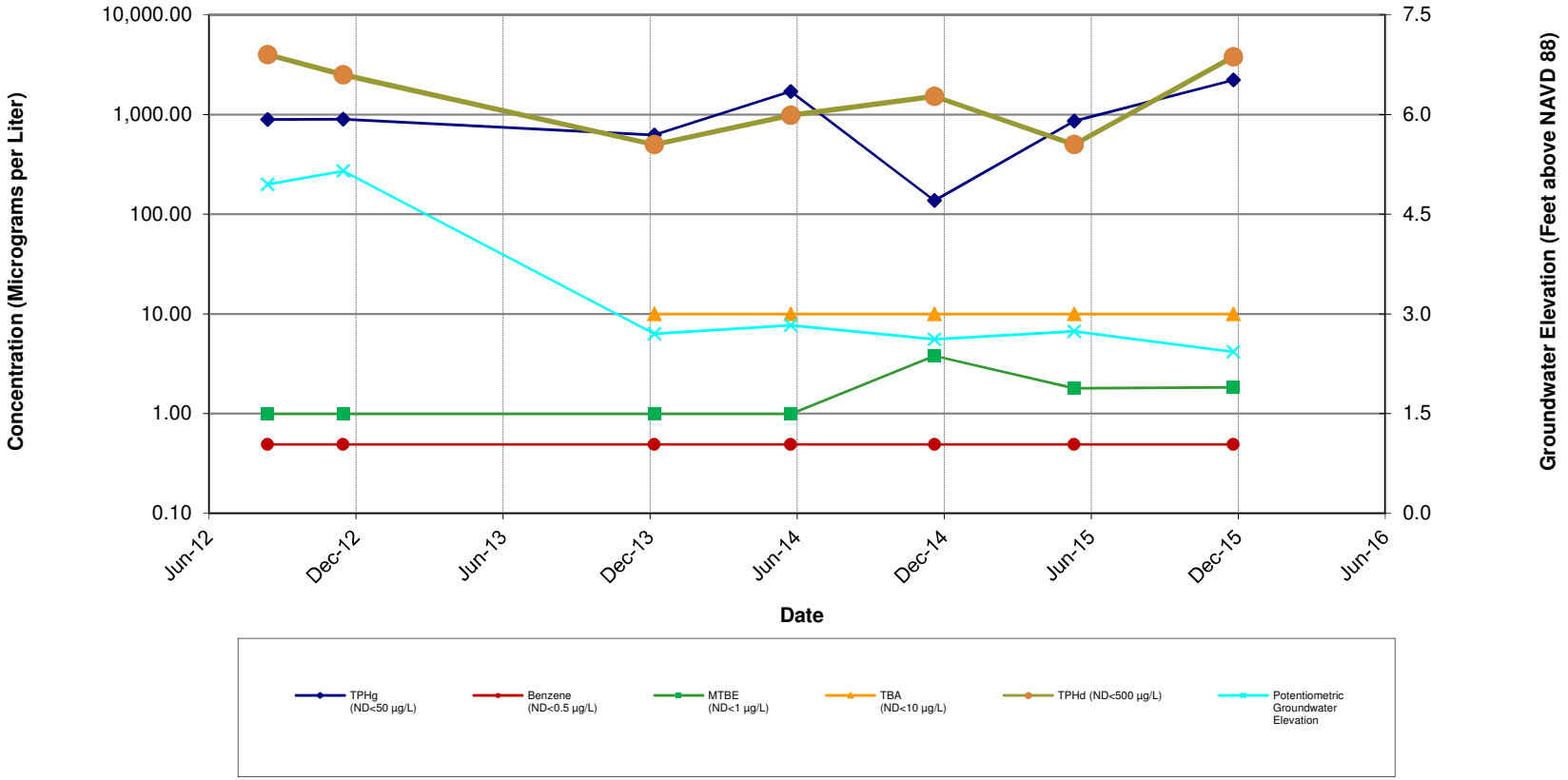
Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755





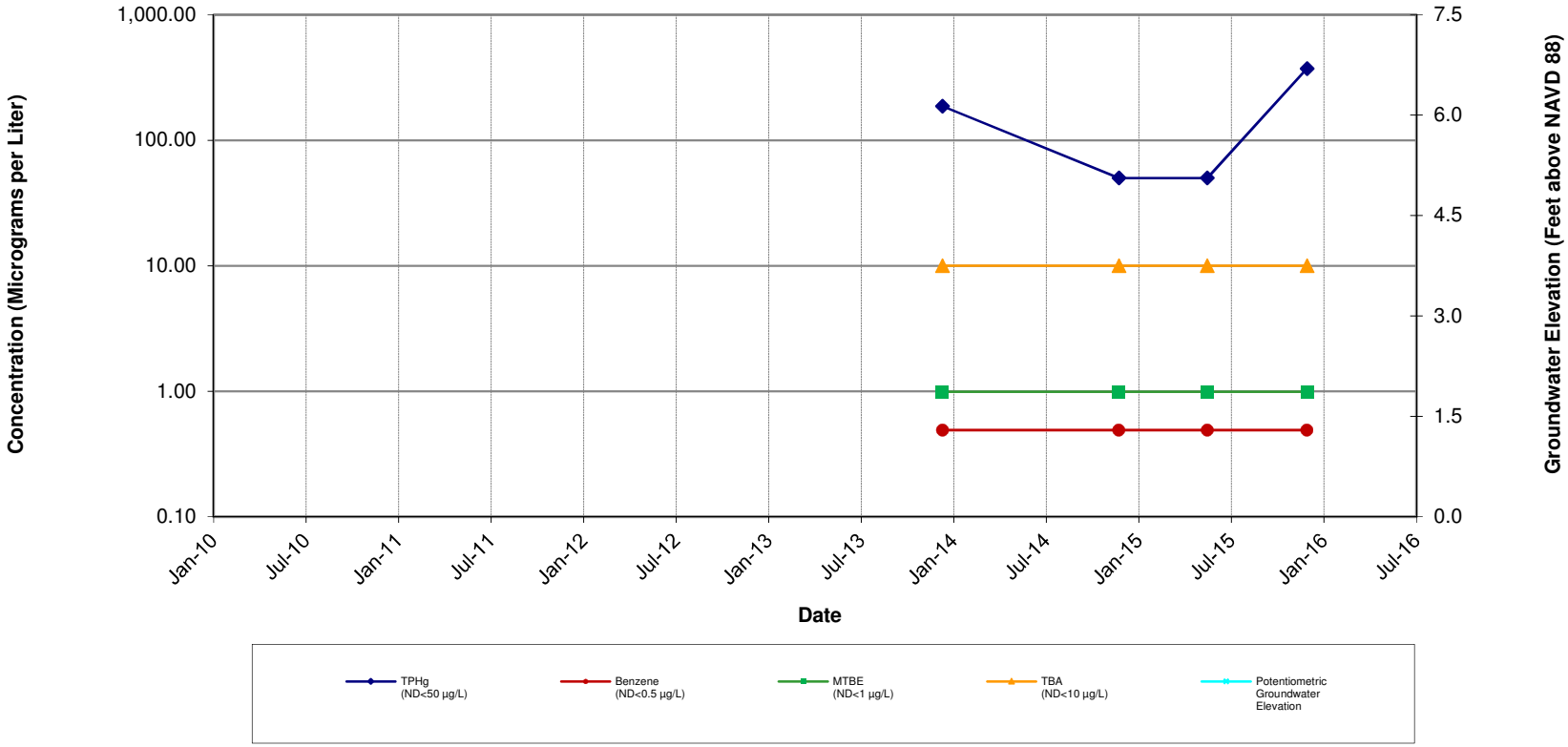
Concentrations over Time in Well MW-19 (Fourth Quarter 2015)

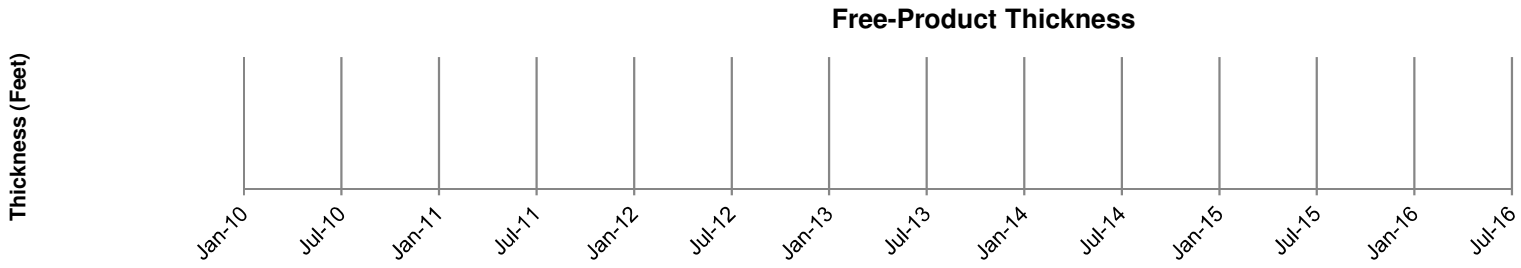
Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



Concentrations over Time in Well BMW-2 (Fourth Quarter 2015)

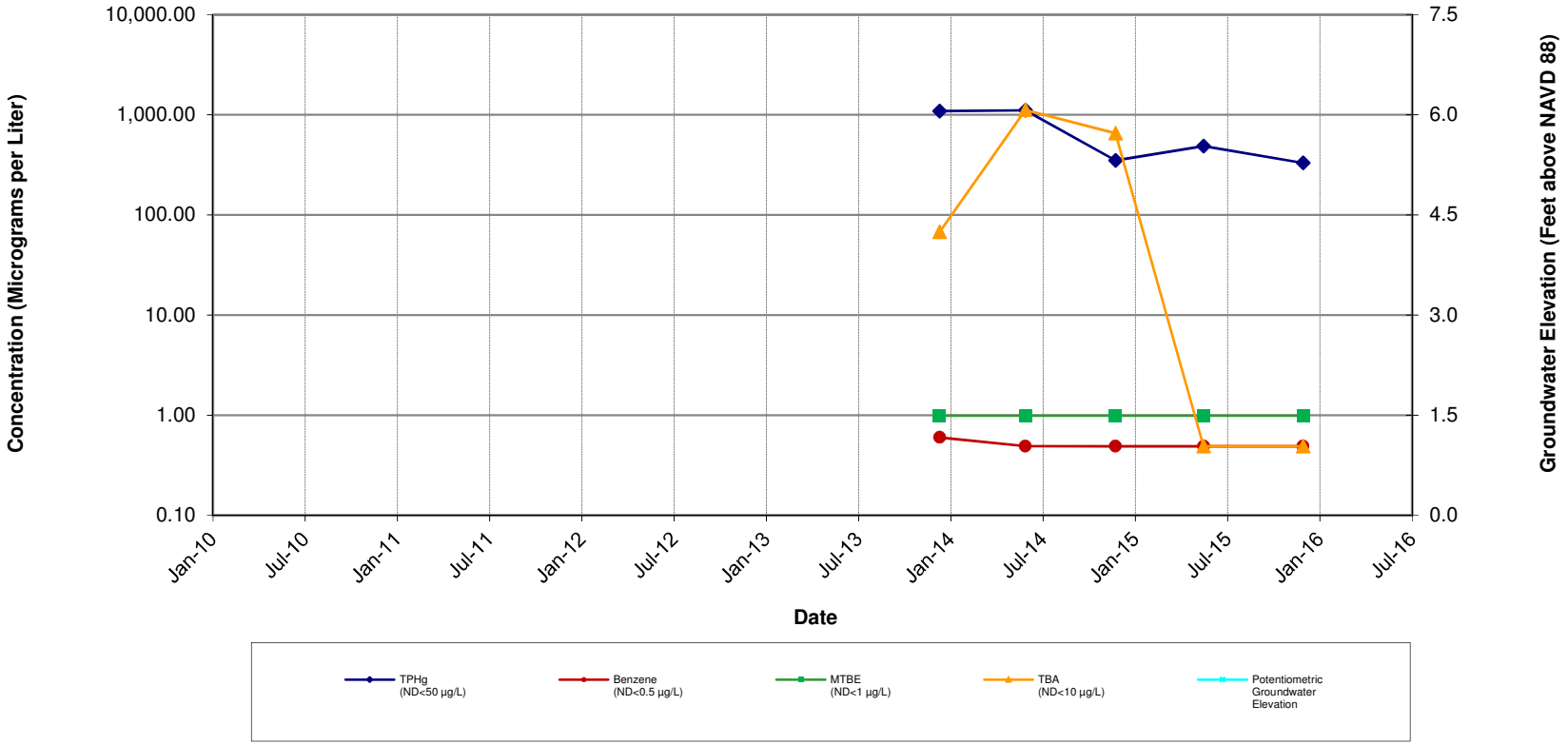
Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755

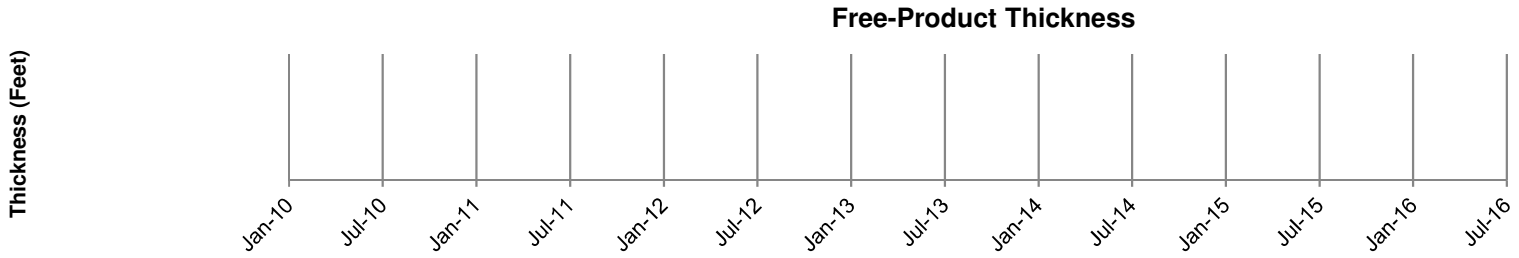




Concentrations over Time in Well BMW-5 (Fourth Quarter 2015)

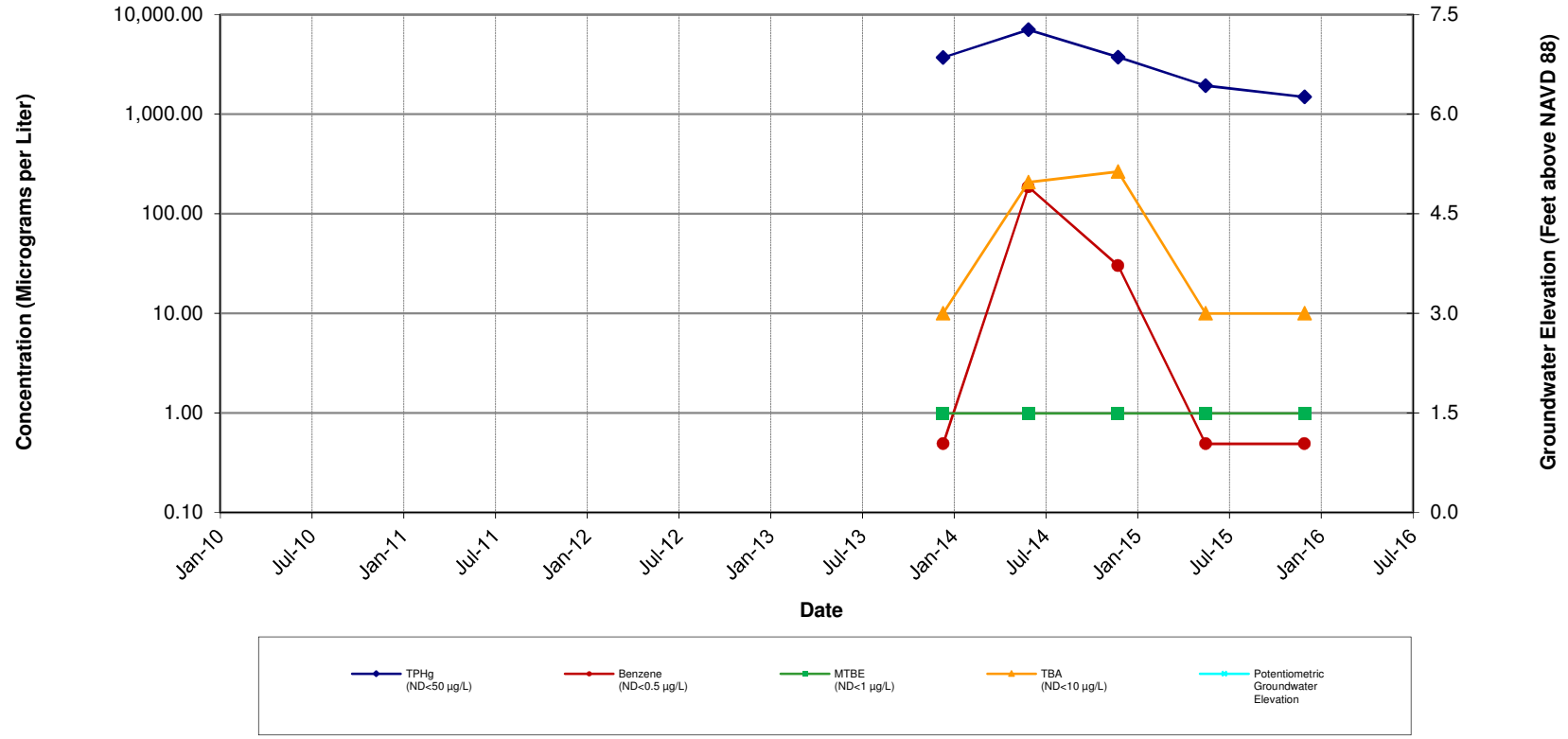
Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



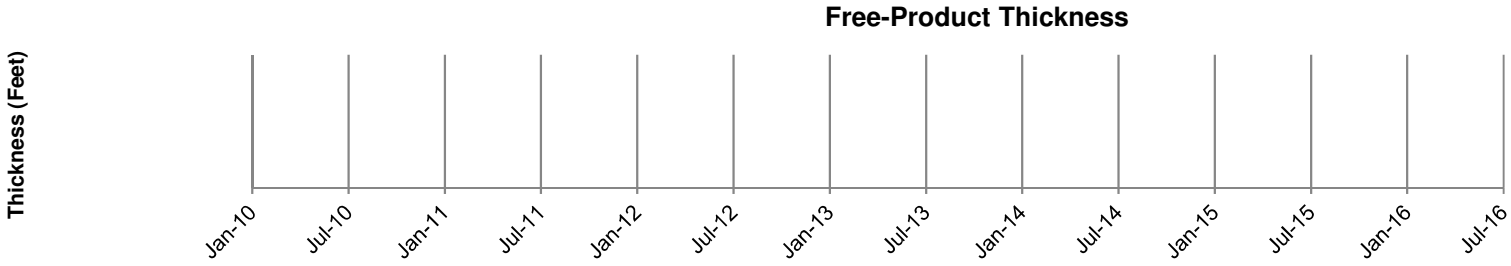


Concentrations over Time in Well BMW-8 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755

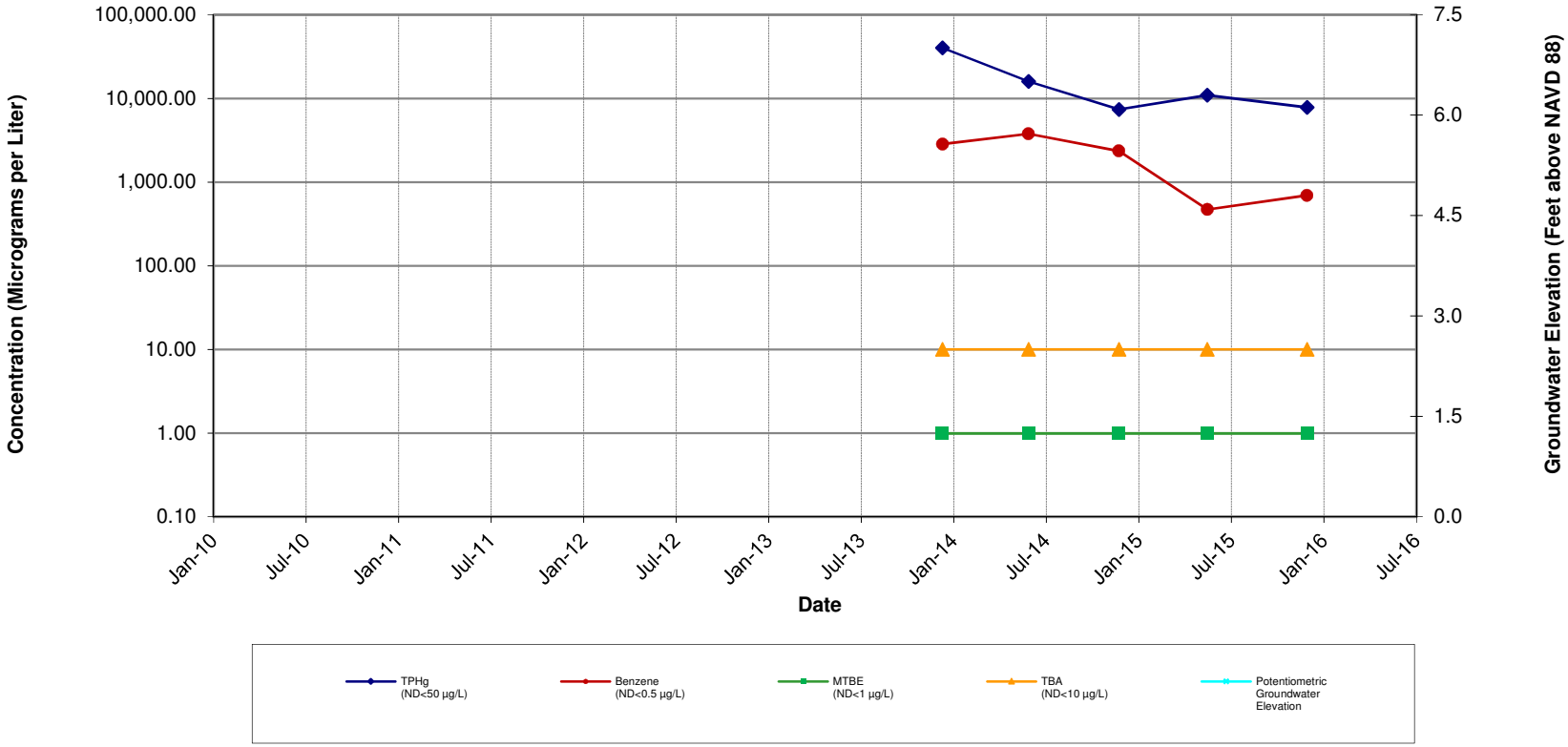


Free-Product Thickness

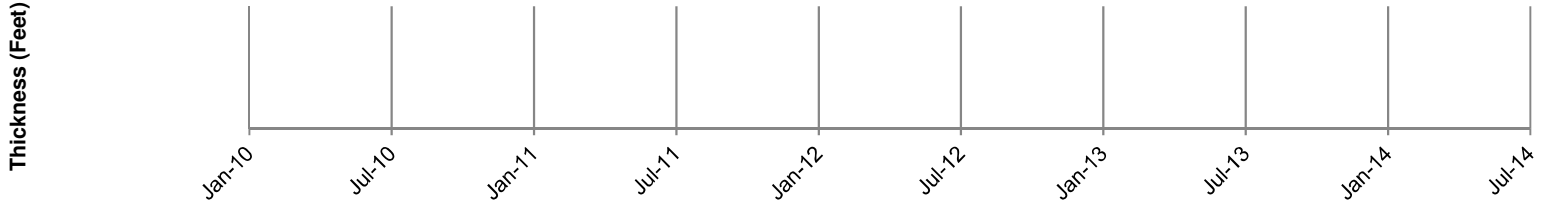


Concentrations over Time in Well BMW-11 (Fourth Quarter 2015)

Former ChemOil Refinery
2020 Walnut Avenue, Signal Hill, California 90755



Free-Product Thickness



Appendix G - Part 2

WDR Groundwater Monitoring Data:

1) Historical Analytical Data for 1Q14 to 4Q15

2) Graphs of Contaminant Concentrations over Time for 1Q14 to 4Q15

Table 1
WDR Groundwater Analytical Data
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well	Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation	Highest / Lowest Groundwater Elevation	TPHg* (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	Isopropylbenzene (µg/L)	n-Propylbenzene (µg/L)	1,2,4-Trimethylbenzene (µg/L)	n-Butylbenzene (µg/L)	Sec-Butylbenzene (µg/L)	Naphthalene (µg/L)	pH (pH Unit)	Temperature (C°)	Oxidation-reduction potential (mV)	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)	Turbidity (NTU)	Acetone (µg/L)	Ethanol (µg/L)	Sulfate (mg/L)	Total dissolved solids (mg/L)	Chloride (mg/L)	Boron (mg/L)	Carbon tetra-chloride (mg/L)	Total Organic Carbon (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Ammonia (mg/L)	Phosphate (mg/L)
MW-8																																															
MW-8	06/27/13	25.90	4	20-50	21.52	4.38	0.00	—	4.38	(H)	1,200	750	<0.5	<0.5	<0.5	1.1J	32.7	<1	<1	<1	471	59.3	40.4	<1	8.3	6.3	84.1	6.84	22.29	-111	2.96	2,670	119	<25	<250	2.7	1,300	369	1.01	<0.0005	59.3	<0.1	<0.1	1.7	0.61
MW-8	09/09/13	25.90	4	20-50	21.95	3.95	0.00	—	3.95	(L)	1,240	2,590	<0.5	<0.5	<0.5	<1	23.2	<1	<1	<1	229	64.6	45.8	<1	8.2	6.6	71.2	6.90	23.75	-118	6.15	2,550	161	<25	<250	9.3	1,250	215	0.94	<0.0005	81.1	<0.1	<0.1	1.52	0.06
MW-8	01/23/14	25.90	4	20-50	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-8	06/12/14	25.90	4	20-50	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-8	09/14/14	25.90	4	20-50	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-8	12/07/14	25.90	4	20-50	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-8	02/16/15	25.90	4	20-50	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-8	05/28/15	25.90	4	20-50	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-8	09/09/15	25.90	4	20-50	21.77	4.13	0.00	—	4.13		1,220	1,360	1.5	<0.5	<0.5	<0.5	12.0	<1	<1	<1	121	36.7	27.5	<1	5.2	5.7	66.6	6.8	18.9	-31	0.9	2,150	193	<25	<250	67.6	2,140	810	0.509	<0.5	21.8	<0.55	<0.75	<0.5	0.204
MW-8	12/10/15	25.90	4	20-50	21.89	4.01	0.00	—	4.01		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-9																																															
MW-9	06/27/13	36.88	4	29-49	32.38	4.50	0.00	—	4.50		2,510	830	33.9	1.4J	22.2	30.6	<2.5	<2.5	<2.5	<2.5	<25	53.8	50.1	5.0J	4.6J	6.9J	121	6.90	25.34	-132	8.75	2,360	64.6	<62.5	<625	1.7	1,090	309	1.05	<0.00125	20.7	<0.1	<0.1	0.5	0.51
MW-9	09/09/13	36.88	4	29-49	32.80	4.08	0.00	—	4.08		3,530	1,560	54.5	2.9	17.5	33.8	<1	<1	<1	<1	<1	58.1	53.1	4.0J	4.7J	7.6J	108	6.80	24.16	-102	3.88	2,420	113.0	<25	<250	10.7	1,160	206	0.82	<0.0005	31.0	0.17	<0.1	0.4	0.05
MW-9	01/23/14	36.88	4	29-49	33.40	3.48	0.00	—	3.48		6,310	<500	40.7	3.6	25.2	56.4	<1	<1	<1	<1	<10	84.9	84.0	10.5	7.6J	12.2	92.5	7.00	NM	495	0.16	1,810	152	<25	<1	3.0	1,100	240	0.86	<0.5	21.2	<0.1	0.11	0.2	1.02
MW-9	06/12/14	36.88	4	29-49	33.53	3.35	0.00	—	3.35		4,130	816	384	7.4	87.8	193	<1	<1	<1	<1	<10	11.9J	<1	11.8J	5.2J	<1	10.5J	7.00	21.29	-48	1.37	2,440	237	<25	<250	18.8	1,160	222	0.71	<0.5	15.9	<0.1	<0.1	0.2	1.02
MW-9	09/14/14	36.88	4	29-49	31.20	5.68	0.00	—	5.68	(H)	10,700	10,200	14.9	2.0	6.8	22.0	<2	<2	<2	<2	<20	57.2	62.5	3.9J	9.9	12.3	54.7	7.34	28.66	-68	2.58	2,370	800	<50	<500	8.7	1,160	300	0.95	<1	120	<0.55	<0.75	<0.50	<0.80
MW-9	12/07/14	36.88	4	29-49	33.68	3.20	0.00	—	3.20		9,270	1,440	29.4	1.7	<1	33.1	<2	<2	<2	<2	<20	<2	<2	2.1J	2.6J	2.1J	11.3	7.22	21.52	-37	2.42	2,380	318	<50	<500	4.4	1,120	240	0.742	<0.5	17.0	<0.55	<0.75	<0.50	<0.80
MW-9	02/16/15	36.88	4	29-49	33.67	3.21	0.00	—	3.21		4,940	1,740	10.1	1.9J	10.6	17.5	<2.5	<2.5	<2.5	<2.5	<25	56.1	49.4	2.5J	5.3	8.0J	67.3	6.90	20.37	-23	1.07	2,340	397	<62.5	<625	6.7	1,540	420	0.788	<1.25	15.0	<0.55	<0.75	1.1	<0.80
MW-9	05/28/15	36.88	4	29-49	33.78	3.10	0.00	—	3.10		12,400	9,110	11.9	1.8J	17.5	25.4	<2.5	<2.5	<2.5	<2.5	<25	77.4	72.1	5.6J	13.4	19.5	27.0	6.79	18.96	-23	0.95	2,350	356	<62.5	<625	<1	1,510	250	0.696	<1.25	23.5	<0.55	<0.75	<0.50	1.20
MW-9	09/09/15	36.88	4	29-49	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-9	01/08/16	36.88	4	29-49	34.14	2.74	0.00	—	2.74	(L)	3,090	737	25.7	3.6	19.8	30.1	<1	<1	<1	<1	<10	75.6	65.5	5.7	7.2	10.7	98.1	6.91	23.16	35	5.35	2,720	292	<25	<250	5.7	1,560	280	1.43	<0.50	25.9	<0.55	<0.75	<0.50	0.246

Table 1
WDR Groundwater Analytical Data
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

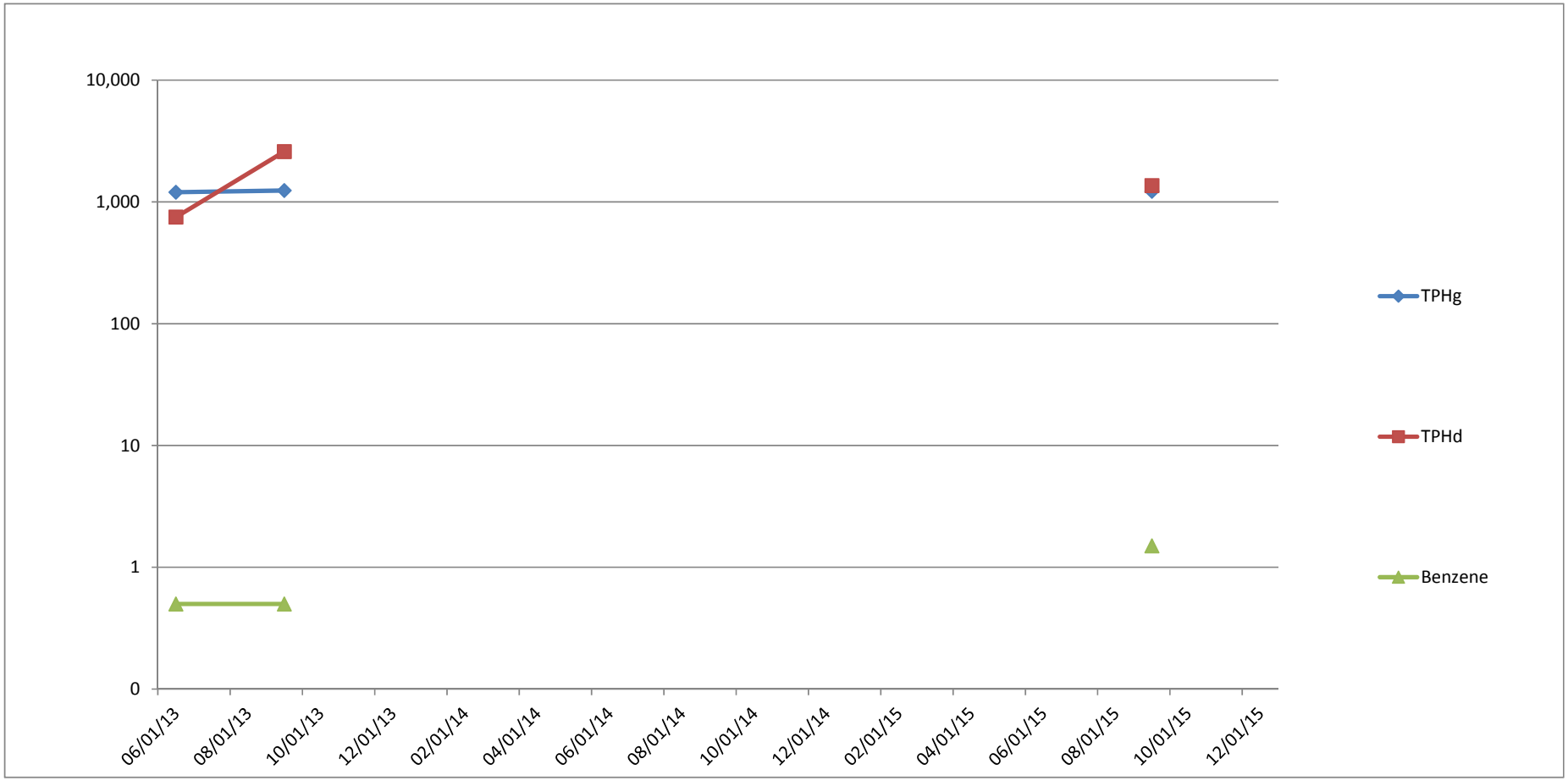
Well	Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation	Highest / Lowest Groundwater Elevation	TPHg* (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	Isopropylbenzene (µg/L)	n-Propylbenzene (µg/L)	1,2,4-Trimethylbenzene (µg/L)	n-Butylbenzene (µg/L)	Sec-Butylbenzene (µg/L)	Naphthalene (µg/L)	pH (pH Unit)	Temperature (C°)	Oxidation-reduction potential (mV)	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)	Turbidity (NTU)	Acetone (µg/L)	Ethanol (µg/L)	Sulfate (mg/L)	Total dissolved solids (mg/L)	Chloride (mg/L)	Boron (mg/L)	Carbon tetra-chloride (mg/L)	Total Organic Carbon (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Ammonia (mg/L)	Phosphate (mg/L)
MW-14																																															
MW-14	06/27/13	16.81	4	5-25	13.00	3.81	0.00	—	3.81	(H)	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	7.00	24.93	86	1.36	1,460	214	<25	<250	106	720	91.7	0.17	<0.0005	5.8	8.22	<0.1	0.1	0.38
MW-14	09/09/13	16.81	4	5-25	13.70	3.11	0.00	—	3.11		<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	6.95	24.64	19	2.60	1,550	253	<25	<250	172	769	87.5	<0.010	<0.0005	5.8	8.65	<0.1	<0.1	<0.02
MW-14	01/23/14	16.81	4	5-25	15.53	1.28	0.00	—	1.28	(L)	<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	7.08	NM	545	2.33	1,030	1.03	<25	<1	108	514	44.8	<0.010	<0.5	7.2	2.35	<0.1	<0.1	0.22
MW-14	06/12/14	16.81	4	5-25	14.23	2.58	0.00	—	2.58		<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	7.08	21.03	34	4.03	1,200	162	<25	<250	325	582	52.3	<0.010	<0.5	8.8	2.12	<0.1	0.2	0.10
MW-14	09/14/14	16.81	4	5-25	NS	—	0.00	—	—		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-14	12/07/14	16.81	4	5-25	14.71	2.10	0.00	—	2.10		<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	7.78	23.92	12	1.81	1,400	272	<25	<250	261	675	68	<0.010	<0.5	7.8	2.4	<0.75	0.84	<0.80
MW-14	02/16/15	16.81	4	5-25	14.56	2.25	0.00	—	2.25		<50	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	7.01	20.84	-3	1.45	1,370	318	<25	<250	18	940	100	<0.010	<0.5	8.5	2.5	<0.75	0.50	1.90
MW-14	05/28/15	16.81	4	5-25	14.29	2.52	0.00	—	2.52		<50	<500	<0.5	<0.5	<0.5	<1	1.1J	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	6.95	19.44	-12	1.33	1,470	226	<25	<250	273	1,010	66	<0.010	<0.5	7.24	<0.55	<0.75	<0.50	0.74
MW-14	09/09/15	16.81	4	5-25	14.70	2.11	0.00	—	2.11		<50	<500	<0.5	<0.5	<0.5	<1	2.7	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	7.01	18.98	-19	1.42	2,110	185	<25	<250	110	860	110	<0.010	<0.5	5.84	2.8	<0.75	0.55	0.120
MW-14	12/10/15	16.81	4	5-25	14.84	1.97	0.00	—	1.97		<50	<500	<0.5	<0.5	<0.5	<1	1.7J	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	7.10	23.12	35	4.55	2,100	278	<25	<250	223	973	81	0.450	<0.5	9.87	1.6	<0.75	<0.50	0.082
MW-15																																														
MW-15	06/27/13	17.17	4	6-26	12.40	4.77	0.00	—	4.77	(H)	578	869	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	48.4	4.1J	<1	<1	5.6	15.6	6.70	25.84	-82	7.93	1,880	178	<25	<250	4.0	922	235	0.44	<0.0005	31.1	<0.1	<0.1	1.19	0.30
MW-15	09/09/13	17.17	4	6-26	13.00	4.17	0.00	—	4.17		1,200	4,030	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	53.4	3.4J	<1	<1	5.64	<1	6.67	24.86	-122	2.38	1,840	197	<25	<250	7.0	911	127	0.40	<0.0005	53.9	0.18	<0.1	1.56	<0.02
MW-15	01/23/14	17.17	4	6-26	14.33	2.84	0.00	—	2.84	(L)	1,800	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	121	10.3	<1	2.2J	15.5	3.0J	6.95	NM	277	0.18	1,810	208	<25	<1	4.7	892	101	0.55	<0.5	41.3	<0.1	<0.1	1.09	1.49
MW-15	06/12/14	17.17	4	6-26	14.11	3.06	0.00	—	3.06		1,510	869	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	85.2	10.8	<1	2.5J	10.6	3.5J	6.95	20.98	8	1.94	1,850	172	<25	<250	19.6	931	107	0.54	<0.5	47.5	<0.1	<0.1	1.14	1.64
MW-15	09/14/14	17.17	4	6-26	14.21	2.96	0.00	—	2.96		1,100	1,700	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	101	8.6	<1	1.4J	12.2	4.9J	7.83	27.35	-146	1.67	1,740	303	<25	<250	9.5	866	110	0.65	<0.5	130	<0.55	<0.75	<0.50	1.0
MW-15	12/07/14	17.17	4	6-26	14.32	2.85	0.00	—	2.85		4,910	629J	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	87.5	4.1J	<1	<1	12.9	<1	7.29	25.52	-82	0.71	1,730	329	<25	<250	6.0	834	94	0.453	<0.5	30.6	1.5	<0.75	1.4	1.38
MW-15	02/16/15	17.17	4	6-26	14.09	3.08	0.00	—	3.08		1,010	635J	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	71.6	3.4J	<1	1.1J	8.7	1.1J	7.05	20.54	-56	1.31	1,350	3	<25	<250	13.9	913	140	<0.010	<0.5	6.4	<0.55	<0.75	0.9	<0.80
MW-15	05/28/15	17.17	4	6-26	13.97	3.20	0.00	—	3.20		1,220	1,410	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	173.0	4.9J	<1	1.4J	23.0	11	7.12	19.18	-61	1.04	675	361	<25	<250	21.3	410	47	0.030	<0.5	1.8	<0.55	<0.75	<0.50	0.86
MW-15	09/09/15	17.17	4	6-26	13.91	3.26	0.00	—	3.26		963	1,520	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	55.8	<1	<1	1.3J	12.9	6.9	7.15	19.13	12	1.17	1,980	414	<25	<250	1,200	1,080	79	<0.010	<0.5	3.22	<0.55	<0.75	<0.50	0.694
MW-15	12/10/15	17.17	4	6-26	14.07	3.10	0.00	—	3.10		1,220	1,980	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	36.2	<1	<1	1.7J	12.6	3.3J	6.51	23.51	-49	9.07	1,210	291	<25	<250	2.6	378	50	0.210	<0.5	2.39	<0.55	<0.75	<0.50	0.520

Table 1
WDR Groundwater Analytical Data
Former Chemoil Refinery
2020 Walnut Avenue, Signal Hill, California 90806

Well	Date	TOC Elevation	Casing Diameter (inch)	Screened Interval (ft bgs)	Depth to GW (ft)	Apparent GW Elevation	Free-Product Thickness (ft)	Apparent Free-Product Elevation	Potentiometric Groundwater Elevation	Highest / Lowest Groundwater Elevation	TPHg* (µg/L)	TPHd (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	MTBE (µg/L)	ETBE (µg/L)	DIPE (µg/L)	TAME (µg/L)	TBA (µg/L)	Isopropylbenzene (µg/L)	n-Propylbenzene (µg/L)	1,2,4-Trimethylbenzene (µg/L)	n-Butylbenzene (µg/L)	Sec-Butylbenzene (µg/L)	Naphthalene (µg/L)	pH (pH Unit)	Temperature (C°)	Oxidation-reduction potential (mV)	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)	Turbidity (NTU)	Acetone (µg/L)	Ethanol (µg/L)	Sulfate (mg/L)	Total dissolved solids (mg/L)	Chloride (mg/L)	Boron (mg/L)	Carbon tetra-chloride (mg/L)	Total Organic Carbon (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Ammonia (mg/L)	Phosphate (mg/L)
MW-16																																														
MW-16	06/27/13	18.41	4	7-27	13.45	4.96	0.00	—	4.96	(H)	940	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	25.9	7.8	<1	<1	11.7	3.2J	6.68	24.55	-97	3.83	1,160	174	<25	<250	12.2	558	75.1	0.37	<0.0005	19.4	<0.1	<0.1	0.2	1.198
MW-16	09/09/13	18.41	4	7-27	13.77	4.64	0.00	—	4.64		1,020	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	36.2	12.2	<1	<1	13.1	3.6J	6.60	21.55	-109	1.62	1,210	333	<25	<250	21.1	594	80.6	0.22	<0.0005	30.2	0.13	<0.1	0.2	0.06
MW-16	01/23/14	18.41	4	7-27	14.75	3.66	0.00	—	3.66		2,520	<500	<0.5	<0.5	<0.5	1.6J	<1	<1	<1	<1	<10	144	55.1	<1	3.6J	28.2	14.9	6.80	NM	227	0.44	1,020	150	<25	<1	8.1	500	65.8	0.27	<0.5	16.1	<0.1	<0.1	0.2	1.79
MW-16	06/12/14	18.41	4	7-27	15.03	3.38	0.00	—	3.38		2,240	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	4.5	<10	91.1	27.8	<1	<1	18.7	3.5J	6.80	21.11	55	4.88	1,270	183	<25	<250	19.6	641	95.6	0.33	<0.5	22.2	<0.1	<0.1	0.3	1.88
MW-16	09/14/14	18.41	4	7-27	15.07	3.34	0.00	—	3.34		839	<500	<0.5	<0.5	<0.5	<1	3.2	<1	<1	<1	<10	55.7	11.8	<1	<1	11.5	1.2J	7.21	26.15	-91	1.61	1,220	332	<25	<250	8.4	603	96	0.44	<0.5	94	<0.55	<0.75	2.9	<0.80
MW-16	12/07/14	18.41	4	7-27	15.19	3.22	0.00	—	3.22		1,130	<500	<0.5	<0.5	<0.5	<1	10.5	<1	<1	<1	<10	16.3	3.6J	<1	<1	6.4	2.5J	7.53	24.82	-36	2.18	1,260	582	<25	<250	7.1	616	150	0.338	<0.5	18.7	<0.55	<0.75	<0.50	<0.80
MW-16	02/16/15	18.41	4	7-27	15.03	3.38	0.00	—	3.38		1,010	<500	<0.5	<0.5	<0.5	<1	7.4	<1	<1	<1	<10	38.2	6	<1	<1	6.3	3.5J	7.69	19.80	-80	1.28	1,280	362	<25	<250	6.7	858	150	0.388	<0.5	20.3	<0.55	<0.75	<0.50	<0.80
MW-16	05/28/15	18.41	4	7-27	14.06	4.35	0.00	—	4.35		2,830	<500	<0.5	<0.5	<0.5	<1	10.7	<1	<1	<1	<10	78.7	17	<1	<1	17.8	9	7.33	18.78	-47	0.75	1,280	458	<25	<250	8.1	770	93	0.384	<0.5	22.2	<0.55	<0.75	<0.50	0.83
MW-16	09/09/15	18.41	4	7-27	15.07	3.34	0.00	—	3.34		2,350	<500	<0.5	<0.5	<0.5	<1	21.0	<1	<1	<1	<10	94.8	32.5	<1	2.7J	16.8	18.8	7.25	18.34	-9	0.89	1,860	800	<25	<250	<1	760	170	0.609	<0.5	25.9	<0.55	<0.75	<0.50	0.609
MW-16	12/10/15	18.41	4	7-27	15.46	2.95	0.00	—	2.95	(L)	1,010	<500	<0.5	<0.5	<0.5	<1	17J	<1	<1	<1	<10	16.0	2.4J	<1	<1	7.0	2.6J	7.18	22.08	-59	50	1,180	359	<25	<250	2.3	706	95	0.792	<0.5	43.1	<0.55	<0.75	<0.50	0.260
MW-19																																													
MW-19	06/27/13	16.46	4	3-20	12.03	4.43	0.00	—	4.43	(H)	774	<500	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	48.6	<1	<1	<1	6.2	139	6.83	26.27	-80	5.25	2,830	194	<25	<250	1.8	1,380	368.0	0.61	<0.0005	68.6	<0.1	<0.1	4.2	0.624
MW-19	09/09/13	16.46	4	3-20	12.58	3.88	0.00	—	3.88		839	16,400	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	26.9	55.6	1.2J	<1	<1	6.9	183	6.73	24.44	-133	4.29	2,840	281	<25	<250	5.6	1,380	236	0.51	<0.0005	89.0	0.13	<0.1	5.10	0.06
MW-19	01/23/14	16.46	4	3-20	13.75	2.71	0.00	—	2.71		1,710	1,380	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	99.0	107	4.4J	<1	<1	14.3	162	7.00	NM	255	0.11	2,890	502	<25	<1	2.9	1,390	275	0.50	<0.5	54.7	<0.1	<0.1	4.57	2.47
MW-19	06/12/14	16.46	4	3-20	13.62	2.84	0.00	—	2.84		1,500	971	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	51.9	92.5	1.7J	<1	2.0J	8.9	56.9	7.00	20.88	12	2.35	2,950	202	<25	<250	15.1	1,450	95	0.48	<0.5	43.7	<0.1	<0.1	4.02	1.92
MW-19	09/14/14	16.46	4	3-20	13.75	2.71	0.00	—	2.71		1,110	2,660	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	92.3	<1	<1	1.4J	11.1	3.7J	6.79	29.45	-136	1.40	2,810	302	<25	<250	11.5	1,420	300	0.67	<0.5	170	<0.55	<0.75	2.7	<0.80
MW-19	12/07/14	16.46	4	3-20	13.83	2.63	0.00	—	2.63		1,190	1,810	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<10	106	<1	<1	1.6J	13.1	3.68J	6.92	25.87	-65	1.22	9,810	337	<25	<250	3,160	4,210	300	<0.010	<0.5	35.9	<0.55	<0.75	<0.50	7.56
MW-19	02/16/15	16.46	4	3-20	13.65	2.81	0.00	—	2.81		1,040	3,890	<0.5	<0.5	<0.5	<1	2	<1	<1	<1	<10	58	<1	<1	1.0J	7.0	1.6J	6.99	20.85	-29	1.50	3,000	401	<25	<250	8.3	2,030	480	0.535	<0.5	37.7	<0.55	<0.75	1.8	<0.80
MW-19	05/28/15	16.46	4	3-20	13.71	2.75	0.00	—	2.75		1,760	3,940	<0.5	<0.5	<0.5	<1	3	<1	<1	<1	<10	110	1.1J	<1	1.9J	14.2	2.7J	7.04	19.56	-34	1.62	2,970	394	<25	<250	1.9	1,620	300	0.581	<0.5	35.2	<0.55	<0.75	<0.50	1.30
MW-19	09/09/15	16.46	4	3-20	18.37	-1.91	0.00	—	-1.91	(L)	1,530	2,860	<0.5	<0.5	<0.5	<1	4.2	<1	<1	<1	<10	80.2	<1	<1	2.6J	10.7	4.8J	6.87	18.29	-21	1.82	2,890	316	<25	<250	4.2	1,480	540	0.710	<0.5	35.3	<0.55	<0.75	<0.50	0.855
MW-19	12/10/15	16.46	4	3-20	14.02	2.44	0.00	—	2.44		1,990	3,370	<0.5	<0.5	<0.5	<1	3.3J	<1	<1	<1	10.9J	94.8	1.4J	<1	2.0J	12.0	3.4J	6.81	23.51	-36	15.71	2,810	392	<25	<250	4.0	1,990	310	0.948	<0.5	69.6	<0.55	<0.75	<0.50	0.385

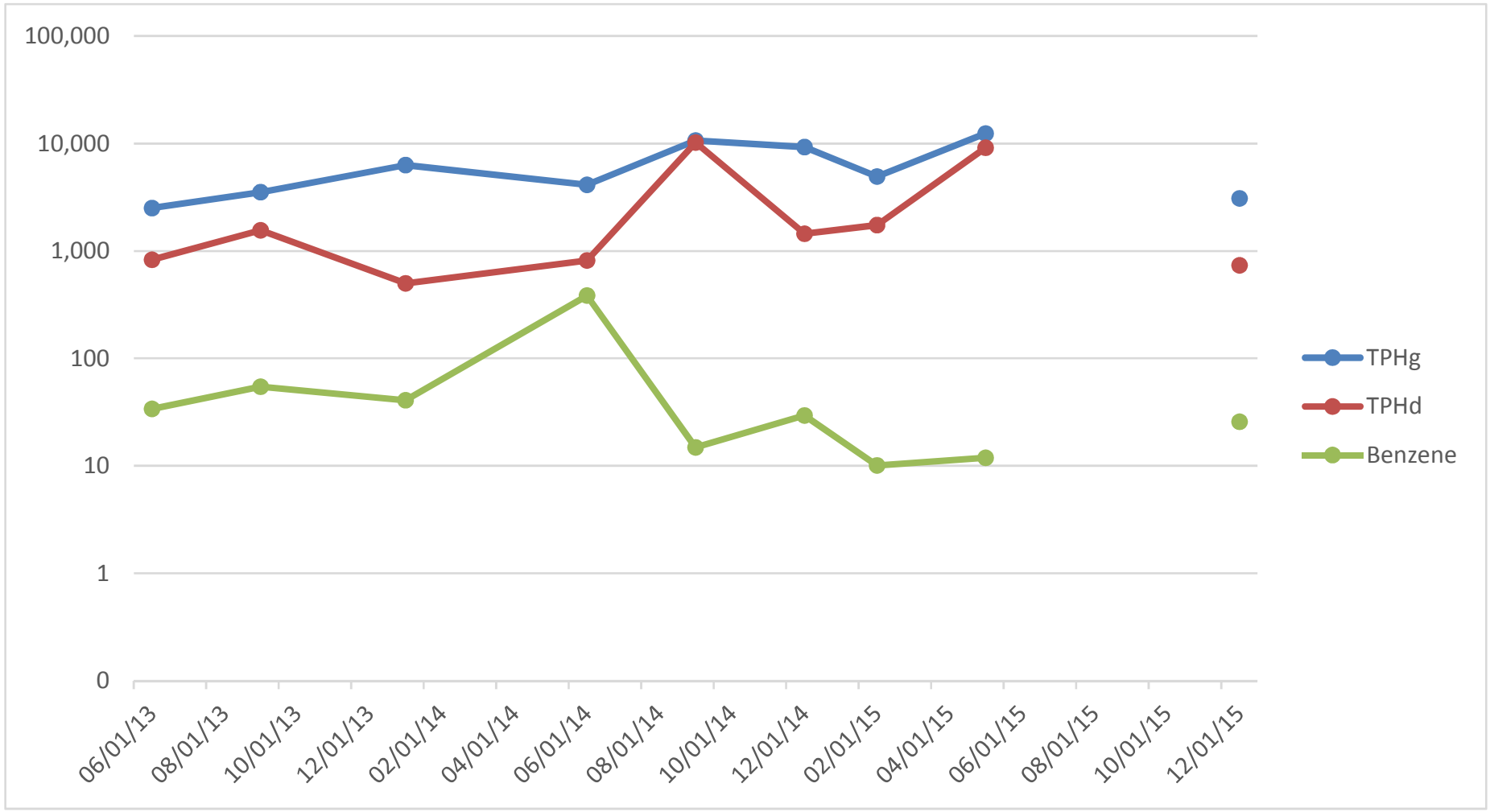
Concentrations over Time in Well MW-8

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



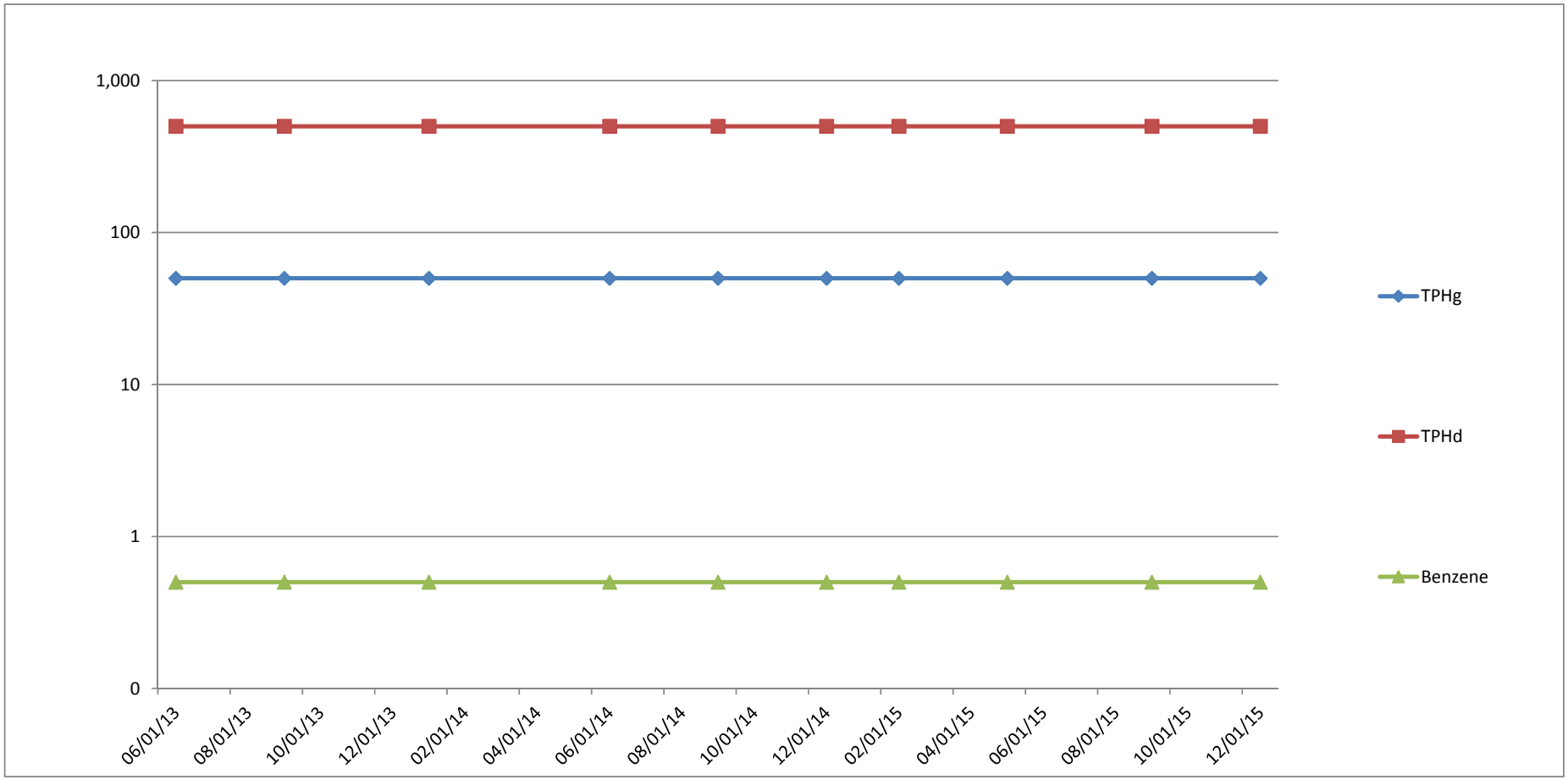
Concentrations over Time in Well MW-9

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



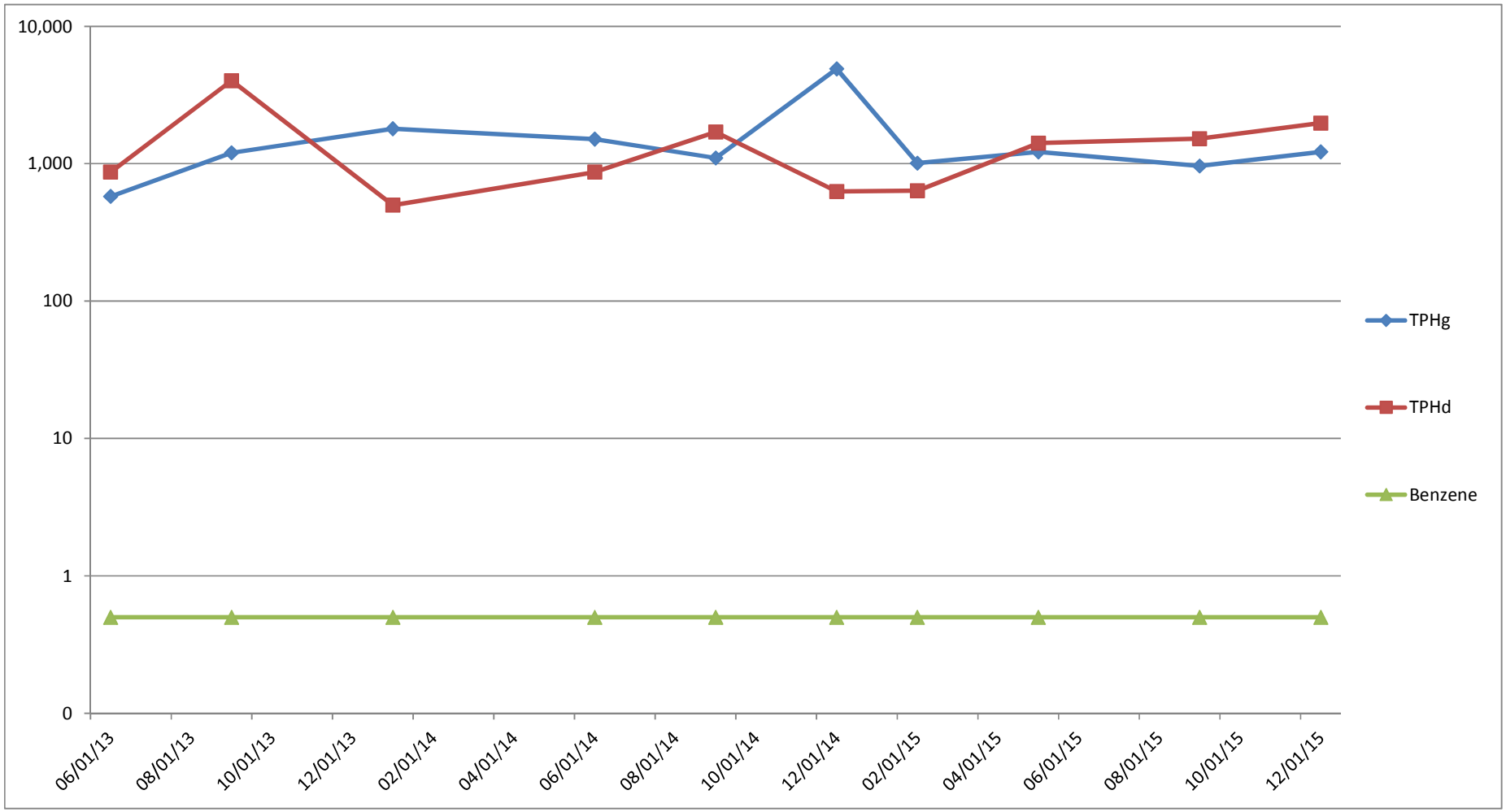
Concentrations over Time in Well MW-14

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



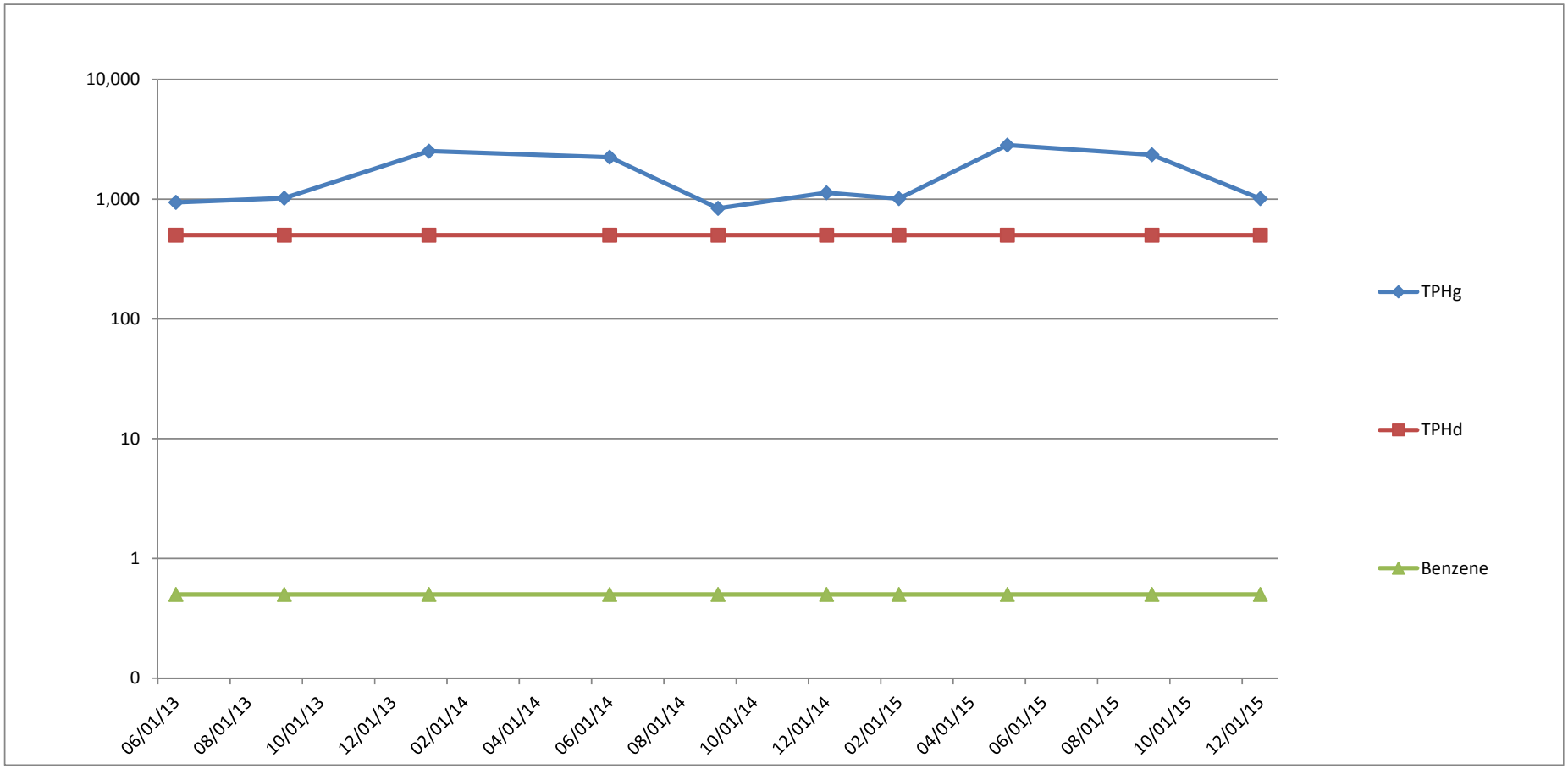
Concentrations over Time in Well MW-15

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



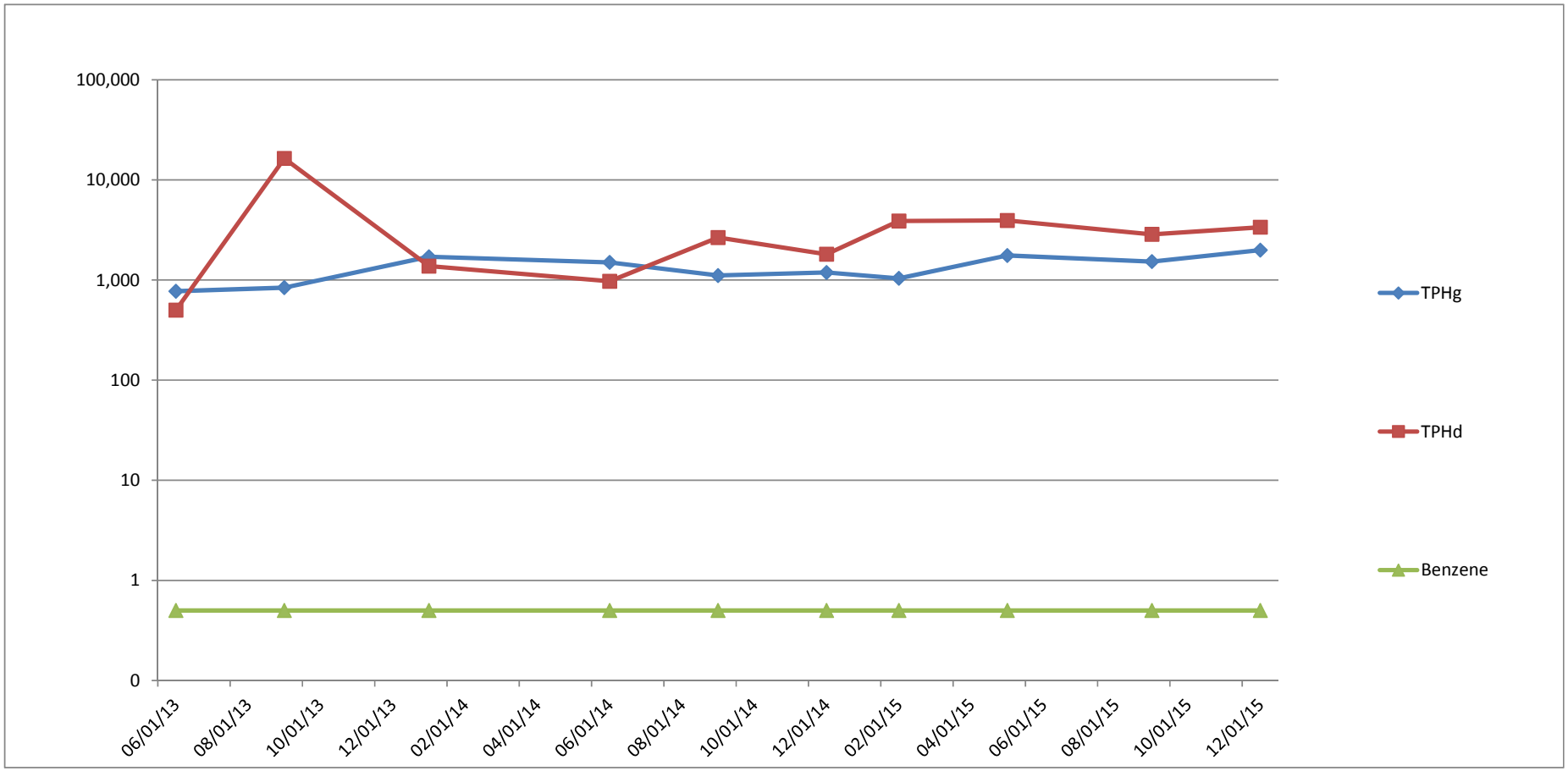
Concentrations over Time in Well MW-16

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



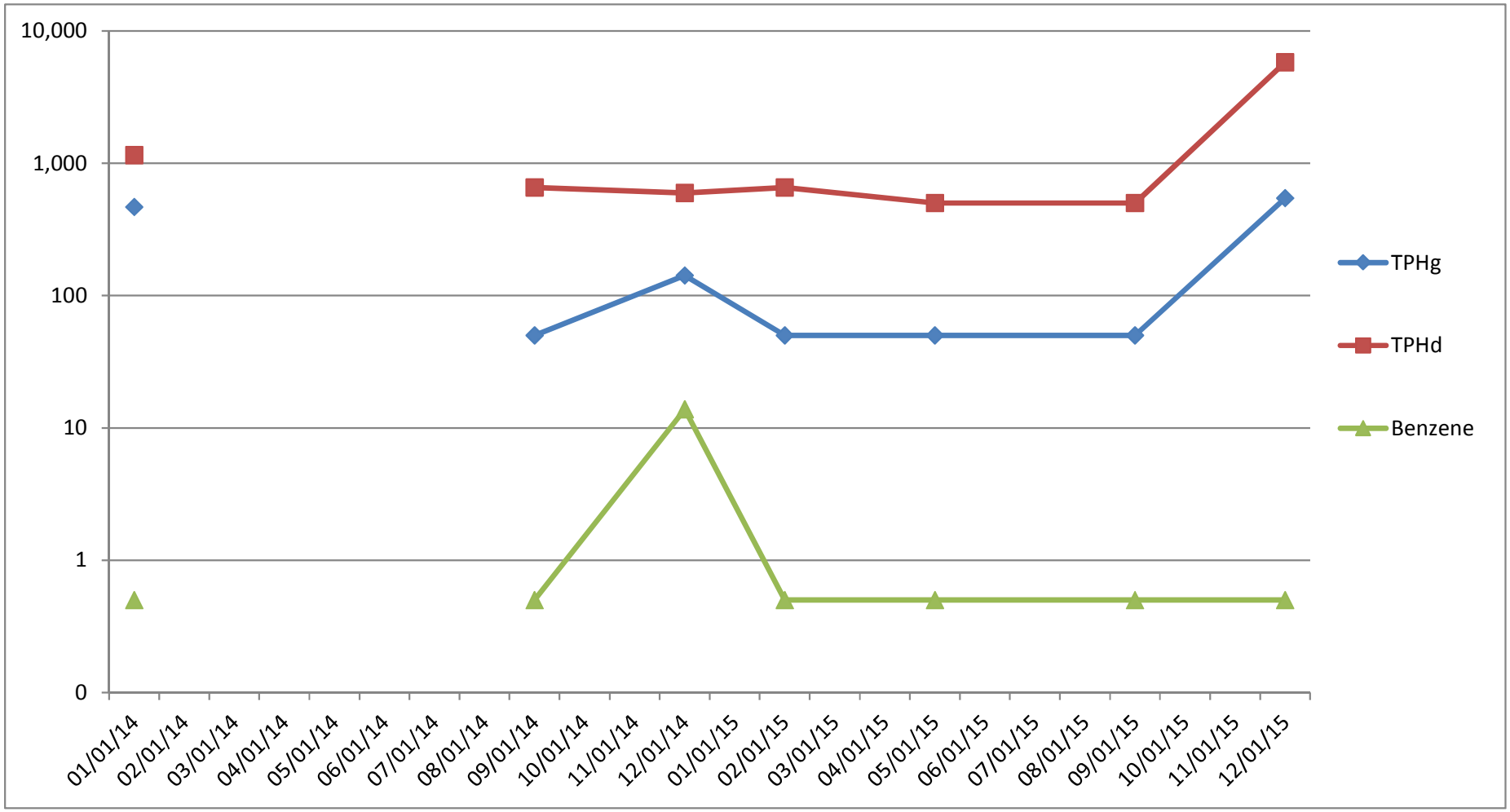
Concentrations over Time in Well MW-19

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



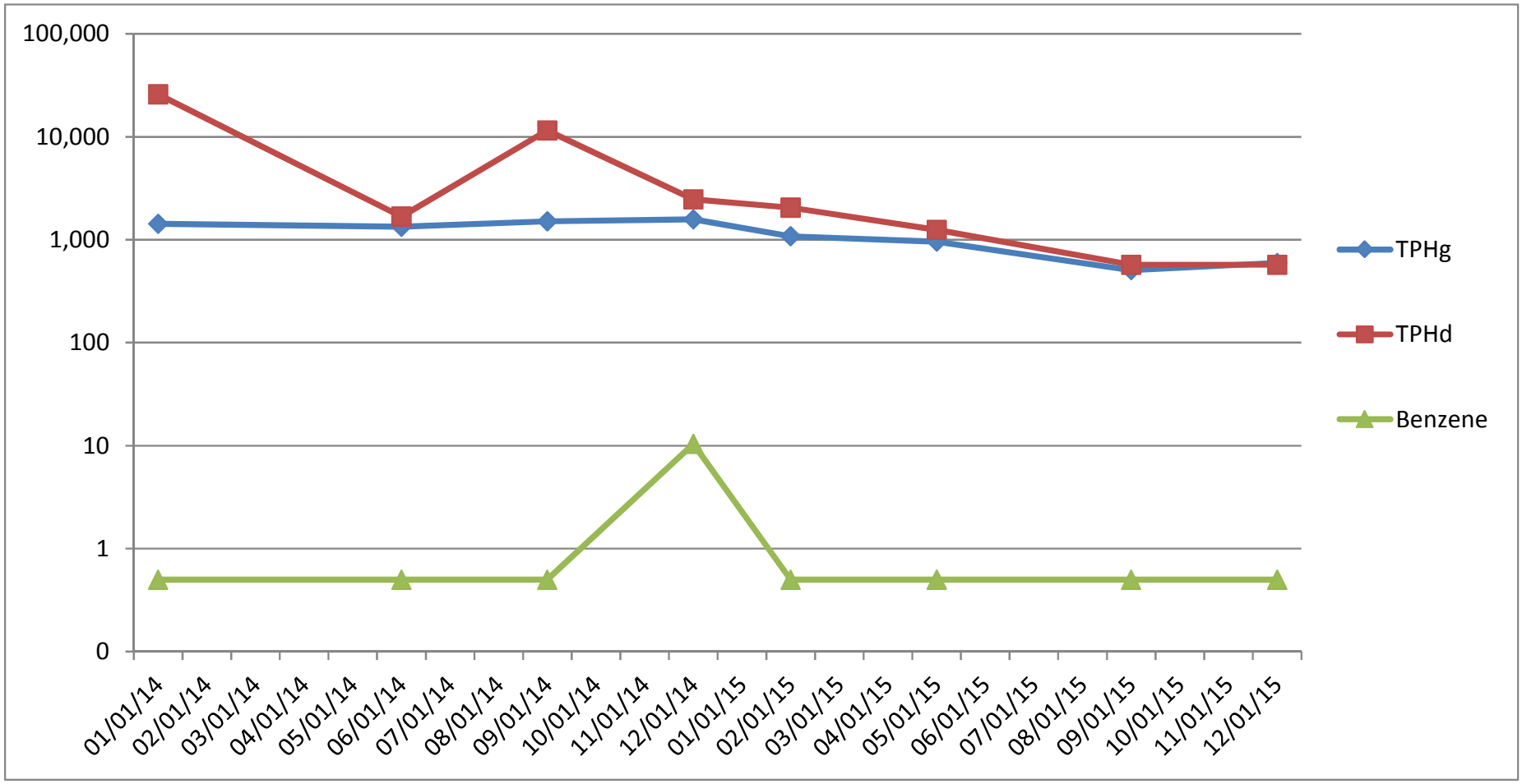
Concentrations over Time in Well BMW-2

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



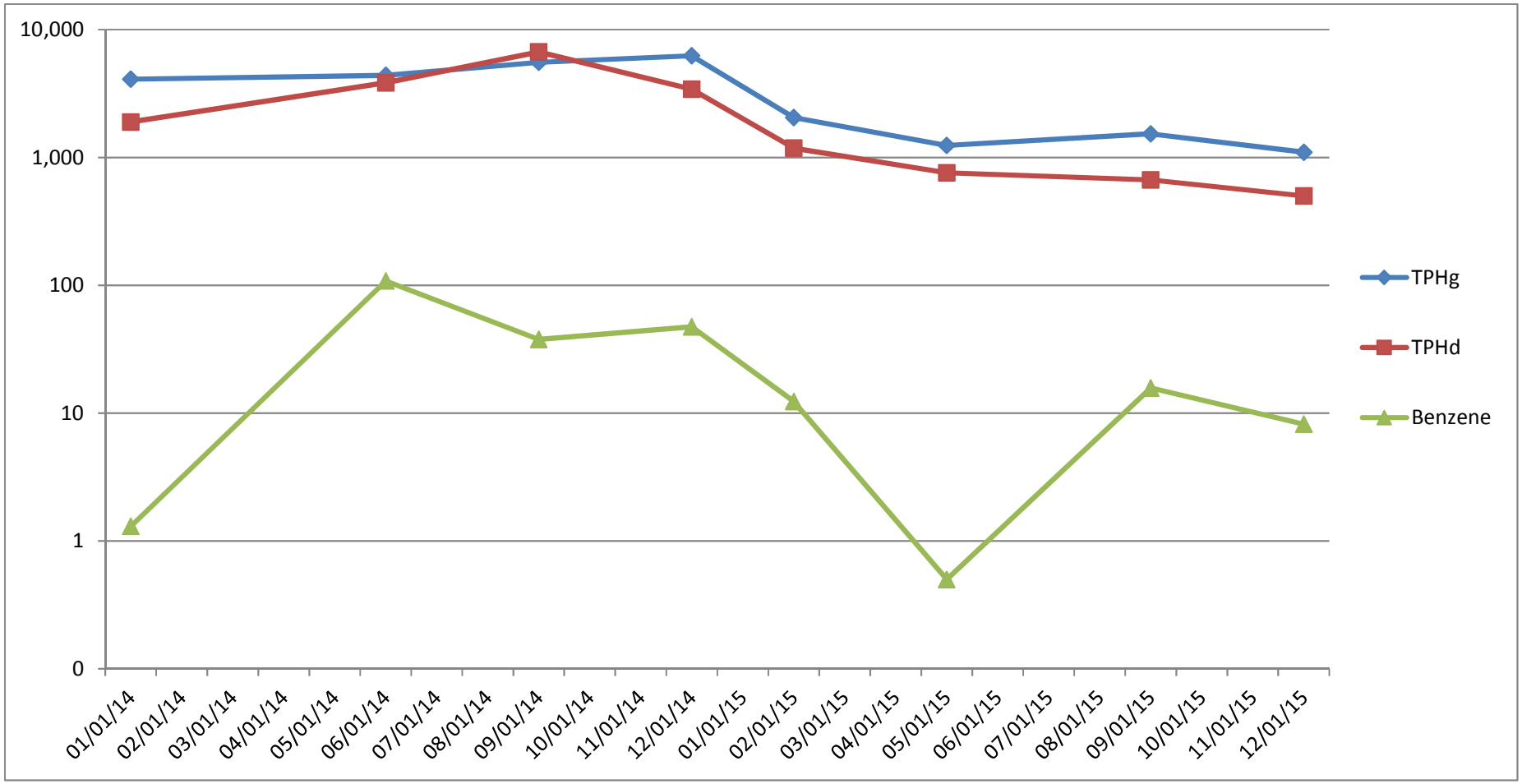
Concentrations over Time in Well BMW-5

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



Concentrations over Time in Well BMW-8

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California



Concentrations over Time in Well BMW-11

Former Chemoil Refinery
2020 Walnut Ave, Signal Hill, California