

# **Health Consultation**

**Shell Oil Products US  
Former Metairie Lube Oil Blending Facility  
Jefferson, Jefferson Parish, Louisiana**

September 19, 2012

**Prepared by**

Louisiana Department of Health and Hospitals  
Office of Public Health  
Section of Environmental Epidemiology and  
Toxicology

Under a Cooperative Agreement With the  
U.S. Department of Health and Human Services  
Agency for Toxic Substances and Disease Registry

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## List of Acronyms

AOI	area of investigation
ATSDR	Agency for Toxic Substances and Disease Registry
COC	contaminant of concern
CREG	cancer risk evaluation guide
EMEG	environmental media evaluation guide
EPH	total petroleum hydrocarbon – extractable petroleum hydrocarbon
ft bgs	feet below ground surface
LDEQ	Louisiana Department of Environmental Quality
LDHH	Louisiana Department of Health and Hospitals
LNAPL	light non-aqueous phase liquid
OPH	Office of Public Health
PID	Photo-Ionization Detector
ppm	parts per million
RECAP	Risk Evaluation/Corrective Action Program
SEET	Section of Environmental Epidemiology and Toxicology
SOPUS	Shell Oil Products US
US EPA	United States Environmental Protection Agency
VOC	volatile organic compound

## Summary and Statement of Issues

### INTRODUCTION

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Due to historical overflows of refined oils and blends at the site, the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility has undergone a series of remedial activities.

Through our cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET) has evaluated soil and water samples from this site to determine whether emissions from the site pose harm to public health.

### CONCLUSION

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Groundwater and soil at the SOPUS Metairie site pose no harm to public health.

### BASIS FOR DECISION

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Under current site conditions, no routes of exposure exist between residual groundwater contaminants at the site and the public. Groundwater at the SOPUS Metairie site therefore poses no harm to public health.

Residual contaminants in soils sampled from the AOIs currently pose no harm to public health. If plans arise for changes in zoning to the SOPUS Metairie site from industrial to residential, soil from this site should be reassessed for its potential to pose harm to public health.

### NEXT STEPS

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The information produced within this health consultation will be made available to the community members and stakeholders in Metairie, LA.

### FOR MORE INFORMATION

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If you have further concerns about the Shell Oil Products US (SOPUS) Former Metairie Lube Oil Blending Facility, questions may be directed to DHH/OPH/SEET at 1-888-293-7020.

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### Background and Site History

The Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility is located at 309 Jefferson Hwy in Jefferson, Jefferson Parish, Louisiana, 70121 (Figure A-1) in an area of industrial and commercial land use [1, 2]. The land parcel on which the site is located is approximately 44 acres in area, bounded to the north by the Earhart Expressway, to the south by Jefferson Hwy, to the east by Dakin Street and the Orleans Parish boundary, and to the west by railway lines. The facility takes up approximately 20 acres of the land parcel; the other 20 acres are not owned or operated by SOPUS [1]. A Lowe's home improvement store is located east of the facility on the same land parcel.

Operations at the site were started by the Butterfarm Grease and Oil Company of Louisiana in 1929. Shell Oil Company acquired the site in 1949. SOPUS continued operations at the site until the Lube Oil Blending Facility was decommissioned in 2007 [1]. The site is currently inactive. There are no present sources of potential contaminants of concern at the site because all residual materials and most of the above-ground tanks and processing equipment have been removed [2]. A site caretaker provides maintenance tasks and upkeep [3].

The facility was formerly used for the blending and packaging of motor oils, gear oils and greases, which were delivered via rail tank car and pumped to storage prior to blending and packaging in various container sizes. When active, the facility could store over 200,000 barrels of refined oils and blends. The oils and greases historically stored at the site have low vapor pressures and high boiling points, are incapable of being mixed into water (separating into layers), and are considered highly immobile in groundwater. These compounds are generally considered to be benign to human health and ecological exposures [1].

Available evidence indicates that in the past there were historical overflows of insoluble heavy hydrocarbon straight chain paraffins from blending operations and leaks from valves and piping at the site [2]. Environmental investigations and remediation activities have been going on at the site since the 1980's [4]. Investigation and remediation activities have focused on five Areas of Investigation (AOIs) [1, 5] (see Figure A-1):

- AOI 1 – the Southwest Tank Farm;
- AOI-2 – the Southeast Tank Farm, which was constructed in 1929 and is the former location of the oldest storage tanks at the site [4];
- AOI-3 – the Northwest Tank Farm, which was constructed in the 1980's [2];
- AOI-4 – the Northeast Tank Farm, which was constructed in the 1950's [2];
- AOI-5 – the basement of the Compound Blending House, which was decommissioned in 2005, and the grounds nearby [4].

Activities at the site have included groundwater monitoring, the recovery of residual light non-aqueous phase liquid (LNAPL) observed in a few on-site groundwater monitoring wells, and the removal of soils to address residual LNAPLs and other contaminants. All of the AOIs have subsequently been declared in need of no further action by the Louisiana Department of Environmental Quality (LDEQ) [6-10]. It is anticipated that future land use at the site will be limited to industrial or commercial purposes.

Through our cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET) has evaluated soil and groundwater data from the SOPUS Metairie site to assess whether residual contaminants in the soil or groundwater at the site pose harm to public health.

### Demographics

The 2010 Census results reported a total population of 11,193 within Jefferson, LA. The largest ethnic group in the city is Caucasian (67.8%), followed by African-American (25.4%), those identifying themselves as belonging to 2 or more races (1.8%), Asian (1.4%) American Indian and Alaskan Native (0.4%), and Native Hawaiian and Other Pacific Islander (0.1%). Nine point six percent (9.6%) of the population identified themselves as Hispanic or Latino of any race. An estimated 77.4 % of the population who were 25 years of age in the year 2010 had earned at least a high school diploma. The median household income was \$41,594. The largest employers in were in educational, health, and social services; retail trade; and arts, entertainment, recreation, accommodation and food services [11].

More than 30 schools and at least 3 childcare facilities, lie within a 2-mile radius of the site [12]. Private residences are located within approximately 600 feet of the site's perimeter [12].

### Discussion

#### Data Used

##### AOIs 1, 2, and 3

The most recent groundwater and soil data for AOIs 1, 2, and 3 were collected during the week of May 24<sup>th</sup>, 2010 and reported in the September 2010 Supplemental Site Investigation Report. All samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOC's), extractable petroleum hydrocarbons (EPHs), and Risk Evaluation/Corrective Action Program (RECAP) metals [1, 13].

Groundwater samples were collected from each of the AOIs. Four wells were sampled in AOI-1 and three in AOI-2. The three monitoring wells inside AOI-3 were abandoned in accordance with State of Louisiana regulations; however, groundwater was collected from a sentinel well in the vicinity of this AOI [5, 13].

Soil samples were collected from AOI-1 (Figure A-2) and AOI-2 (Figure A-3). Three sample types were typically collected from each soil boring location:

- a surface sample
- a sample from the depth with the highest Photo-Ionization Detector (PID) reading to test for the presence of VOCs
- a sample from above the saturated zone.

Thirteen soil samples were collected from four soil borings and a monitoring well (labeled “sentinel well”) in AOI-1. Twelve soil samples were collected from four soil borings in AOI-2.

As a result of barium levels found to exceed the RECAP soil screening standards in samples collected during the May 2010 sampling event, additional soil excavation activities were conducted in AOI 2 in September 2011 (see Figure A-4):

- One excavation was performed at soil boring SB-10-02 and measured 5 feet wide, 5 feet long, and six feet deep
- One excavation was performed at soil boring SB-10-03 and measured approximately 6 feet wide, 6 feet long, and 5 feet deep [14].

Two sidewall samples collected from each of these excavations in September 2011 were analyzed for barium. Floor samples were not collected because May 2010 samples SB-10-02 (4-6) and SB-10-03 (4-6) were considered to provide adequate vertical definition. Once analysis of the post-excavation samples was complete, the excavations were filled with clean fill material [14].

Soil samples were not collected from AOI-3 (Figure A-5) because previous sampling events found insignificant quantities of contaminants in the soil of this area [5, 13].

### AOIs 4 and 5

AOI 4 (Figure A-6) and AOI 5 (Figure A-7) were also sampled for the September 2010 Supplemental Site Investigation Report. As a result of data collected from these sampling events, soil excavation activities were conducted in AOIs 4 and 5 during September-October 2011. These activities included the removal of several monitoring wells in which LNAPL or contamination levels above the limiting RECAP screening standards were detected. These removal activities are considered to have eliminated potential source areas for groundwater contamination [1].

Confirmation sampling was performed following the excavation activities to confirm that any contaminants remaining in the soil were present at concentrations below the limiting RECAP screening standards [1].

The two areas of soil removal in AOI-4 were designated Excavation 1 and Excavation 2.

- Ten sidewall samples and 4 floor samples were collected from Excavation 1 in September 2011. The samples were analyzed for arsenic, lead, SVOCs, and EPHs.

Four of the sidewall samples (SW2, Duplicate SW3, SW8, and SW9) were found to contain benzo(a)pyrene levels that exceeded the limiting RECAP screening standard; additional soil was removed from the four locations from which these samples had been collected, and these locations were resampled in October 2011 and analyzed for benzo(a)pyrene and arsenic. An additional hand auger sample was collected in December 2011 to further delineate the presence of benzo(a)pyrene in the remaining soil.

Because of an elevated arsenic concentration detected at sidewall location SW-6, four additional hand auger samples were collected near the location of this sample in

November 2011, at the same depth as the original sample, to further delineate arsenic in the remaining soil.

- One floor sample was collected from Excavation 1 in September 2011 and analyzed only for lead.
- Two sidewall samples and one floor sample were collected from Excavation 2 in September 2011. The samples were analyzed for arsenic, lead, SVOCs, and EPHs [1].

The two areas of soil removal in AOI-5 were designated Excavation 1 and Excavation 2.

- Three sidewall samples and one floor sample were collected from Excavation 1 in September 2011. The samples were analyzed for arsenic, lead, SVOCs, and EPHs.
- Three sidewall samples and one floor sample were collected from Excavation 2 in September 2011. The samples were analyzed for arsenic, lead, SVOCs, and EPHs.

### **Exposure Pathways**

An exposure pathway consists of five elements: a source of contamination, transport through an environmental medium (air, water, or soil), a point of exposure, a route of human exposure (ingestion, dermal exposure, or inhalation), and a population. Completed pathways require that all five necessary elements exist and that exposure to a contaminant has occurred in the past, is presently occurring, or will occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present.

### Groundwater

Exposure to contaminants detected in groundwater sampled from the SOPUS Metairie site could occur through ingestion, dermal contact, or inhalation of water vapor (for volatile and semi-volatile contaminants) during domestic use. However, the groundwater-bearing zone located less than 20 feet below ground surface (ft bgs) under the site is not used as a public water supply or a domestic water supply. Within one mile of the site, there are three active wells that are not related to environmental monitoring or recovery. These wells include a public supply well and an industrial well, both owned by Ochsner Health System, and an irrigation well owned by the Metairie Country Club. All of these wells are screened below 700 feet, much lower than the zone of groundwater at the SOPUS Metairie site [2, 4, 15, 16].

Groundwater flow under the site is in a west-northwest or north direction [4]. There are no reported releases of contamination from the site to any nearby surface water bodies, including the concrete-lined drainage canal which intersects the site from northeast to southwest (Hoey's Canal) [2]. The site's water-bearing unit is currently classified as a Class 3A – Non Drinking Water unit [1, 2, 13]. No exposure pathway exists between groundwater at the SOPUS Metairie site and the public.



### Soil

Exposure to contaminants detected in soil sampled from the SOPUS Metairie site would occur through incidental (accidental) ingestion, or dermal contact. Exposures to soil are more likely where ground cover, such as grass, is absent. Because the SOPUS Metairie site is an industrial site with limited public accessibility, occupational exposures would be the most likely ones to occur.

### **Evaluation Process**

Groundwater samples collected from the SOPUS Metairie site were not assessed because there is no exposure pathway between groundwater at the site and the public. Site groundwater is not accessible for recreational use and does not serve as a drinking water source or connect with an aquifer serving as a source of drinking water. Because groundwater was the only medium sampled in AOI-3, it has not been included in this assessment.

The evaluation process used to assess soil samples collected from the SOPUS Metairie site is described in Appendix B. Contaminant concentrations were initially screened using comparison values (CVs) appropriate for their media. These conservative screening values are only used to determine which environmental contaminants need further evaluation. CVs are not used to predict adverse human health effects. Contaminant concentrations that exceeded CVs are identified as contaminants of concern (COCs) and are listed in bold red text. Because child exposures are unlikely at this site, which is not open for public access, CVs for adult exposures were used in this assessment.

### **Data Limitations**

In multiple instances in which contaminant concentrations were below method detection limits, the method detection limits used were above the contaminants' CVs. These contaminants could still be present at concentrations that could pose harm to public health. Future analyses for these contaminants should be performed using more sensitive laboratory methods to determine if they are present in concentrations that pose harm to public health.

### **Health Effects Evaluation**

#### AOI-1 Soil

Table B-1 lists data for soil samples collected from AOI-1. No contaminants of concern were detected in soils sampled from AOI-1. Soil from AOI-1 poses no harm to public health.

### AOI-2 Soil

Table B-2 lists data for soil samples collected from AOI-2. Two ranges of EPHs, the C16-C21 Aromatics and the C21-C35 Aromatics, were identified as COCs when screened with CVs for residential (non-industrial) exposures but do not exceed the CVs used to screen for industrial exposures. Nine SVOCs that were analyzed as non-detects were also identified as COCs when the method detection limits used to analyze samples were above the CVs used by SEET to screen the soil samples. The soils from which these EPHs and SVOCs were analyzed were excavated, so these contaminants are no longer present. No COCs were detected in soils sampled from lower depths at these locations.

Table B-3 lists barium levels detected in soil samples collected from the sidewalls of the excavations in AOI-2 in September 2011. The barium concentrations detected at this time were not of concern. Soil from AOI-2 poses no harm to public health.

### AOI-4 Soil

Table B-4 lists data for soil samples collected from AOI-4 during the September 2011 sampling event. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were identified as COCs. The concentrations of concern for these contaminants were all located at sidewall location SW-3 in Excavation 1; this location was one of the areas that underwent further soil removal and was resampled.

Table B-5 lists data for soil collected during the resampling events in October and December 2011. Benzo(a)pyrene was again identified as a contaminant of concern using a CV that screens for cancer-related health effects. However, the sample was collected from a sidewall location three feet (3') below ground surface in the excavated area. Cancer-related health effects are a concern following long-term exposures to significant levels of carcinogens; this type of exposure is not likely to occur to at this location. Soil from AOI-4 poses no harm to public health.

### AOI-5 Soil

Table B-6 lists data for soil samples collected from AOI-5. No COCs were identified in soil sampled from AOI-5. Soil from AOI-5 poses no harm to public health.

## **Child Health Considerations**

The physical differences between children and adults demand special emphasis in assessing public health hazards. Children may be at greater risk than are adults from exposures to hazardous substances. Children play outdoors and engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than adults and breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate result in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage.

Due to a fence surrounding the SOPUS Metairie property and to ongoing caretaking at the site, access to the site by children is unlikely. There are also no exposure pathways between the contaminants onsite and children offsite. Soil at the SOPUS Metairie site therefore poses no harm to children's health.

### **Conclusions**

SEET and ATSDR are committed to addressing community concerns about the risks involved in exposure to environmental contaminants. Our agencies are committed to providing the residents of Jefferson, LA with the best science-based information available to keep the community safe.

Under current site conditions, no routes of exposure exist between residual groundwater contaminants at the site and the public. Groundwater at the SOPUS Metairie site therefore poses no harm to public health.

Residual contaminants in soils sampled from the AOIs currently pose no harm to public health. If plans arise for changes in zoning to the SOPUS Metairie site from industrial to residential, soil from this site should be reassessed for its potential to pose harm to public health.

If you have further concerns about the SOPUS Metairie facility, questions may be directed to DHH/OPH/SEET at 1-888-293-7020.

### **Recommendations**

SEET will be available to assess any additional samples collected from the SOPUS Metairie site or to reassess the current data following any changes in usage of or access to the site.

### **Public Health Action Plan**

The information produced within this health consultation will be disseminated to the community members and stakeholders in Metairie, LA.

## **Report Preparation**

This Shell Oil Products US Former Metairie Lube Oil Blending Facility Health Consultation was prepared by the Louisiana Department of Health and Hospitals under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR).

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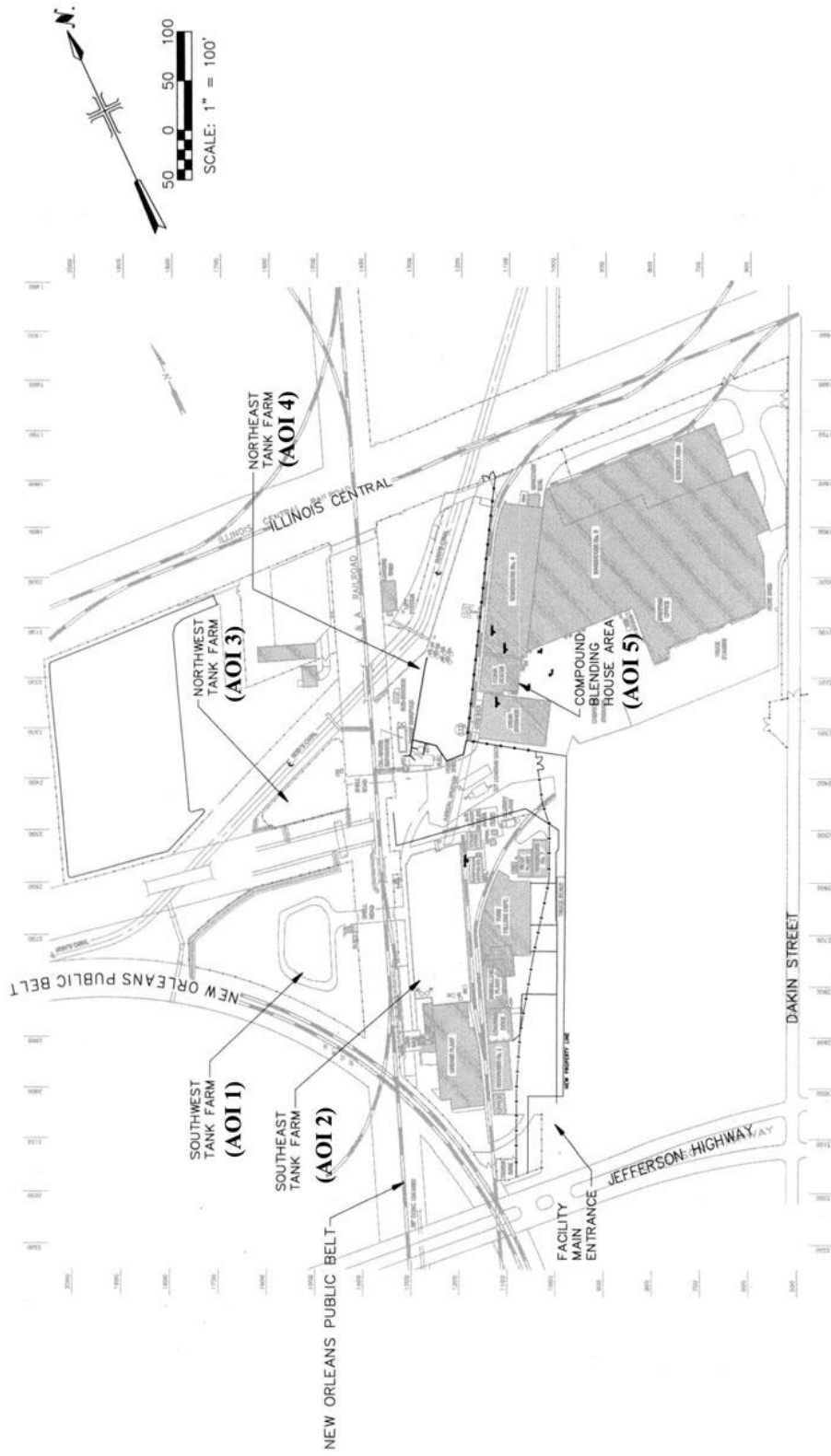
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**APPENDIX A: Maps**

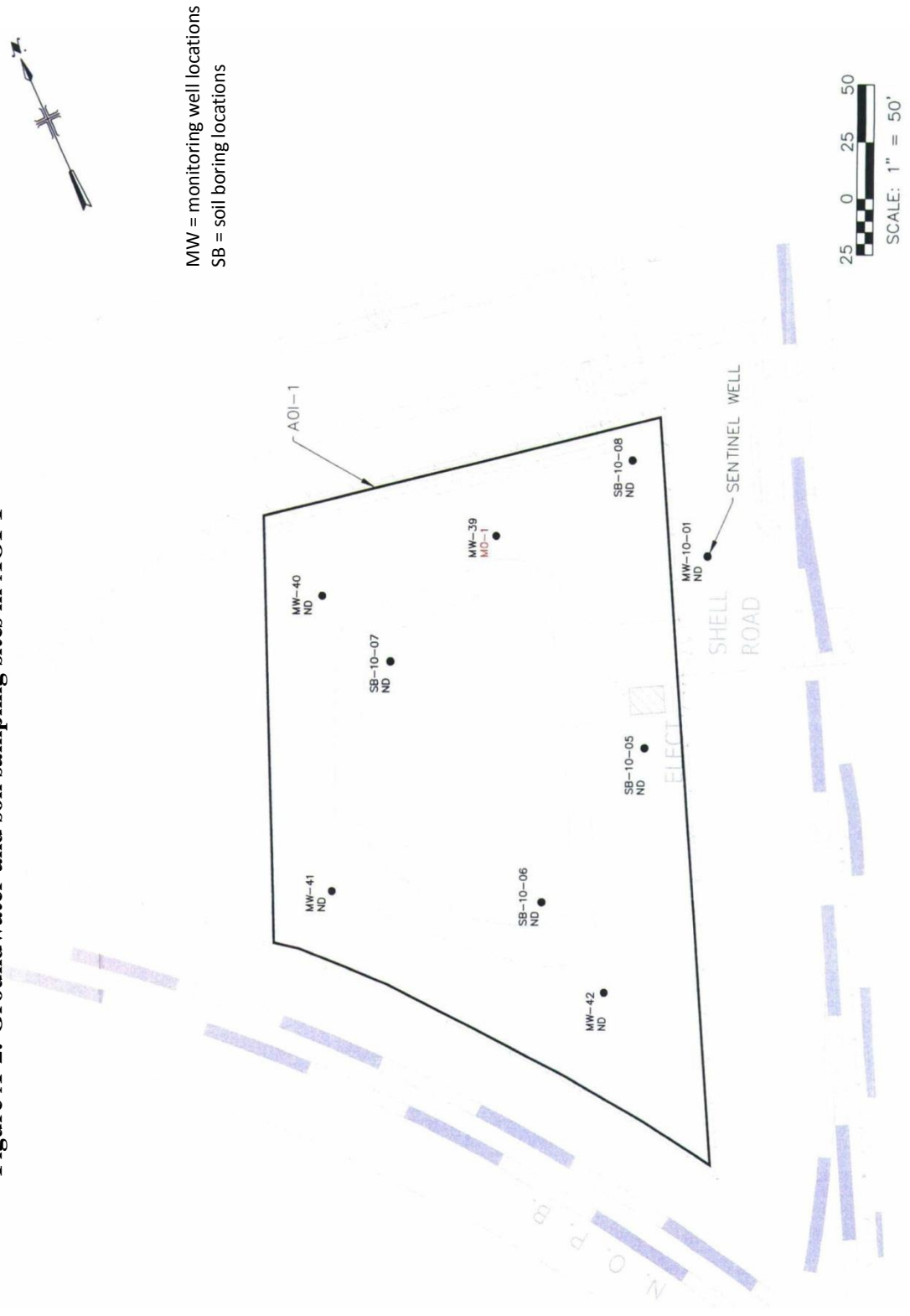
Figure A-1: The Shell Oil Products US former Metairie Lube Oil Blending Facility



Adapted from: Malcolm Pirnie, Inc. Pennzoil-Quaker State Company d.b.a. SOPUS Site Summary Report, AI Number 1274. Houston: Nov 2008.



Figure A-2: Groundwater and soil sampling sites in AOI-1



Adapted from: Malcolm Pirnie, Inc. Pennzoil-Quaker State Company Supplemental Site Investigation Report, Metairie Facility.  
Houston: Sep 2010.

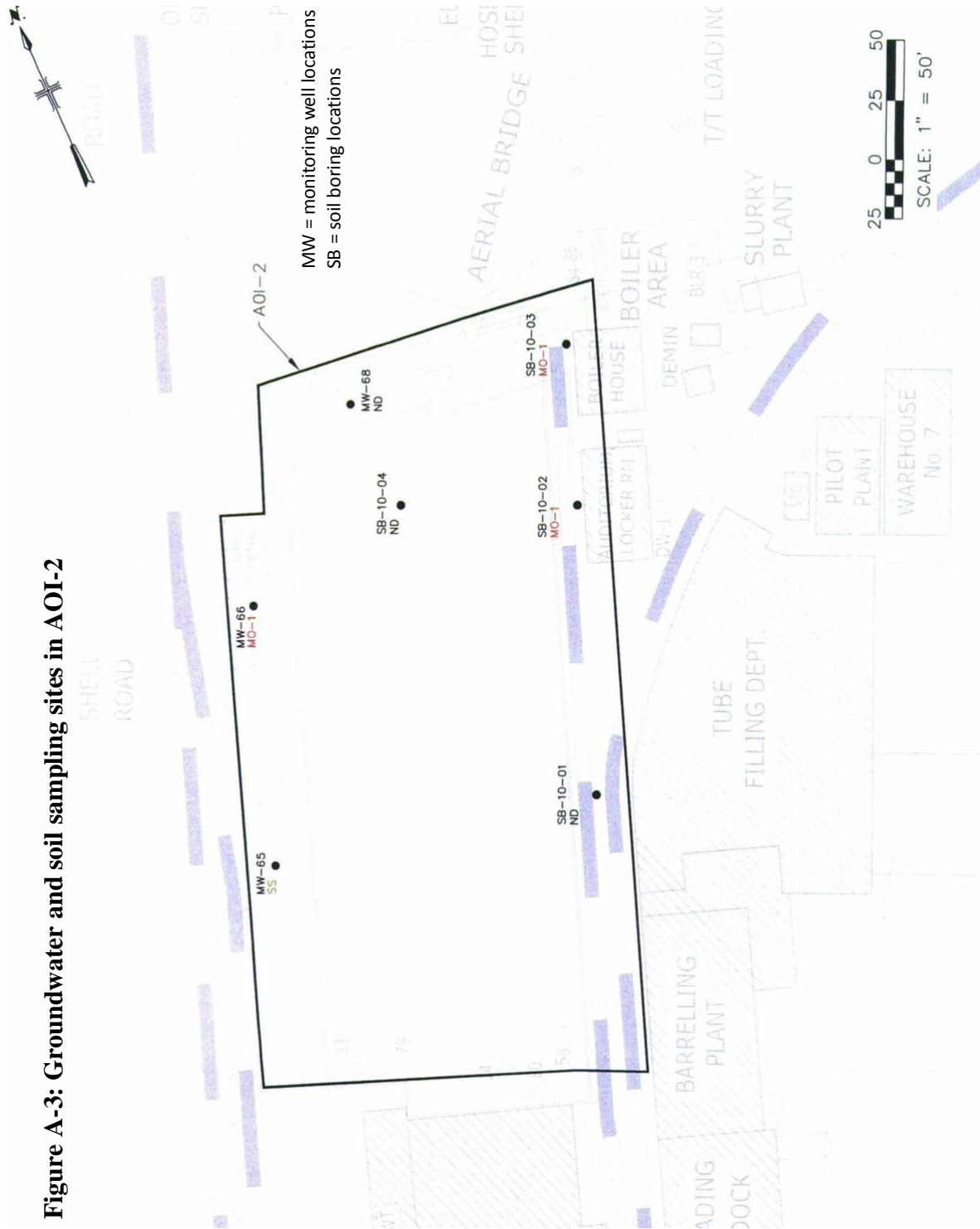
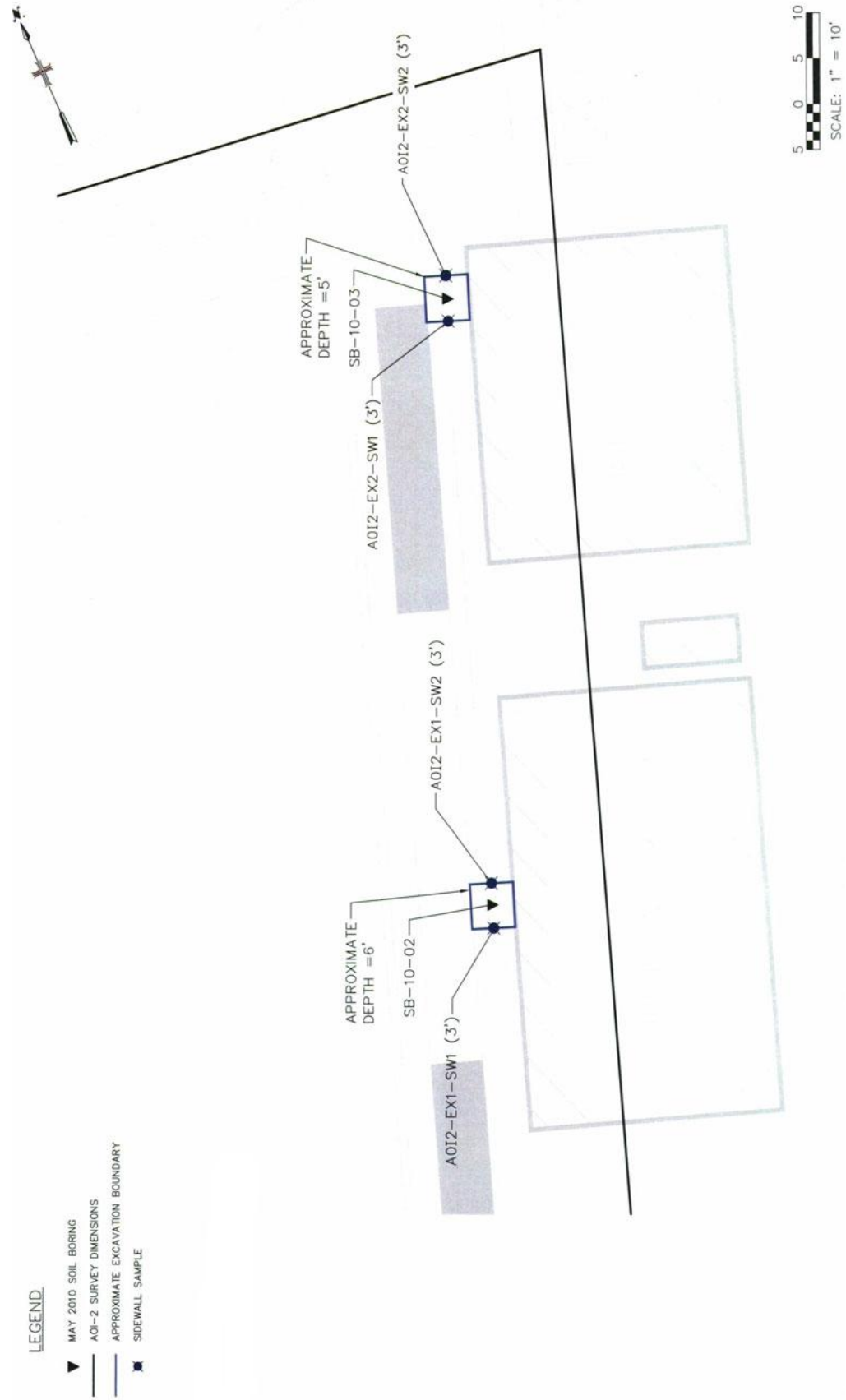


Figure A-3: Groundwater and soil sampling sites in AOI-2

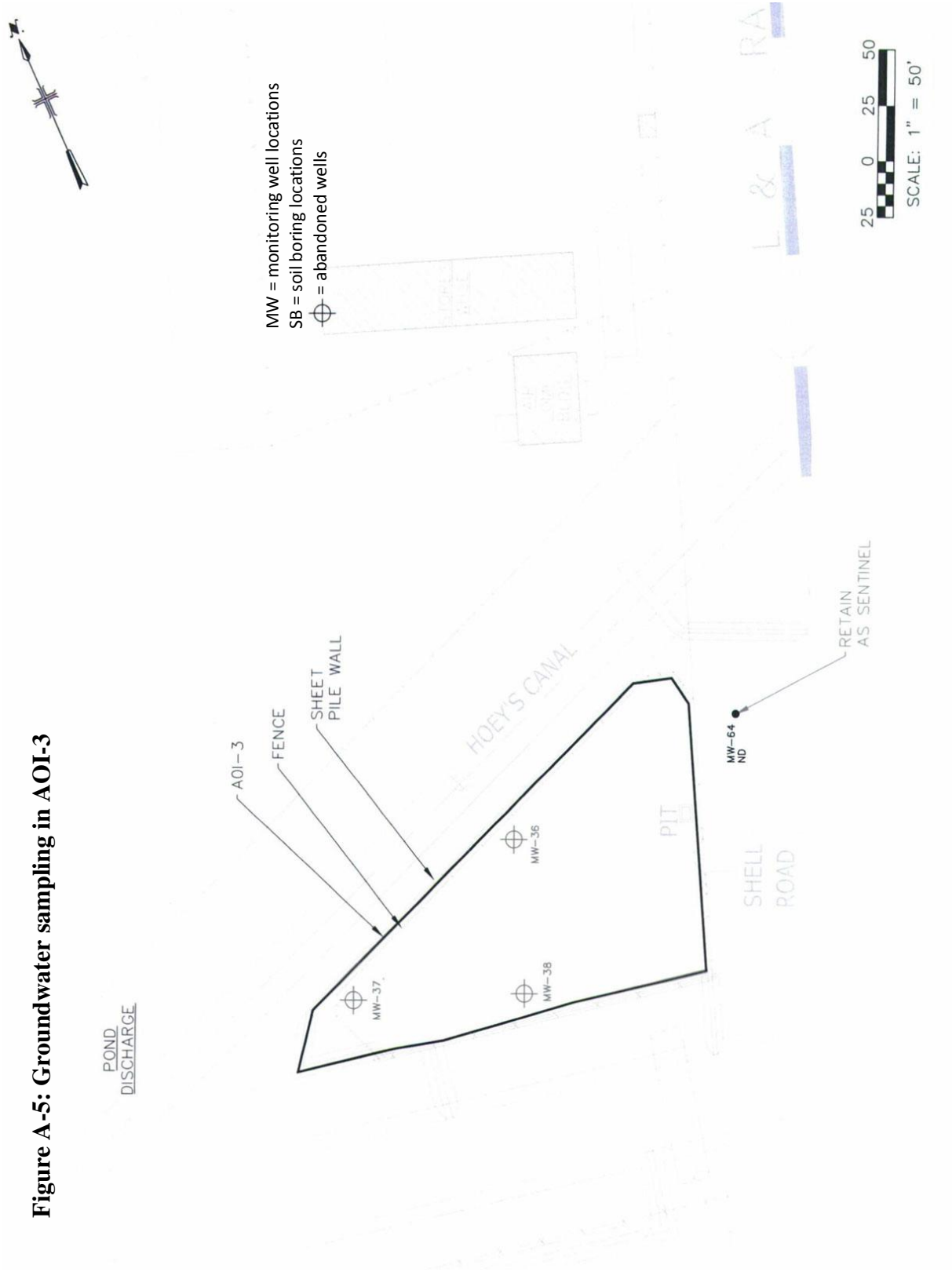
Adapted from: Malcolm Pirnie, Inc. Pennzoil-Quaker State Company Supplemental Site Investigation Report, Metairie Facility. Houston: Sep 2010.

Figure A-4: Additional excavation and sampling sites in AOI-2



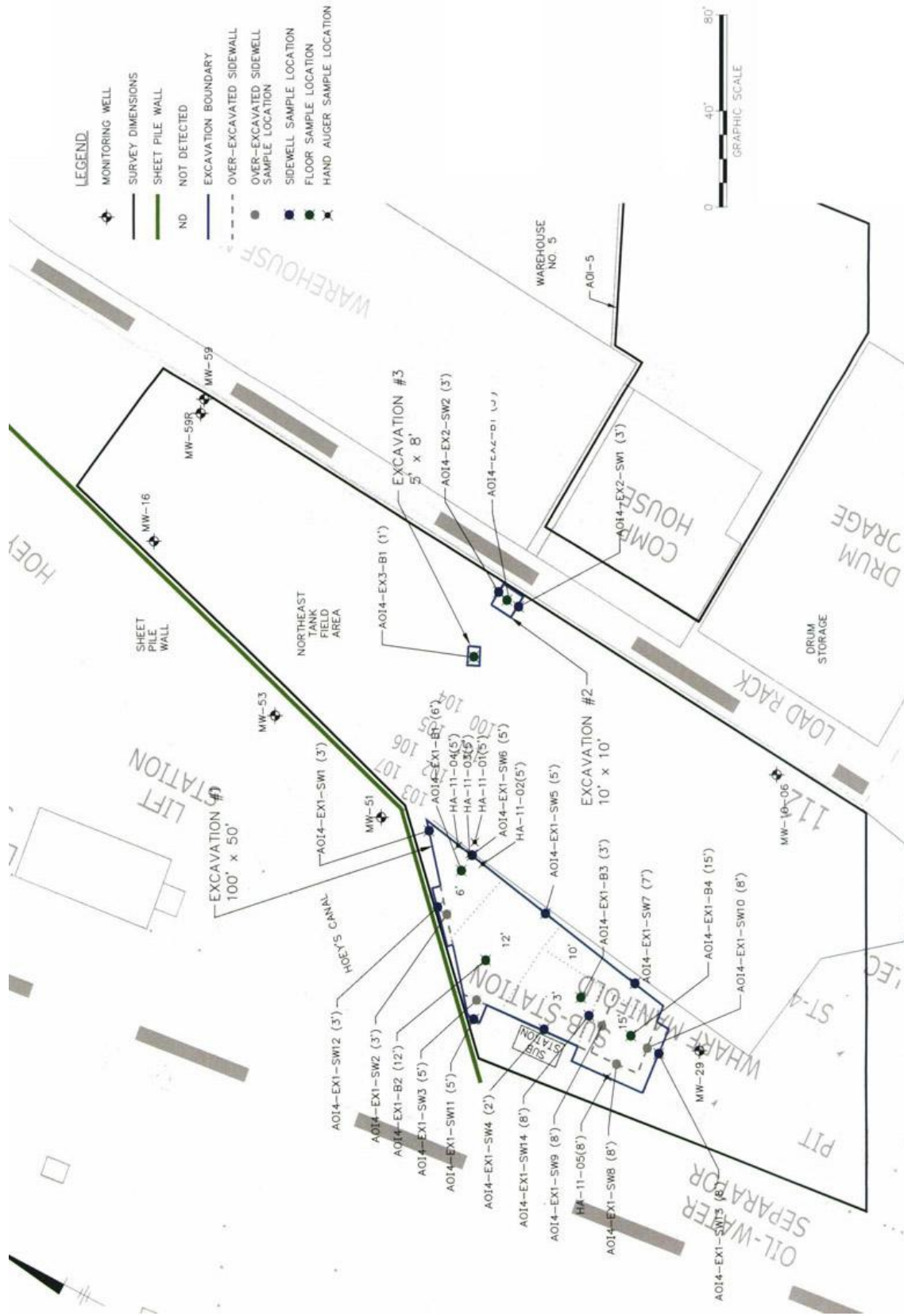
Adapted from: ARCADIS-US, Inc./Malcolm Pirnie, Inc. Shell Oil Products Former Metairie Lube Oil Blending Facility: Corrective Action Report Area of Investigation 2 (AOI-2). Houston: Nov 2011.

Figure A-5: Groundwater sampling in AOI-3



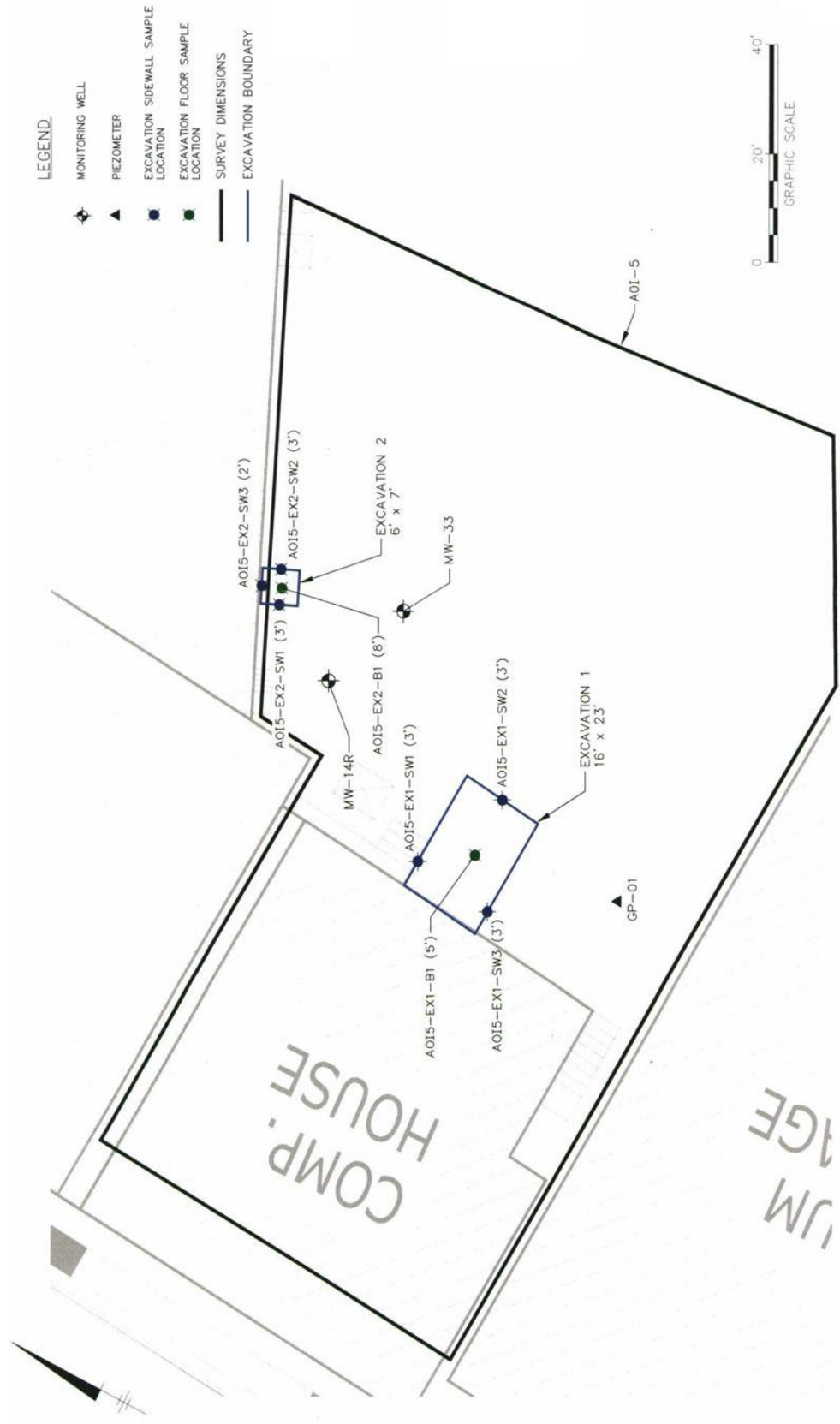
Adapted from: Malcolm Pirnie, Inc. Pennzoil-Quaker State Company Supplemental Site Investigation Report, Metairie Facility.  
Houston: Sep 2010.

Figure A-6: Soil sampling in AOI-4



Adapted from: ARCADIS-US, Inc./Malcolm Pirnie, Inc. Shell Oil Products Former Metairie Lube Oil Blending Facility: Corrective Action Report AOI-4 and AOI-5. Houston: Dec 2011.

Figure A-7: Soil sampling in AOI-5



Adapted from: ARCADIS-US, Inc./Malcolm Pirnie, Inc. Shell Oil Products Former Metairie Lube Oil Blending Facility: Corrective Action Report AOI-4 and AOI-5. Houston: Dec 2011.

**APPENDIX B: Data Evaluation**

### Screening Process

Comparison values were used in the initial screening process to determine which samples needed to be closely evaluated. Comparison values are media-specific concentrations of chemicals that are used by health assessors to screen environmental contaminants for further evaluation. These values are not used as predictors of adverse health effects.

*Environmental media evaluation guides* (EMEGs) are estimated contaminant concentrations at which noncarcinogenic health effects are unlikely. They are calculated from the Agency for Toxic Substances and Disease Registry's (ATSDR) minimal risk levels (MRLs). EMEGs apply to acute (14 days or less), intermediate (15–365 days) and chronic (365 days or more) exposures.

*Reference dose media evaluation guides* (RMEGs) are estimated contaminant concentrations at which noncarcinogenic health effects are unlikely. They are calculated from the U.S. Environmental Protection Agency's (EPA) reference dose (RfD).

*Cancer risk evaluation guides* are estimated contaminant concentrations that would be expected to cause no more than one additional excess cancer in 1 million exposed persons over a lifetime. CREGs are calculated from the United States Environmental Protection Agency's (EPA's) cancer slope factors (CSFs).

*Regional Screening Levels* (RSLs) are risk-based concentrations derived from exposure information assumptions using EPA toxicity data. RSLs are considered by the EPA to be protective for humans (including sensitive groups) over a lifetime.

Because child exposures are unlikely at this site, which is not open for public access, CVs for adult exposures were used in this assessment.

When no comparison value was available for a contaminant, screening was based on the Louisiana Department of Environmental Quality's Risk Evaluation/Corrective Action Program (RECAP) screening standards<sup>1</sup>, which are concentrations at or above which remediation of a medium (soil, sediment, or water) should occur.

Contaminants that were not detected at concentrations above the method detection limits are identified as "non-detects" (ND). For conservative screening purposes, these contaminants were assessed using a value of half the method detection limit, or the lowest limit measurable by the laboratory methodology used for sample analysis.

Tables B-1 through B-5 list the contaminants detected in soil sampled from Areas of Interest 1, 2, 4, and 5 at the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility.

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<sup>1</sup> Louisiana Department of Environmental Quality Corrective Action Group. Risk Evaluation/Corrective Action Program. Aug 2003. Accessed 22 Nov 2011 at: <http://www.deq.louisiana.gov/portal/tabid/2930/Default.aspx>



## Shell Oil Metairie

Table B-1: Contaminants detected in soil sampled from Area of Interest-1 (AOI-1) at the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility, May 2010.

Contaminant	Range of concentrations detected (ppm*)		Location, Maximum	CV† (ppm)	CV reference
	Minimum	Maximum			
<b>Metals</b>					
Arsenic	ND‡	5.91	SB 10-05 (8-10)	210	Chronic EMEG§
Barium	28.4	405	MW-10-01 (3-4)	140,000	Chronic EMEG
Beryllium	0.546	1.41	MW-10-01 (3-4)	1,400	Chronic EMEG
Cadmium	ND	1.25	SB 10-05 (12-14)	70	Chronic EMEG
Chromium	5.65	17.2	MW-10-01 (3-4)	700	Chronic EMEG
Cobalt	2.29	14.3	MW-10-01 (3-4)	7,000	Int.* EMEG
Copper	2.13	24.4	SB 10-06 (8-10)	7,000	Int. EMEG
Lead	7.57	24.8	SB-10-06 (12-14)	400	EPA†† regional screening level
Nickel	8.14	44.6	MW-10-01 (3-4)	14,000	RMEG‡‡
Vanadium	5.26	27.5	SB-10-07 (2-4)	7,000	Int. EMEG
Zinc	20.3	80.5	MW-10-01 (3-4)	210,000	Chronic EMEG
<b>Semivolatile Organic Compounds</b>					
Fluoranthene	ND	0.06	SB-10-06 (12-14)	280,000	Int. EMEG
Phenanthrene	ND	0.062	SB-10-06 (12-14)	2,100	RECAP Soil SSni§§
Pyrene	ND	0.066	SB-10-06 (12-14)	21,000	RMEG
<b>Volatile Organic Compounds</b>					
2-Butanone	ND	0.06	SB-10-05 (8-10)	420,000	RMEG
Acetone	ND	0.35	SB-10-05 (8-10)	1,000,000	Int. EMEG

\* ppm= parts per million

† CV = comparison value

‡ ND = not detected

§ EMEG = environmental media evaluation guide

\*\* Int. = intermediate

†† EPA = Environmental Protection Agency

‡‡ RMEG = reference dose media evaluation guide

§§ RECAP Soil SSni = Louisiana Department of Environmental Quality Risk Evaluation/Corrective Action Program Screening Option Soil Screening Standard for Non-industrial exposures

## Shell Oil Metairie

Table B-2: Contaminants detected in soil sampled from Area of Interest-2 (AOI-2) at the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility, May 2010. (Contaminant concentrations exceeding their screening values are listed in bold red)

Contaminant	Range of concentrations detected (ppm*)		Location, Maximum	CV <sup>†</sup> (ppm)	CV reference
	Minimum	Maximum			
<b>Extractable Petroleum Hydrocarbons</b>					
C12-C16 Aliphatics	ND <sup>*</sup>	87	SB-10-02 (2-4)	370	RECAP Soil SS <sup>§</sup> ni
C16-C21 Aromatics	ND	<b>170</b>	SB-10-02 (2-4)	150	RECAP Soil SSni
				1,700	RECAP Soil SSi
C16-C35 Aliphatics	ND	6200	SB-10-02 (2-4)	7,100	RECAP Soil SSni
C21-C35 Aromatics	ND	<b>980</b>	SB-10-03 (0-2)	180	RECAP Soil SSni
				2,500	RECAP Soil SSi
C8-C10 Aliphatics	ND	4.3	SB-10-01 (0-2)	120	RECAP Soil SSni
<b>RECAP Metals</b>					
Arsenic	ND	3.13	SB-10-03 (4-6)	210	Chronic EMEG <sup>**</sup>
Barium	74.6	7630	SB-10-03 (0-2)	140,000	Chronic EMEG
Beryllium	ND	1.13	SB-10-04 (2-4)	1,400	Chronic EMEG
Cadmium	ND	0.79	SB-10-03 (6-8)	70	Chronic EMEG
Chromium	ND	15.3	SB-10-04 (2-4)	700	Chronic EMEG
Cobalt	0.56	9.64	SB-10-03 (4-6)	7,000	Int. <sup>††</sup> EMEG
Copper	1.6	27.7	SB-10-03 (6-8)	7,000	Int. EMEG
Lead	7.58	18.2	SB-10-02 (4-6)	400	EPA <sup>††</sup> regional screening level
Nickel	1.4	21.1	SB-10-03 (4-6)	14,000	RMEG <sup>§§</sup>
Vanadium	ND	29.1	SB-10-04 (2-4)	7,000	Int. EMEG
Zinc	13.4	67.3	SB-10-02 (4-6)	210,000	Chronic EMEG
<b>Semivolatile Organic Compounds</b>					
3,3'-Dichlorobenzidine	ND (0.17) <sup>***</sup>	<b>ND (4.3)</b>	SB-10-03 (0-2)	1.6	CREG <sup>†††</sup>
Acenaphthene	ND	0.58	SB-10-02 (2-4)	420,000	Int. EMEG
Benzo (a) anthracene	ND (0.033)	<b>ND (0.83)</b>	SB-10-03 (0-2)	0.15	EPA regional screening level
Benzo (a) pyrene	ND (0.033)	<b>ND (0.83)</b>	SB-10-03 (0-2)	0.096	CREG

## Shell Oil Metairie

Contaminant	Range of concentrations detected (ppm*)		Location, Maximum	CV† (ppm)	CV reference
	Minimum	Maximum			
Benzo (b) fluoranthene	ND (0.033)	<b>ND (0.83)</b>	SB-10-03 (0-2)	0.15	EPA regional screening level
Bis(2-chloroethyl)ether	ND (0.17)	<b>ND (4.3)</b>	SB-10-03 (0-2)	0.64	CREG
Chrysene	ND	0.45	SB-10-02 (2-4)	150	EPA regional screening level
Fluoranthene	ND	0.54	SB-10-02 (2-4)	280,000	Int. EMEG
Fluorene	ND	0.31	SB-10-02 (2-4)	280,000	Int. EMEG
Hexachlorobenzene	ND (0.17)	<b>ND (4.3)</b>	SB-10-03 (0-2)	0.44	CREG
Indeno (1,2,3-cd) pyrene	ND (0.033)	<b>ND (0.83)</b>	SB-10-03 (0-2)	0.15	EPA regional screening level
N-Nitrosodi-n-propylamine	<b>ND (0.17)</b>	<b>ND (4.3)</b>	SB-10-03 (0-2)	0.1	CREG
Pentachlorophenol	ND (0.66)	<b>ND (17.0)</b>	SB-10-03 (0-2)	1.8	CREG
Phenanthrene	ND	0.19	SB-10-02 (2-4)	2,100	RECAP Soil SSni
Pyrene	ND	0.88	SB-10-03 (0-2)	21,000	RMEG
<b>Volatile Organic Compounds</b>					
Xylenes, Total	ND	0.0066	SB-10-01 (12-14)	140,000	Chronic EMEG

\* ppm = parts per million

† CV = comparison value

‡ ND = not detected

§ RECAP Soil SS = Louisiana Department of Environmental Quality Risk Evaluation/Corrective Action Program Screening Option Soil Screening Standard for Non-industrial (ni) or industrial (i) exposures

\*\* EMEG = environmental media evaluation guide

†† Int. = intermediate

‡‡ EPA = Environmental Protection Agency

§§ RMEG = Reference dose Media Evaluation Guide

\*\*\* Method detection limits are listed in parentheses for non-detects

††† CREG = cancer risk evaluation guide

## Shell Oil Metairie

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Table B-3: Barium detected in soil sampled from Area of Interest-2 (AOI-2) following additional excavation at the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility, September 2011.

Contaminant	Range of concentrations detected (ppm <sup>*</sup> )		Location, Maximum	CV <sup>†</sup> (ppm)	CV reference
	Minimum	Maximum			
<b>Metals</b>					
Barium	185	1570	AOI2-EX2-SW1 (3')	140,000	Chronic EMEG <sup>‡</sup>

\* ppm = parts per million

<sup>†</sup>CV = comparison value

<sup>‡</sup>EMEG = environmental media evaluation guide

## Shell Oil Metairie

Table B-4: Contaminants detected in soil sampled from Area of Interest-4 (AOI-4) at the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility, September 2011. (Contaminant concentrations exceeding their screening values are listed in bold red)

Contaminant	Range of concentrations detected (ppm <sup>*</sup> )		Location, Maximum	CV <sup>†</sup> (ppm)	CV reference
	Minimum	Maximum			
<b>Extractable Petroleum Hydrocarbons</b>					
C12-C16 Aliphatics	ND <sup>*</sup>	6.3	AOI4-EX1-B3 (3')	370	RECAP Soil SSni <sup>§</sup>
C12-C16 Aromatics	ND	7.6	AOI4-EX1-B4 (15')	180	RECAP Soil SSni
C16-C21 Aromatics	ND	43	AOI4-EX1-B4 (15')	150	RECAP Soil SSni
C16-C35 Aliphatics	ND	590	AOI4-EX1-B3 (3')	7,100	RECAP Soil SSni
C21-C35 Aromatics	ND	34	AOI4-EX1-SW3 (5')	180	RECAP Soil SSni
<b>Metals</b>					
Arsenic	ND	138	AOI4-EX1-SW6 (5')	210	Chronic EMEG <sup>**</sup>
Lead	12.5	77.7	AOI4-EX2-SW2 (3')	400	EPA <sup>††</sup> regional screening level
<b>Semivolatile Organic Compounds</b>					
2-Methylnaphthalene	ND	1.2	AOI4-EX1-B4 (15')	28,000	Chronic EMEG
Acenaphthene	ND	2.7	AOI4-EX1-B4 (15')	420,000	Int. <sup>‡‡</sup> EMEG
Anthracene	ND	1.7	AOI4-EX1-B4 (15')	1,000,000	Int. EMEG
Benzo (a) anthracene	ND	<b>1.3</b>	AOI4-EX1-SW3 (5')	0.15	EPA regional screening level
Benzo (a) pyrene	ND	<b>1.5</b>	AOI4-EX1-SW3 (5')	0.096	CREG <sup>§§</sup>
Benzo (b) fluoranthene	ND	<b>2.6</b>	AOI4-EX1-SW3 (5')	0.15	EPA regional screening level
Benzo (k) fluoranthene	ND	0.86	AOI4-EX1-SW3 (5')	1.5	EPA regional screening level
Chrysene	ND	1.7	AOI4-EX1-SW3 (5')	150	EPA regional screening level
Dibenzofuran	ND	2	AOI4-EX1-B4 (15')	78	EPA regional screening level
Fluorene	ND	3.3	AOI4-EX1-B4 (15')	280,000	Int. EMEG
Indeno (1,2,3-cd) pyrene	ND	<b>1.3</b>	AOI4-EX1-SW3 (5')	0.15	EPA regional screening level

\* ppm = parts per million

† CV = comparison value

‡ ND = not detected

§ RECAP Soil SSni = Louisiana Department of Environmental Quality Risk Evaluation/Corrective Action Program Screening Option Soil Screening Standard for Non-industrial exposures

\*\* EMEG = environmental media evaluation guide

†† EPA = Environmental Protection Agency

‡‡ Int. = intermediate

§§ CREG = cancer risk evaluation guide

## Shell Oil Metairie

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Table B-5: Contaminants detected in soil sampled after additional excavation from Area of Interest-4 (AOI-4) at the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility, October 2011 . (Contaminant concentrations exceeding their screening values are listed in bold red)

Contaminant	Range of concentrations detected (ppm*)		Location, Maximum	CV <sup>†</sup> (ppm)	CV reference
	Minimum	Maximum			
<b>Metals</b>					
Arsenic	ND <sup>‡</sup>	5.55	AOI4-EX1-SW12 (3')	210	Chronic EMEG <sup>§</sup>
<b>Semivolatile Organic Compounds</b>					
Benzo (a) pyrene	ND	<b>0.22</b>	AOI4-EX1-SW12 (3')	0.096	CREG <sup>**</sup>

\* ppm = parts per million

<sup>†</sup> CV = comparison value

<sup>‡</sup> ND = not detected

<sup>§</sup> EMEG = environmental media evaluation guide

\*\* CREG = cancer risk evaluation guide

## Shell Oil Metairie

Table B-6: Contaminants detected in soil sampled from Area of Interest-5 (AOI-1) at the Shell Oil Products US (SOPUS) former Metairie Lube Oil Blending Facility, September 2011.

Contaminant	Range of concentrations detected (ppm <sup>*</sup> )		Location, Maximum	CV <sup>†</sup> (ppm)	CV reference
	Minimum	Maximum			
<b>RECAP Metals</b>					
Arsenic	ND <sup>‡</sup>	3.01	AOI5-EX2-SW2 (3')	210	Chronic EMEG <sup>§</sup>
Lead	10.8	48.1	AOI5-EX2-SW2 (3')	400	EPA <sup>**</sup> regional screening level
<b>Semivolatile Organic Compounds</b>					
Acenaphthene	ND	0.35	AOI5-EX1-B1 (5')	420,000	Int. <sup>††</sup> EMEG
Phenanthrene	ND	0.057	AOI5-EX1-B1 (5')	2,100	RECAP Soil SSni <sup>‡‡</sup>
Pyrene	ND	0.037	AOI5-EX2-SW3 (5')	21,000	RMEG <sup>§§</sup>

\* ppm = parts per million

<sup>†</sup> CV = comparison value

<sup>‡</sup> ND = not detected

<sup>§</sup> EMEG = environmental media evaluation guide

<sup>\*\*</sup> EPA = Environmental Protection Agency

<sup>††</sup> Int. = intermediate

<sup>‡‡</sup> RECAP Soil SSni = Louisiana Department of Environmental Quality Risk Evaluation/Corrective Action Program Screening Option Soil Screening Standard for Non-industrial exposures

<sup>§§</sup> RMEG = Reference dose Media Evaluation Guide