REMEDIAL INVESTIGATION REPORT

FOR THE

R&H OIL/TROPICANA ENERGY SITE

SAN ANTONIO, TEXAS

PREPARED BY:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, Texas 78664
(512) 671-3434

JANUARY 4, 2017

100012569

RECEIVED
17 JAN -9 PM 2:06
SUPERFUND SEC.
REMEDIAL BRANCH
(6SF-R)

Remedial Investigation Report

For The

R&H Oil/Tropicana Energy Site
San Antonio, Texas

January 4, 2017

Prepared by:

Pastor, Behling & Wheeler, LLC

consulting engineers and scientists

TABLE OF CONTENTS

LIST OF TABLES iv
LIST OF FIGURES vi
LIST OF APPENDICES viii
LIST OF ACRONYMS x
EXECUTIVE SUMMARY xiii
1.0 INTRODUCTION 1
1.1 REPORT PURPOSE AND ORGANIZATION 1
1.2 SITE BACKGROUND 2
1.2.1 Site Description 2
1.2.2 Ownership and Operational History 3
1.2.3 Previous Regulatory, Removal Action and Investigation History 4
1.2.3.1 Pre-Removal Regulatory and Investigation History 4
1.2.3.2 Removal Actions 4
1.2.3.3 Post-Removal Investigations 5
1.2.4 Potential Source Areas 6
1.2.5 Former Kelly Air Force Base 7
2.0 STUDY AREA INVESTIGATIONS 9
2.1 INTRODUCTION 9
2.2 GROUNDWATER INVESTIGATIONS 12
2.2.1 Off-Site Groundwater Investigation 13
2.2.2 On-Site Groundwater Investigation 14
2.3 SOIL INVESTIGATIONS 15
2.4 DRAINAGE-DITCH INVESTIGATION 16
2.5 SOIL GAS INVESTIGATIONS 16
2.6 LNAPL INVESTIGATIONS 17
3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA 19
3.1 SURFACE FEATURES 19
3.2 METEOROLOGY 19
3.3 GEOLOGY AND HYDROGEOLOGY 20
3.3.1 Regional Geologic and Hydrogeologic Setting 20
3.3.2 Water-Well Survey Results 22
3.3.3 Site Hydrogeologic Framework 22
3.3.3.1 Upper Water Bearing Zone 24
3.3.3.2 Lower Water Bearing Zone 24
3.3.4 Groundwater Movement and Flow Conditions 24
3.3.5 General Groundwater Chemistry 26
3.3.6 Conceptual Hydrogeologic Model 26
3.4 LAND USE AND DEMOGRAPHY 27
3.4.1 Land Use 27
3.4.2 Demographics 27
3.5 ECOLOGY 28

3.5.1 Terrestrial Habitats 28
3.5.2 Aquatic and Wetland Habitats 29
3.5.3 Plant and Animal Species 30
3.5.4 Threatened and Endangered Species 30

4.0 NATURE AND EXTENT OF CONTAMINATION 31

4.1 INTRODUCTION 31
4.2 DATA VALIDATION 31
4.3 SOILS 32
4.3.1 On-Site Soil 33
4.3.2 Off-Site Soil 35
4.4 GROUNDWATER 35
4.5 LNAPL 41
4.6 SOIL GAS 43
4.7 DITCH SURFACE WATER 45

5.0 CONTAMINANT FATE AND TRANSPORT 46

5.1 POTENTIAL ROUTES OF MIGRATION 46
5.1.1 Human Health Pathways 46
5.1.2 Ecological Pathways 47
5.1.3 Air Transport Pathways 47
5.1.4 Groundwater Transport Pathways 48
5.2 CONTAMINANT PERSISTENCE 49
5.3 CONTAMINANT MIGRATION 50
5.3.1 Contaminant Plume Stability 50
5.3.2 Presence of Biodegradation Indicators 51

6.0 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS 55

6.1 Summary of Baseline Human Health Risk Assessment 55
6.1.1 Identification of COPCs 55
6.1.2 Exposure Assessment 55
6.1.3 Toxicity Assessment 56
6.1.4 Risk Characterization 56
6.1.5 BHHRA Conclusions 58
6.2 SUMMARY OF SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT 59
6.2.1 Potential Ecological Risks Associated with Soil 60
6.2.2 Potential Ecological Risks Associated with Surface Water 60
6.2.3 Scientific Management Decision Point 61

7.0 SUMMARY AND CONCLUSIONS 62

7.1 SUMMARY 62
7.1.1 Nature and Extent of Contamination 62
7.1.2 Fate and Transport 65
7.1.3 Risk Assessment 67
7.2 CONCLUSIONS 68

8.0 REFERENCES 69

LIST OF TABLES

Table	Title
1	Site History Summary
2	Extent Evaluation Values: Soil
3	Extent Evaluation Values: Groundwater
4	Monitoring Well Summary
5	Monitoring Well Gauging Summary
6	Aquifer Testing Results
7	Groundwater Sampling Results: Physical Properties and Attenuation Parameters
8	On-site Soil Sampling Results: Total Petroleum Hydrocarbons
9	On-site Soil Sampling Results: Metals
10	On-site Soil Sampling Results: Volatile Organic Compounds
11	On-site Soil Sampling Results: Semi-Volatile Organic Compounds
12	On-site Soil Sampling Results: Extent Evaluation Value Exceedances
13	Off-site Soil Sampling Results
14	Extent Evaluation Value Exceedances in Groundwater
15	On-site Groundwater Sampling Results: Total Petroleum Hydrocarbons June 2011
16	On-site Groundwater Sampling Results: Metals June 2011
17	On-site Groundwater Sampling Results: Volatile Organic Compounds June 2011
18	On-site Groundwater Sampling Results: Semi-Volatile Organic Compounds June 2011
19	On-site Groundwater Sampling Results: Total Petroleum Hydrocarbons October 2011
20	On-site Groundwater Sampling Results: Metals October 2011
21	On-site Groundwater Sampling Results: Volatile Organic Compounds October 2011
22	On-site Groundwater Sampling Results: Semi-Volatile Organic Compounds October 2011
23	On-site Groundwater Sampling Results: Total Petroleum Hydrocarbons May 2012
24	On-site Groundwater Sampling Results: Metals May 2012
25	On-site Groundwater Sampling Results: Volatile Organic Compounds May 2012
26	On-site Groundwater Sampling Results: Semi-Volatile Organic Compounds May 2012
27	On-site Groundwater Sampling Results: Volatile Organic Compounds April 2014
28	On-site Groundwater Sampling Results: Volatile Organic Compounds May 2015
29	On-site/Off-site Groundwater Sampling Results: December 2015
30	Off-site Groundwater Sampling Results: February 2011
31	Off-site Groundwater Sampling Results: October 2011
32	Off-site Groundwater Sampling Results: May 2012
33	Off-site Groundwater Sampling Results: April 2014
34	Off-site Groundwater Sampling Results: May 2015

LIST OF TABLES - CONTINUED

Table	Title
35	Light Non-Aqueous Phase Liquid Analysis
36	Soil Gas Sampling Results
37	Surface Water Sampling Results

LIST OF FIGURES

Figure	Title
1	Site Location Map
2	Site Map
3	Site Map - Previous Investigation Locations
4	Monitoring Well Location Map
5	Soil Sample/Boring Location Map
6	Drainage Ditch and Surface Water Sample Location Map
7	Soil Gas Sample Location Map
8	Site Topographic Map
9	Regional Geologic Map
10	Cross Section Locations
11	Cross Section A-A'
12	Cross Section B-B'
13	Cross Section C-C'
14	Cross Section D-D'
15	Cross Section E-E'
16	Cross Section F-F’
17	Cross Section G-G’
18	Cross Section H-H’
19	Groundwater Potentiometric Surface Map - July 25, 2011
20	Groundwater Potentiometric Surface Map - August 23, 2011
21	Groundwater Potentiometric Surface Map - September 15, 2011
22	Groundwater Potentiometric Surface Map - October 10, 2011
23	Groundwater Potentiometric Surface Map - November 16, 2011
24	Groundwater Potentiometric Surface Map - December 13, 2011
25	Groundwater Potentiometric Surface Map - January 23, 2012
26	Groundwater Potentiometric Surface Map - February 20, 2012
27	Groundwater Potentiometric Surface Map - March 14, 2012
28	Groundwater Potentiometric Surface Map - April 11, 2012
29	Groundwater Potentiometric Surface Map - May 9, 2012
30	Groundwater Potentiometric Surface Map - June 6, 2012
31	Groundwater Potentiometric Surface Map – July 7, 2012
32	Groundwater Potentiometric Surface Map – August 23, 2012
33	Groundwater Potentiometric Surface Map – September 26, 2012
34	Groundwater Potentiometric Surface Map – October 24, 2012
35	Groundwater Potentiometric Surface Map – November 27, 2012
36	Groundwater Potentiometric Surface Map – December 11, 2012
37	Groundwater Potentiometric Surface Map – January 16, 2013
38	Groundwater Potentiometric Surface Map – February 20, 2013
39	Groundwater Potentiometric Surface Map – April 21, 2014
40	Groundwater Potentiometric Surface Map – December 18, 2014
41	Groundwater Potentiometric Surface Map – May 4, 2015
42	Groundwater Potentiometric Surface Map – March 3, 2016
43	Surface and Shallow Soil Extent Evaluation Value Exceedances
44	Deep Soil Extent Evaluation Exceedances
45	Groundwater Concentration Map: Benzene

LIST OF FIGURES - CONTINUED

Figure	Title
46	Groundwater Concentration Map: Toluene
47	Groundwater Concentration Map: Ethylbenzene
48	Groundwater Concentration Map: Xylenes
49	Benzene Groundwater Concentration Trends
50	Toluene Groundwater Concentration Trends
51	Ethylbenzene Groundwater Concentration Trends
52	Xylene (Total) Groundwater Concentration Trends
53	Spatial Groundwater Concentration Trends
54	Measured In-Well LNAPL Thickness - July 25, 2011
55	Measured In-Well LNAPL Thickness - August 23, 2011
56	Measured In-Well LNAPL Thickness - September 15, 2011
57	Measured In-Well LNAPL Thickness - October 10, 2011
58	Measured In-Well LNAPL Thickness - November 16, 2011
59	Measured In-Well LNAPL Thickness - December 13, 2011
60	Measured In-Well LNAPL Thickness - January 23, 2012
61	Measured In-Well LNAPL Thickness - February 20, 2012
62	Measured In-Well LNAPL Thickness - March 14, 2012
63	Measured In-Well LNAPL Thickness - April 11, 2012
64	Measured In-Well LNAPL Thickness - May 9, 2012
65	Measured In-Well LNAPL Thickness - June 6, 2012
66	Measured In-Well LNAPL Thickness – July 7, 2012
67	Measured In-Well LNAPL Thickness – August 23, 2012
68	Measured In-Well LNAPL Thickness – September 26, 2012
69	Measured In-Well LNAPL Thickness – October 24, 2012
70	Measured In-Well LNAPL Thickness – November 27, 2012
71	Measured In-Well LNAPL Thickness – December 11, 2012
72	Measured In-Well LNAPL Thickness – January 16, 2013
73	Measured In-Well LNAPL Thickness – February 20, 2013
74	Measured In-Well LNAPL Thickness – April 21, 2014
75	Measured In-Well LNAPL Thickness – December 18, 2014
76	Measured In-Well LNAPL Thickness – May 4, 2015
77	Measured In-Well LNAPL Thickness – March 3, 2016
78	Groundwater and LNAPL Hydrographs
79	Benzene Concentrations in Soil-Gas and Sub Slab Samples
80	Human Health Conceptual Site Model
81	Ecological Conceptual Site Model

LIST OF APPENDICES

Appendix		Title
A		Photographic Log
	A-1	Photographs of Current Conditions
	A-2	Historical Aerial Photographs
	A-3	Photographs Prior to Removal Action in 2001 (From R&H Oil/Tropicana Energy Site Update presentation, Chris Villarreal, February 5, 2003)
	A-4	Photographs of Removal Action in 2001 at R&H Oil Portion of Site (From Removal Report for R&H Oil Company, Roy F. Weston, Inc., January 2002)
	A-5	Photographs of Removal Action in 2001 at Tropicana Energy Portion of the Site (From Removal Report for Tropicana Energy Company Inc., Roy F. Weston, Inc., January 2002)
B		Screening Level Ecological Risk Assessment
C		Site Control Documentation
	C-1	Order Appointing Receiver
	C-2	Restrictive Covenants
	C-3	City Ordinance
D		Work Plan Refinement Notices
E		Soil Boring Logs/Well Construction Diagrams
F		Hydraulic Testing Data
	F-1	July 2011 Slug Tests
	F-2	December 2011 Slug Tests
G		RI Analytical Laboratory Reports, Validation Reports, and Analytical Data Database Electronic Files (on DVD)

H TCEQ TRRP Tier 1 TPH PCL Calculator Output
I LNAPL Baildown and Transmissivity Testing
Table I.1 LNAPL Transmissivity Test: Baildown Method
Table I.2 MW-15 LNAPL Transmissivity Test: Skimming Method
Figure I.1 AQTESOLV Output
Figure I.2 LNAPL Skimming Test MW-15

LIST OF ACRONYMS

ACM	Asbestos Containing Material
API	American Petroleum Institute
AST	Aboveground Storage Tank
ATSDR	Agency for Toxic Substances and Disease Registry
ARAR	Applicable or Relevant and Appropriate Requirements
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CEI	Compliance Evaluation Inspection
cm/sec	centimeter per second
COC	Chemical of Concern
COPEC	Chemicals of Potential Ecological Concern
COPC	Chemical of Potential Concern
CPS	City Public Services
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CSM	Conceptual Site Model
DPT	Direct Push Technology
DO	Dissolved Oxygen
DOT	Department of Transportation
EEV	Extent Evaluation Value
ERA	Ecological Risk Assessment
EPA	Environmental Protection Agency
ft/ft	feet per foot
ft/year	Feet per year
Fe(III)	Ferric Iron
Fe(II)	Ferrous Iron
FSP	Field Sampling Plan
GPD	Gallons per Day
HI	Hazard Index
HQ	Hazard Quotients
HRS	Hazard Ranking System

LIST OF ACRONYMS

KAFB	Kelly Air Force Base
LNAPL	Light Non-Aqueous Phase Liquid
Mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MSL	Mean Seal Level
mV	Millivolts
NAPL	Non-Aqueous Phase Liquid
NOAA	National Oceanic and Atmospheric Association
NOV	Notice of Violoation
NPL	National Priorities List
NWI	National Wetlands Inventory
NTU	Nephelometric Turbidity Unit
OVM	Organic Vapor Monitor
ORP	Oxidation/Reduction Potential
PAH	Polycyclic Aromatic Hydrocarbon
PBW	Pastor, Behling & Wheeler, LLC
PCL	Protective Concentration Level
PHA	Public Health Assessment
PPM	Parts Per Million
PVI	Petroleum Vapor Intrusion
QA/QC	Quality Assurance and Quality Control
QAPP	Quality Assurance Project Plan
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RSL	Regional Screening Level
SAWS	San Antonio Water System
SC	Specific Conductance
SOW	Statement of Work
SLERA	Screening-Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TCEQ	Texas Commission on Environmental Quality
TDH	Texas Department of Health

LIST OF ACRONYMS

TDWR	Texas Department of Water Resources
TPH	Total Petroleum Hydrocarbons
TRRP	Texas Risk Reduction Program
TNRCC	Texas Natural Resource Conservation Commission
TWC	Texas Water Commission
TWDB	Texas Water Development Board
UCL	Upper Confidence Limit
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The United States Environmental Protection Agency (EPA) proposed the former R&H Oil/Tropicana Energy Site in San Antonio, Bexar County, Texas (the Site) to the National Priorities List (NPL) in June 2001; however, the Site has not been listed on the NPL. On March 12, 2010, the EPA and Respondents entered into an Administrative Settlement Agreement and Order on Consent (Settlement Agreement, 2010) requiring the Respondents to conduct a Remedial Investigation and Feasibility Study (RI/FS) for the Site. As described in the Settlement Agreement, the Remedial Investigation (RI) consists of collecting data to characterize site conditions, determining the nature and extent of the contamination at or from the Site, assessing the risk to human health and the environment and conducting treatability testing as necessary to evaluate the potential performance and cost of the treatment technologies that are being considered. The purpose of the RI Report is: (1) to provide a summary of the results of the field activities; (2) to characterize the Site; (3) to classify groundwater beneath the Site; (4) to define the nature and extent of chemicals of concern (COCs); and (5) to provide appropriate site-specific discussions regarding the fate and transport of Site COCs.

The nature and extent of COCs in Site environmental media were evaluated in the RI through installation of 24 groundwater monitoring wells (in addition to six existing groundwater monitoring wells), five non-aqueous phase liquid (NAPL) monitoring wells, 41 soil borings, 48 soil samples, 17 soil-gas sample points, three sub-slab vapor sampling points, five ditch surface water samples, and five NAPL samples. The sampling and analytical program rationale and methods were described in the RI/FS Work Plan (PBW, 2010a), the Field Sampling Plan (FSP) (PBW 2010b), and Quality Assurance Project Plan (QAPP) (PBW, 2010c). The key RI conclusions are summarized by area/media below. The extent of detected COCs in these media was evaluated through comparisons of sample concentrations to Extent Evaluation Values (EEVs) initially identified in the RI/FS Work Plan and updated in this report as appropriate. EEVs were risk-based values protective of residential exposures and provided a conservative basis for the determination of the extent of COCs for this commercial/industrial property.

Key RI Conclusions

- Surface Seeps – A tarry semi-solid NAPL material is present in the shallow soils at various locations in the northern (R&H Oil) portion of the Site. The NAPL material

appears at the ground surface as seeps in several areas. Sampling or other characterization of this material was not conducted during the RI, however, further characterization of the tarry seeps will be performed as needed as part of remedial design/remedial action (RD/RA) activities to implement the remedy selected for the Site.

- Shallow Vadose Zone Soils –

  Surface and shallow soils at the Site were evaluated through the collection of soil samples from the ground surface to a depth of 5 ft bgs. As indicated on Table 12, surface and shallow soil sample EEV exceedances were observed at all on-site soil sample locations. EEV exceedances in Surface soils (0-0.5 ft bgs) are characterized by elevated TPH, metals, and polycyclic aromatic hydrocarbons (PAHs). Lighter hydrocarbons, such as benzene and other gasoline-related compounds, were not found in the surficial soils at concentrations exceeding the EEVs. EEV exceedances in shallow soil samples (0.5-5 ft bgs) were limited to TPH, lead, mercury, and benzene.

- Deep Vadose Zone Soils –

  TPH, arsenic, lead and generally short-chain hydrocarbons were detected in deep soils at concentrations exceeding the EEVs. The COCs exceeding the EEVs in deep soils are compounds commonly associated with gasoline-type sources and did not include many of the metals or PAH compounds observed in the surface soils. The depths and locations of these exceedances suggest that the elevated concentrations are associated with LNAPL present (or historically present) near or on the top of the water table.

- Groundwater – Shallow groundwater at the Site was encountered from 10 to 22 ft bgs during the RI. Several metals (arsenic, lead, and manganese) and semi-volatile organic compounds (SVOCs) (2,4-dimethylphenol, 2-methylnaphthalene and 3&4 methylphenol) were detected in Site groundwater at concentrations exceeding the EEVs. Volatile organic compounds (VOCs) typically associated with petroleum hydrocarbon sources, such as benzene, ethylbenzene, toluene and xylenes (BTEX), were the most predominant COCs present in Site groundwater. The VOC concentrations are highest in the northwest portion of the Site (at the location of wells MW-12 and MW-14, the assumed source area) and decrease rapidly as the groundwater moves hydraulically downgradient towards the eastern boundary of the Site. Groundwater samples collected beyond the eastern boundary of the Site did not contain COCs at concentrations exceeding the EEVs,

indicating that natural attenuation processes have prevented downgradient off-site migration of COCs that may be attributed to the Site. The dissolved COC groundwater plume extends upgradient of the Site, likely due to dispersion of the COCs during their release period and potentially due to the operation of the Kelly Air Force Base groundwater pump and treat system which, during its operational period from approximately 2003 to 2013, provided a hydraulic gradient for groundwater flow from the Site to the north/northwest; a flow direction that is opposite to natural conditions.

In addition to concentration trends, geochemical groundwater parameters such as dissolved oxygen (DO) concentrations and oxidation/reduction potential (Redox or Oxidation-Reduction Potential (ORP) indicate that groundwater conditions conducive to biodegradation of the petroleum hydrocarbon compounds are present. Groundwater elevation data collected during the RI indicates a very low groundwater gradient (typically around 0.001 ft/ft but occasionally approaching zero) at the Site, as such, the groundwater flow velocity at the Site is relatively slow. Given the age of the releases (greater than 25 years), the observed dissolved COC plume stability, low groundwater velocity, and demonstrated COC degradation indicates limited potential for future migration.

- Surface Water - A drainage ditch is present adjacent to the western perimeter of the Site. The ditch receives surface-water runoff from an industrial area of San Antonio and is frequently dry except after rainfall events. No COCs were detected at concentrations exceeding the EEVs in surface-water samples collected from the drainage ditch in October 2011 following a rainfall event.

- Soil Gas – Eleven soil-gas points were installed near 11 of the monitoring wells, three soil-gas points were installed on the eastern perimeter of the Site, and three soil-gas points were installed in the sidewalk on the east side of Somerset Road, east of the Site. Three sub-slab sample points were installed in the on-site abandoned building located near the entrance of the Site. With the exception of acetone, no COCs were detected in these sub-slab vapor samples. The sub-slab samples were collected near the downgradient boundary of the property directly over the dissolved COC groundwater plume. The sample location and results of the sub-slab samples indicate that vapor intrusion associated with the off-site dissolved COC groundwater plume is unlikely. The highest soil gas concentrations were typically BTEX-related compounds (e.g., benzene

concentrations in the range of 14,000 to 620,000 ug/m^3) likely associated with shallow vadose zone light non-aqueous phase liquid (LNAPL) sources (not affected groundwater or deep LNAPL near the water table). Soil gas COC concentrations observed at locations with LNAPL sources present at the surface of the water table e.g., SG-12, SG-18, and SG-19, were considerably lower (benzene concentrations in the range of 33 to 270 ug/m^3).

- LNAPL - LNAPL is present in various areas of the Site in shallow vadose zone soils and in deeper soils above the water table. Due to the wide variety of historical activities performed at the Site (e.g., oil refining, fuel blending, and oil recycling), the location and characteristics of the LNAPL vary considerably across the Site. LNAPL observed in the northwest portion of the Site is characteristic of gasoline. LNAPL present in the central and southern areas of the Site is heavier and more characteristic of longer-chain hydrocarbons such as diesel fuel or fuel oil. LNAPL was sufficiently mobile to enter monitoring wells when the water table was depressed during drought conditions observed from 2011 to 2014; however, as the water table elevation subsequently began to rise, the volume and occurrence of LNAPL in wells across the Site rapidly decreased. In March 2016, measurable LNAPL was only observed in one well, MW-5, in the southern part of the Site.

Baseline Human Health Risk Assessment (BHHRA) - The primary objective of the BHHRA was to evaluate the possible risks associated with COCs in environmental media to human receptors at the Site. Data were segregated by media and by location (e.g., on-site groundwater, off-site groundwater, on-site soil, on-site soil gas, off-site drainage ditch surface water, off-site soil gas and off-site soil). Exposure point concentrations were estimated for soil constituents of potential concern (COPC) exposures, e.g., COCs that exceeded applicable human health screening levels. The maximum detected soil gas concentrations were used in the vapor intrusion assessment. Exposure scenarios addressed current and potential future land use and included an on-site future industrial worker, on-site future construction worker, future use of shallow groundwater for drinking water (both on-Site and off-site), current and future youth trespasser, current and future on-site maintenance worker, current and future contact recreation receptor, and current and future off-site residential receptor.

Based on the calculated hazard indices, the BHHRA estimated all potential on-site and off-site noncarcinogenic hazards at below the threshold of 1 except for potential on-site vapor intrusion

exposure to the on-site future industrial worker. The potential hazard for the hypothetical exposure scenario is driven by benzene. Shallow soil sample concentrations on-site exceed the Total TPH protective concentration level (PCL) derived for the mixture of TPH compounds measured in shallow soil. As such, exposure to shallow soils on-site might pose an unacceptable hazard to a future industrial worker at the Site. Potential carcinogenic risks from exposure to soil were calculated as less than 10^{-6} for the current trespasser and future construction worker, and at the low end of the allowable risk range of 10^{-4} to 10^{-6} for the current maintenance worker and the future industrial worker. Potential carcinogenic risks from vapor intrusion are estimated at 3 x 10^{-4} for the future industrial worker and at 4 x 10^{-6} for the off-site resident with benzene and ethylbenzene being the risk drivers.

Concentrations of some COPCs in the uppermost groundwater bearing unit, both on-site and off-site to the north, exceed drinking water standards; however, no water supply wells have been identified in the vicinity of the Site, and a City of San Antonio ordinance prohibits construction of water wells in the area (CSA, 1994; CSA 1997).

In summary, risks and hazards are below levels of concern for the current receptors/scenarios: current on-site maintenance worker and current youth trespasser. However, in the event that the property is used for industrial purposes in the future, exposure to an industrial worker from TPH in shallow soils and/or vapors in an enclosed space might pose an unacceptable risk. Restrictive covenants are currently in place at the Site (see Appendix C) and include the following restrictions; 1) property use is limited to commercial/industrial activities; 2) use of groundwater at the Site is prohibited and actions must be taken to prevent exposure to affected groundwater or soil if any activities may result in exposure to groundwater; and 3) protections must be taken to address potential exposures associated with future construction at the property, including mitigation of potential vapor intrusion if building construction is proposed.

Screening Level Ecological Risk Assessment (SLERA) – The SLERA (PBW, 2013) used data collected (i.e., soil and surface water) during the RI to evaluate the completeness and potential significance of potential ecological exposure pathways identified for the Site. The Site and adjacent areas do not provide unique habitat or foraging areas for wildlife species, nor is the Site believed to be used for critical life stages. No significant ecological resources were identified for the Site or adjacent properties and the habitat present at the Site has been determined to be of low ecological quality. There are no known occurrences of federal or state-listed threatened or endangered plant or animal species, or natural communities within the Site boundaries, and none

have been observed at the Site during numerous Site visits and sampling events. The SLERA focused on the surface and shallow soils at the Site as well as surface water in the nearby drainage ditch. Data from seventeen surface soil samples (0 to 0.5 ft bgs) and 14 shallow soil samples (2 ft to 5 ft bgs) were evaluated in the SLERA. Three additional surface soil samples were collected at the western fence line to support the SLERA and provide additional information that the drainage ditch adjacent to the Site to the west has not been impacted by potential historical surface runoff from the Site. In addition to the soil samples, five surface water samples were collected in the intermittent drainage ditch adjacent to the Site and evaluated in the SLERA.

Initially, the SLERA utilized chronic screening criteria to evaluate potential risk, but given the limited ecological resources at the Site, acute criteria were determined to be more appropriate. The SLERA concluded that it was not necessary to proceed to a site-specific Baseline Ecological Risk Assessment (BERA) because the concentrations of COCs present in soil and surface water were not at levels where toxicity would be expected. Therefore, it is unlikely that potential soil exposure at the Site would result in adverse ecological risks. Similarly, it is unlikely that surface water occasionally present in the ditch results in an adverse impact to aquatic life. The SLERA indicated that there is adequate information to conclude that ecological risks associated with the Site are negligible for the exposure and receptors evaluated in the SLERA. As such, there was no need to evaluate ecological risks further. Likewise, it is unnecessary to develop remedial action objectives to protect ecological receptors at this Site because adverse ecological risks are unlikely. The SLERA was approved by EPA on September 26, 2013.

1.0 INTRODUCTION

The United States Environmental Protection Agency proposed the former R&H Oil/Tropicana Energy Site in San Antonio, Bexar County, Texas to the NPL in June 2001; however, the Site has not been listed on the NPL. On March 12, 2010, the EPA and Respondents entered into an Administrative Settlement Agreement and Order on Consent (Settlement Agreement, 2010) requiring the Respondents to conduct a Remedial Investigation and Feasibility Study (RI/FS) (PBW, 2010a) for the Site. Pursuant to Paragraphs 21 through 28 of the Statement of Work (SOW) for the RI/FS, included as Appendix B of the Settlement Agreement, an RI/FS Work Plan and a Sampling and Analysis Plan were prepared for the Site (PBW, 2010b). These documents were approved by EPA on September 24, 2010. This Remedial Investigation (RI) Report has been prepared in accordance with Paragraph 37 of the SOW and Section 5.9 of the approved RI/FS Work Plan (PBW, 2010a). The report was prepared by Pastor, Behling & Wheeler, LLC (PBW) on behalf of the Respondents. The Respondents participating in the Settlement Agreement for the RI/FS are:

Bridgestone Americas Tire Operations, LLC
Department of State Health Services
Perkin Elmer Automotive Research, Inc. (f/k/a EG&G Automotive Research (Perkin Elmer, Inc.))
Exxon Mobil Corporation
Flint Group US LLC
BAE Systems Resolution, Inc. (f/k/a Santana Resolution Corporation)
Structural Metals, Inc.

For the purposes of the RI Report, the above Respondents are collectively referred to as the R&H Oil Company Site Group. A Site location map is provided as Figure 1 and a general Site map is provided as Figure 2. Photographs of current Site conditions are shown in Appendix A-1.

1.1 REPORT PURPOSE AND ORGANIZATION

As outlined in the Settlement Agreement (Page 11, Paragraph 33), the RI consists of "collecting data to characterize Site conditions, determining the nature and extent of the contamination at or from the Site, assessing risk to human health and the environment, and conducting treatability testing as necessary to evaluate the potential performance and cost of the treatment technologies that are being considered." The purpose of the RI Report, as specified in the Work Plan (Section 5.9) and the SOW (Page 24, Paragraph 37), is to provide "a summary of the results of the field

activities to characterize the Site, classification of ground water beneath the Site, nature and extent of contamination, and appropriate site-specific discussions for fate and transport of contaminants." Based on these objectives and consistent with the suggested RI report format in EPA RI/FS guidance (EPA, 1988), this report contains a description of RI data collection and analysis activities, summaries of the Final Baseline Human Health Risk Assessment (BHHRA) (PBW, 2016) and Final Screening-Level Ecological Risk Assessment (SLERA) (PBW, 2013, Appendix B). No treatability studies were proposed as part of the RI, so no treatability study discussions are included herein. The RI Report, along with the BHHRA and SLERA, is intended to provide necessary information for the development and screening of remedial alternatives, and refining the identification of applicable or relevant and appropriate requirements (ARARs) in subsequent FS-related tasks.

The organization of this RI Report is based on the suggested format provided in Table 3-13 of EPA's RI/FS Guidance (EPA, 1988). As such, Section 2.0 describes Study Area investigation activities, Section 3.0 details the physical characteristics, including surface and subsurface features, Section 4.0 provides the nature and extent of contamination evaluation, Section 5.0 describes contaminant fate and transport, Section 6.0 summarizes the human health and ecological baseline risk assessments, and Section 7.0 provides the report summary and conclusions. References cited in this report are listed in Section 8.0.

1.2 SITE BACKGROUND

1.2.1 Site Description

The Site is located approximately five miles southwest of downtown San Antonio and is comprised of two tracts: a northern tract located at 403 Somerset Road and a southern tract located at 507 Somerset Road in San Antonio, Bexar County, Texas (Figures 1 and 2) (the address of the southern tract was formerly listed as 419 Somerset Road in the proposed NPL listing of the Site). The northern tract has been previously referred to as the R&H Oil Company and/or the Eldorado Refining and Marketing, Inc. Site. The southern tract has been referred to as the Tropicana Energy Company site. Both tracts together are considered "the Site" for the purposes of this report (Figure 2).

1.2.2 Ownership and Operational History

An understanding of the Site's operating history was developed through review of the R&H Oil Company Site Screening Report prepared by the Texas Natural Resource Conservation Commission (TNRCC), (TNRCC, 2000) and the HRS Documentation Record (TNRCC, 2001). A summary of the history is discussed below and shown on Table 1. Historical aerial photographs from 1929, 1939, 1957, 1962, 1973, 1987 and 1991 are included in Appendix A-2.

The specific date when industrial operations started at the Site is not known. An October 1929 aerial photograph shows the Site area as undeveloped land. According to the TNRCC (TNRCC, 2000), an operating refinery is indicated in aerial photographs from as early as 1939, with storage tanks visible on both the northern and southern tracts. The 1939 photograph shows industrial operations on both the northern and southern tracts.

According to TNRCC, 2001, Monarch Refining Company/Wing Corporation operated on certain areas of the northern tract lots and on the southern tract lots from 1950 to 1974. Flint Ink Corporation operated a refinery on certain other northern tract lots. Later Site operations included oil recycling and waste oil refining activities on the northern tract, and a petroleum products distribution facility, and then a gasoline blending operation on the southern tract. Waste oil recycling activities on the northern tract, and the fuel/gasoline blending operations on the southern tract, ceased in approximately the late 1980s or early 1990s and the Site remained inactive (TNRCC, 2001).

Over the course of time, operational areas at the Site varied. The northern part of the Site was generally reported to contain process areas/buildings, a warehouse, an office, an API separator, pump houses, tank batteries, and a railroad loading platform (TNRCC, 2000). The southern part of the Site was reported to contain tank batteries and drum storage areas (TNRCC, 2001).

On September 23, 2013, a receiver was appointed for the Site by the 131st District Court of Bexar County, Texas. A copy of the court order appointing the receiver is included in Appendix C.

On June 6, 2014, the receiver recorded restrictive covenants on the deeds for the Site. These restrictive covenants limit groundwater use, restrict future land use to commercial/industrial use, and require additional investigation and vapor intrusion controls prior to any new industrial-use construction. These restrictive covenants are provided in Appendix C.

1.2.3 Previous Regulatory, Removal Action and Investigation History

1.2.3.1 Pre-Removal Regulatory and Investigation History

An overview of the regulatory and investigation history of the Site is summarized in Table 1. The most significant spill appears to have been the release of approximately 8,000 gallons of natural gasoline during off-loading of a tanker truck on April 18-19, 1990. This release occurred into, and then outside of, an on-site bermed area on the southern tract, reportedly spreading over a 700 square yard area (Raba-Kistner, 1991). Following initial response and recovery operations (approximately 7,800 gallons were reportedly recovered), eight soil borings and six monitoring wells were installed and sampled in the southern tract. These six monitoring wells (MW-1 through MW-6) are shown on Figure 3. Petroleum hydrocarbons were reportedly encountered at all eight soil boring locations, with light non-aqueous phase liquid (LNAPL) observed in several soil cores. Records from the investigation do not indicate that LNAPL accumulated within the monitoring wells (Raba-Kistner, 1991).

The first overall Site assessment was initiated with concurrent removal assessments of the R&H Oil Company, Inc. and Tropicana Energy Company, Inc. properties (E&E, 1998a; and E&E, 1998b; respectively) in April 1998. Assessment activities included an inventory of tank equipment, tankage, and drums; and collection of oil, waste, sludge, soil, groundwater, and building (asbestos) samples. Soil sample locations for these assessments are shown on Figure 3. Appendix A-3 shows photographs of the Site prior to the removal actions in 2001.

1.2.3.2 Removal Actions

Removal actions were performed during the period from August to October, 2001 (Weston, 2002a; 2002b). Appendix A-4 and A-5 show photographs taken during the removal actions for the R&H Oil Company, Inc. and Tropicana Energy Company, Inc. properties, respectively. Removal actions at the R&H Oil Company, Inc. property included removal of asbestos containing materials (ACM), materials (as described below), on-site containers, equipment, piping and other items, and removal of hydrocarbon impacted soils based on visual observations. The following materials were removed from the R&H Oil Company, Inc. property (Weston, 2002a):

- 52,906 gallons of oil from tanks along with bottom sediments whose water content was greater than 30% for off-site disposal.
- 26,701 gallons of wastewater for off-site disposal.

- 1,396 cubic yards of hydrocarbon-impacted soil for off-site disposal.
- 30 cubic yards of ACM for off-site disposal.
- 120 cubic yards of oily debris for off-site disposal.
- 443 tons of metal for sale as scrap.

Removal actions at the Tropicana Energy Company, Inc. property included removal of materials (described below), on-site containers and equipment, piping, and removal of impacted soils. The following materials were removed from the Tropicana Energy Company, Inc. property (Weston, 2002b):

- 1,626 gallons of benzene-contaminated wastewater for off-site disposal.
- 4,715 gallons of wastewater for off-site disposal.
- 96 cubic yards of hydrocarbon-impacted soil for off-site disposal.
- 144 tons of metal for sale as scrap.

1.2.3.3 Post-Removal Investigations

In December 2003, the Texas Department of Health (TDH) and the Agency for Toxic Substances and Disease Registry (ATSDR) conducted a Public Health Assessment (PHA) for the Site (ATSDR, 2003). This assessment evaluated available Site information and identified potential exposure pathways through which people might come into contact with COCs detected at the Site. The evaluated pathways included possible contact with Site COCs in surface water, air, soil, groundwater, and soil gas. Based on that evaluation, the PHA concluded that "at present the R&H Oil Company/Tropicana Energy Company Site poses no apparent public health hazard" (ATSDR, 2003).

In 2004, some members of the R&H Oil Company Site Group voluntarily conducted a preliminary investigation at the Site to gain a better understanding of the Site conditions at that time. This investigation, the undertaking and scope of which were not approved by EPA in advance, involved collection of soil samples from seven on-site and four off-site soil borings (Figure 3). Six of the on-site borings and all four of the off-site soil borings were converted to temporary monitoring wells for the collection of groundwater samples. LNAPL samples were also collected from one temporary on-site monitoring well and two previously existing monitoring wells (MW-3 and MW-6 installed as part of the 1991 Raba-Kistner investigation described above). The investigation results indicated that Site soils and groundwater were

affected by petroleum hydrocarbons, including BTEX COCs, but the off-site impacts appeared very limited (ERM, 2004). The data collected from this investigation have not been validated or formally approved by EPA, but were used in the scoping of the RI.

A passive soil-gas survey was performed at the Site during September 2008 by an EPA contractor (SAIC, 2008). This survey involved the placement of passive soil-gas collection vials in the shallow subsurface (depth range of 2 to 3 feet bgs) for a 15-day sampling period. After completion of the sampling period, the sampling devices were retrieved and the samplers analyzed for volatile organic compounds (VOCs). The investigation concluded that detected concentrations were "mainly located in the center of the site" (SAIC, 2008).

1.2.4 Potential Source Areas

Potential source areas at the Site include former operation areas, product storage areas, and product loading areas. As noted previously, the source of petroleum hydrocarbons (e.g., tanks, piping, sludge, etc.) were removed as part of removal actions completed by EPA in 2001. Areas of residual hydrocarbons (detailed in Section 4.0) were generally identified as follows:

R&H Oil Northwest Corner – The nature of the LNAPL observed in monitoring wells located in the northwest corner of the Site, and the distribution of dissolved BTEX compounds across the Site, indicate that the northwest corner of the Site may be a potential residual source area for gasoline type compounds. Forensic laboratory analyses conducted on LNAPL samples collected from MW-14 in this area estimated that the LNAPL is a heavily weathered gasoline produced after 1960 but prior to the early 1980s (see Section 4.5). The highest dissolved BTEX (and related gasoline compounds) concentrations are found in the northwest corner of the Site at the location of wells MW-12 and MW-14. BTEX concentrations decrease rapidly from west to east downgradient across the Site (see Section 4.4 for a more detailed discussion of BTEX concentrations in groundwater). Historical Site information indicates that gasoline was not manufactured or stored in the northwest corner of the Site; however, there is a report of gasoline produced by Monarch Refining, located on the southern portion of the Site, being loaded on the rail spur in the northwest corner of the Site (TDWR, 1981).

R&H Oil Central Area – The central portion of the northern tract (R&H Oil) historically contained above ground storage tanks (ASTs). Residual hydrocarbons observed in the central portion of the Site are most likely related to these ASTs. Tarry material is present at the ground surface in the northern portion of the Site (Figure 43) and appears to seep to the surface during

hot periods. Based on photos taken during the EPA-lead removal actions in 2001 (Weston, 2002), these seeps appear to have been present prior to the removal actions. Sampling or other characterization of this material was not conducted during the RI, however, further characterization of the tarry seeps will be performed as needed as part of remedial design/remedial action (RD/RA) activities to implement the remedy selected for the Site.. The contribution of the thinner oil-like LNAPL material to the dissolved BTEX plume is likely minimal based on BTEX concentration trends across the Site.

Tropicana Energy North Central Area – The north central area of the southern tract of the Site (Tropicana Energy area) was the location of two 150,000 gallon ASTs operated by Tropicana Energy Corporation (TEC) in the late 1980s and early 1990s. TEC used the area to store and blend ethanol, gasoline, and gasoline-range components for sale as full specification gasoline (Raba-Kistner, 1991). As described previously, during a fuel transfer operation in April 1990, approximately 8,000 gallons of natural gasoline were spilled into the bermed AST area with a small quantity flowing outside of the bermed area. Based on the response actions performed following the release, approximately 7,800 gallons of the estimated 8,000 gallons of product was recovered (Raba-Kistner, 1991). Forensic laboratory analyses and TPH analysis performed as part of this RI on a LNAPL sample from this area (MW-5) indicates the presence of a mixture of light hydrocarbons (gasoline) and middle-range hydrocarbons (diesel/kerosene), suggesting that the LNAPL in this area is likely a combination of gasoline from the 1990 spill and oil releases from historical refining operations. While this potential source area may contribute to the dissolved BTEX plume, the contribution is likely minimal based on concentration trends across the Site.

1.2.5 Former Kelly Air Force Base

The former East KAFB, now the Port of San Antonio, is located immediately northwest of the Site. The portion of the base adjacent to the Site was known as “East Kelly” and is identified as “Zone 4” in environmental documents. A regional groundwater plume of dissolved-phase chlorinated solvents originates from East KAFB and extends to the east and southeast of Zone 4 (towards the Site). Due to the reducing groundwater conditions associated with petroleum hydrocarbons at the Site, the chlorinated solvent plume is degraded in the vicinity of the Site and downgradient of the Site for approximately one-half mile (based on 2012 Isoconcentration Map from Semiannual Compliance Plan Report [Shaw, 2013]). As part of East KAFB’s plume remedy strategy, a groundwater recovery system comprised of horizontal recovery wells was

installed to the northwest of the Site. This system was operated from 2003 to 2013 and pumped and treated approximately 706 million gallons of water according to information provided by the KAFB contractor. Based on the relatively low groundwater gradient in the vicinity of East KAFB and the Site, and the recovery system's proximity to the Site (particularly the south bank recovery wells), Site groundwater containing petroleum hydrocarbon COCs was potentially drawn to the northwest (hydraulically upgradient) by the operation of the recovery system. BTEX concentration data reported for East KAFB well SS052MW097 over this timeframe suggest that these COCs were introduced to the East KAFB area as a result of the operation of the groundwater extraction system.

2.0 STUDY AREA INVESTIGATIONS

2.1 INTRODUCTION

Consistent with the sequence specified in the RI/FS Work Plan, Site investigation activities were performed using an iterative, phased approach that began with off-site sampling locations and proceeded to on-site sampling activities. Data from each phase of the investigation were compared to the EEVs established in the Work Plan for the purpose of assessing whether the lateral and vertical extent of the COCs in the environmental medium being evaluated had been identified (PBW, 2010a). EEVs were risk-based criteria based on residential exposure scenarios and are provided on Tables 2 and 3. The criteria used to establish the EEVs were updated as new TCEQ and EPA criteria were issued (e.g., updated protective concentration limit tables and the EPA Vapor Intrusion Screening Level calculator). The current soil and groundwater criteria are reflected in Tables 2 and 3, respectively. The criteria are the lower of the Texas Risk Reduction Program (TRRP) Protective Concentration Levels (PCLs) or the EPA Regional Screening Levels (RSLs). The results are discussed in Sections 4.3 (soils) and 4.4. (groundwater) and the comparison to EEVs are shown on Tables 8 through 34. The various phases of work performed as part of the RI are described in the following paragraphs:

Off-site Well Installation (January 2011) – Five monitoring wells (MW-7 through MW-11) were installed in the neighborhood adjacent to the Site to the southeast. These wells were sampled within seven days after installation.

On-site Investigation (May 2011) – Nine groundwater monitoring wells (MW-12 through MW-20) and five LNAPL monitoring wells (NMW-1 through NMW-5) were installed on the Site as part of this phase of the investigation. Soil samples were collected from the ground surface, the 1-5 ft bgs soil interval, and a deep vadose zone soil interval at each well location. All on-site groundwater monitoring wells were sampled as part of this investigation phase.

Soil Gas, Ditch Surface Water, Site-Wide Groundwater and LNAPL Investigation (October 2011) – Shallow soil gas and sub-slab vapor points were installed and sampled as part of this phase of the investigation. Pre-sampling rainfall resulted in accumulation of water in the adjacent drainage ditch and surface-water samples were collected from the ditch during this event. A site-wide groundwater sampling event was conducted and LNAPL was collected from several monitoring wells for analysis.

Off-Site Well Installation (May 2012) – Two additional groundwater monitoring wells (MW-21 and MW-22) were installed in the neighborhood southeast of the Site. Shallow soil-gas sample points were also installed adjacent to the locations of the monitoring wells. A site-wide groundwater monitoring event was conducted following the installation of these new wells.

SLERA Surface Soil Sampling (October 2012) – Three additional surface soil samples (SB-1 through SB-3) were collected along the drainage ditch on the western perimeter of the property to evaluate potential transport of COCs to the ditch via overland flow of stormwater. This sampling was conducted to address a data gap identified in the SLERA.

Additional BHHRA Sampling (February 2014) – Two additional soil samples were collected from previous on-site sample locations (NMW-1 and MW-13) to support risk calculations based on TPH fractionation data for previous soil samples. Two additional soil sample locations (SB-4 and SB-5) were advanced to address a data gap identified in the BHHRA. Three additional soil-gas samples were collected along the eastern perimeter of the Site to support the conclusions of the BHHRA.

Site-Wide Groundwater Sampling Event (April 2014) – A site-wide groundwater sampling event was conducted in April 2014 that included sampling two existing monitoring wells located on the former East KAFB northwest of the Site (SS052MW097 and SS052MW097).

Additional West and Northwest Groundwater Delineation (April 2015) – Based on comments from EPA, additional groundwater delineation of COCs to the west and northwest of the Site was performed. Five additional monitoring wells (MW-23 through MW-27) were installed (two on-site, three off-site), and a site-wide groundwater monitoring event was conducted (including two existing East KAFB wells SS052MW097 and SS052MW097).

Off-Site Soil-Gas Sampling (May 2015) – Four additional soil-gas sampling points were installed below the sidewalk on the east side of Somerset Road east of the Site. These samples were collected to confirm the BHHRA conclusions that vapor intrusion originating from on-site sources was not a risk in the residential area east of the Site.

Additional North and Northeast Groundwater Delineation (December 2015) – Based on comments from EPA, additional delineation of COCs in groundwater to the north and northeast of the Site was performed. Three additional monitoring wells (MW-28 through MW-30) were

installed (two off-site, one on-site), and a limited groundwater monitoring event was conducted (wells MW-25, MW-28, MW-29, MW-6, and MW-30).

Groundwater Gauging and LNAPL Recovery Evaluation Events (June 2011 – March 2016) - Between June 2011 and March 2013, groundwater-level gauging was conducted on a monthly basis to monitor groundwater elevation and evaluate how in-well LNAPL thickness responded to changes in groundwater levels at the Site. From August 2012 through February 2013, wells containing greater than 0.5 ft of LNAPL were bailed monthly to remove the LNAPL to evaluate how LNAPL recovery to the wells may be influenced by groundwater levels at the Site. Five additional groundwater gauging events were conducted between March 2013 and March 2016 to evaluate how LNAPL in Site monitoring wells was responding to changing water levels related to increased precipitation. Groundwater-level measurements were collected during a total of 24 gauging events conducted during the RI.

As the RI progressed, changes were made to the scope of work to accommodate new information. These changes were proposed in Work Plan Refinement Notices (Appendix D) as specified in Section 10 of the SAP, and approved by EPA prior to implementation. The first Work Plan Refinement Notice recognized the presence of two hydrostratigraphic zones at the Site (see Section 3.3.3 for a detailed discussion of these zones). Following installation of the off-site groundwater monitoring wells, it was apparent that impacts at the Site were limited to the vadose zone and the upper water-bearing zone. Work Plan Refinement Notice dated April 25, 2011 revised the scope of the Work Plan to focus on the uppermost water-bearing zone for future RI activities. The second Work Plan Refinement Notice dated March 26, 2012 expanded the scope of the RI to include installation of two groundwater monitoring wells in the upper water-bearing zone in the neighborhood southeast of the Site. A third Work Plan Refinement Notice dated October 17, 2012 was prepared to address additional soil samples collected from along the drainage ditch to support the SLERA. Other changes to the original scope of work proposed in the Work Plan included LNAPL recovery evaluations consisting of baildown testing, monthly LNAPL removal, and transmissivity testing and expanding the groundwater sampling program to include wells located on the adjacent Kelly Air Force Base. As noted previously, Work Plan Refinement Notices are presented in Appendix D.

Sample collection methods, field measurements procedures, laboratory analytical methods and data validation procedures were specified in the Field Sampling Plan (FSP) (PBW, 2010b) and the Quality Assurance Project Plan (QAPP) (PBW, 2010c). Quality assurance and quality control

(QA/QC) samples were collected at the frequency specified in the FSP. Detailed descriptions of field and laboratory procedures specified in the FSP and QAPP are not repeated herein; however, general discussions of these procedures are noted in the specific investigation summaries below. Field activities were performed in accordance with the Site-specific Health and Safety Plan (PBW, 2010d).

2.2 GROUNDWATER INVESTIGATIONS

Groundwater investigation activities are described by area below. Details regarding the lithology, structure, hydraulic characteristics, and groundwater flow directions, along with regional groundwater information and Site hydrogeologic cross-sections, are provided in Section 3.3. The extent of COCs in the upper groundwater-bearing zone is discussed in Section 4.4. Monitoring well locations are shown on Figure 4, and boring logs and well construction diagrams for the monitoring wells are provided in Appendix E.

Soil borings for monitoring wells were advanced using the hollow-stem auger drilling method. Soil samples were collected continuously from each boring using a split-barrel sampler and logged in the field for lithology. Soil headspace samples were also collected and screened in the field for total organic vapor concentrations using an organic vapor meter (OVM). In addition, soil core samples were visually inspected for the presence of LNAPL. Monitoring wells were constructed using 2-inch diameter, flush-joint-threaded Schedule 40 PVC casing and 0.010-inch slotted PVC screen. Once the casing and screen were in place, the remaining well materials (filter sand (typically 12/20), bentonite pellets, and cement/bentonite grout) were added to the annular space. Filter sand was typically placed to a depth approximately 2 feet above the top of the screened interval and the remainder of the borehole annulus was filled with bentonite pellets and hydrated to within two ft of ground surface, after which cement was used for the well completion. Wells installed in paved areas were completed with a flush-mounted vault set in a concrete pad. Wells installed in non-traffic areas were completed as “stick-up” completions with the PVC riser protected by an aluminum cover and the well protected by bollards placed on each side of the well. After construction, the longitude, latitude, and elevation of each monitoring well was surveyed relative to Texas State Plane Coordinates and mean sea level (MSL). The surveyed elevations are provided on Table 4 and the surveyed elevations and locations are provided on the well as-built diagrams in Appendix E.

Per FSP procedures, well development consisted of surging and bailing or pumping. Temperature, pH, specific conductivity, and turbidity were monitored during the development process. Typically ten casing volumes of water were removed from the well during development. Development water was placed in DOT-approved drums and staged on-site. Investigation-derived waste (IDW) will be disposed of as part of the remedial action conducted at the Site.

Groundwater wells were purged and sampled using a peristaltic pump in accordance with low-flow sampling procedures described in the FSP. Purging was typically performed at a flow rate of 0.2 liter per minute or less, with the pump intake near the middle of the screened interval. Field measurements of pH, temperature, specific conductance (SC), dissolved oxygen (DO), ORP, and turbidity were recorded during sampling. After purging, groundwater samples were collected directly from the discharge of the pump. If the stabilized turbidity reading was greater than 10 nephelometric turbidity units (NTU), the sample collected for metals analysis was filtered in the field before sampling using a 10 micron (um) filter.

2.2.1 Off-Site Groundwater Investigation

Groundwater was investigated in the upgradient area to the west and northwest of the Site and in the neighborhood adjacent to the Site to the southeast (downgradient). Five groundwater monitoring wells (MW-7 through MW-11) were installed to the base of the lower water-bearing zone during the initial phase of the RI (Figure 4). This water-bearing zone was termed the "lower water-bearing zone" for the Site for the purpose of this RI (recognizing that deeper water-bearing zones not relevant to this investigation are present at significantly greater depths – see discussion of regional hydrogeology in Section 3.3.1). Two additional groundwater monitoring wells (MW-21 and MW-22) were installed in the upper water-bearing zone during a later phase of the RI. Monitoring wells MW-21 and MW-22 were co-located with lower water-bearing zone monitoring wells MW-9 and MW-8, respectively. A summary of the investigation area monitoring wells and their construction is provided on Table 4 and well construction diagrams are provided in Appendix E.

Four monitoring wells, MW-25, MW-26, MW-27, and MW-28, were installed to the west and northwest of the Site to evaluate upgradient and off-site groundwater conditions. These wells were installed in the uppermost water-bearing zone in April 2015. One additional off-site well, MW-29, was installed east of the Site in the uppermost water-bearing zone in December 2015.

Groundwater samples were collected for analysis from the initial off-site groundwater monitoring wells (in the residential neighborhood) five times during the RI; once immediately after the wells were installed (February 2011) and then as part of the subsequent site-wide groundwater monitoring events (October 2011, May 2012, April 2014, and May 2015). The three additional wells installed west and northwest of the Site were sampled during the event conducted in May 2015 and well MW-29 was sampled during the event conducted in December 2015.

2.2.2 On-Site Groundwater Investigation

Twelve groundwater monitoring wells, MW-12 through MW-20 (May 2011), MW-23 and MW-24 (April 2015), and MW-30 (December 2015), were installed on the Site as part of the RI. These groundwater monitoring wells were installed across the water table in the upper water-bearing zone at the Site. At the time of installation, the water table was approximately 20 ft bgs but has been observed as high as 10 ft bgs in the Site vicinity during the RI. Monitoring well locations are presented on Figure 4. Monitoring wells were developed and sampled soon after installation. Slug tests were performed at four of the upper zone groundwater monitoring wells (MW-12, MW-16, MW-17, and MW-20) and NMW-5 in July 2011 and December 2011 to provide an estimate of the hydraulic conductivity of the upper water-bearing zone.

In accordance with FSP procedures, at each monitoring well location, an initial soil boring was advanced to total depth using direct push technology (DPT). This soil boring was continuously sampled for lithologic logging, collecting soil samples, and collecting soil headspace vapor readings with an OVM. Each soil core was also observed for evidence of the presence of LNAPL. Soil borings for installation of the monitoring wells were advanced using hollow-stem auger drilling methods and monitoring wells were constructed as described previously. Several on-site monitoring wells installed during previous investigations were repaired as part of the RI activities, including the addition of well casing, protective casings, and bollards where required. After construction, the location and elevation of each monitoring well, including previously existing and repaired wells, were surveyed relative to Texas State Plane Coordinates and MSL. The surveyed elevations are provided on Table 4 and the surveyed elevations and locations are provided on the well construction diagrams in Appendix E.

On-site groundwater monitoring wells were sampled and analyzed as part of site-wide sampling events conducted in June 2011, October 2011, May 2012, April 2014, May 2015, and December 2015.

2.3 SOIL INVESTIGATIONS

The soil investigation program consisted of collecting soil samples from each of the borings advanced for monitoring well installation (groundwater and LNAPL monitoring wells) or other specific locations necessary to address data gaps identified during the progression of the RI (soil sampling events were conducted in May 2011, October 2012, and February 2014). Soil sample locations are shown on Figure 5. In accordance with Section 5.6.2 of the Work Plan, soil samples were collected from three depth intervals at each boring location; a surface soil sample from the 0-0.5 ft bgs interval; a shallow soil sample from the 0.5–4 ft bgs interval; and finally a deeper soil sample. The deep soil sample was generally collected from the interval exhibiting the highest OVM reading and typically corresponded to the water table fluctuation zone (approximately 10 to 20 ft bgs). Soil samples were collected using either plastic trowels, or a core barrel sampler driven by DPT techniques. Soil borings driven with DPT were advanced using a hydraulic ram to drive a core barrel containing a butyrate plastic liner for sample collection. Soil samples collected for VOC analyses were collected from the soil cores using Terra Core® samplers. Soil sampling locations are provided on Figure 5.

Soil samples were collected from the ground surface at locations MW-12 and MW-20 in June 2011 for analysis of soil geotechnical stability characteristics including compaction characteristics, one-dimensional consolidation testing, and swell/settlement potential. Soil samples from three locations, MW-12 (5-6 ft bgs), MW-20 (2 ft bgs), and MW-15 (5-6 ft bgs) were analyzed for grain size and Atterberg limits, and porosity and laboratory permeability.

In October 2012, three soil samples were collected from the 0-0.5 ft bgs interval along the drainage ditch west of the Site to evaluate potential impacts to the ditch associated with overland flow of stormwater from the Site (SB-1, SB-2, and SB-3). This information was collected to address data gaps identified in the draft SLERA.

In February 2014, additional soil samples were collected to support the BHHRA. Two additional samples were collected from the vicinity of wells NMW-1 and MW-13 (NMW-1 (0-0.5) and MW-13 (3-4)) to evaluate TPH fractions in soil. Two additional soil borings (SB-4 and SB-5) were advanced in the northern portion of the Site to provide a more complete data set for the area.

2.4 DRAINAGE-DITCH INVESTIGATION

Due to precipitation in the San Antonio area in September and early October 2011, water accumulated in the drainage ditch adjacent to the Site (see Figure 6). In accordance with Section 5.6.3 of the Work Plan, surface water samples were collected from the ditch at three locations adjacent to the Site and two locations upstream of the Site (sample locations shown on Figure 6). Surface water samples were collected by submerging a beaker into the water and filling sample containers from the beaker. The beaker was rinsed with water from the sampling location prior to sampling to ensure that any residual water from the previous sampling location was removed. Field measurements of pH, temperature, SC, and DO, were recorded during sampling.

2.5 SOIL GAS INVESTIGATIONS

Soil-gas sampling was performed at the Site and off-site following the methodology described in Section 6.5 of the approved SAP. The potential for vapor intrusion in the investigation area was evaluated by collecting shallow soil-gas samples, including from below the slab of one of the two remaining buildings on the Site. Most shallow soil-gas sample points were co-located with the groundwater monitoring-well locations (MW-12 through MW-22). Other soil-gas sample points were located along the eastern property boundary (SG-23 through SG-25) or in the sidewalk on the east side of Somerset Road (SG-26 through SG-28). Soil-gas sample locations are provided on Figure 7. Soil-gas points were co-located with monitoring well locations so the subsurface information collected during monitoring well installation could be used to better understand and interpret the soil-gas data. Using this technique, soil-gas sampling results were able to be correlated with potential shallow source areas (e.g., LNAPL present in the vadose zone, dissolved COC source areas, and areas where no dissolved COCs are present). Soil-gas sampling points were installed at two locations in the city streets adjacent to the Site beyond, but directly downgradient of, the dissolved plume of COCs (SG-21 and SG-22).

Soil-gas points were installed using DPT to advance a 2-inch borehole approximately 5 or 6 feet bgs. Soil-gas sample points SG-13 and SG-18 were installed to approximately 4 ft bgs to avoid NAPL-saturated soils found below 4 ft (based on the lithology observed during monitoring-well installation), see Section 4.6 for a description of how shallow source areas influenced the evaluation of soil-gas data collected at the Site. A stainless-steel sample point attached to 1/4-inch diameter polyethylene tubing was placed in the bottom of the borehole and covered with one foot of coarse-grained sand. The remainder of the borehole was sealed to the ground surface with

hydrated bentonite clay granules. Soil-gas points SG-21 and SG-22, which were co-located with off-site monitoring wells, were completed using flush-mount vaults installed in the pavement of the street. Three sub-slab vapor points were installed in the abandoned former office building located near the entrance of the Site (Figure 7). Sub-slab sample points were installed by using a hammer-drill to create a 3/8-inch diameter hole through the slab. A 1/4-inch diameter piece of polyethylene tubing was placed through the hole and sealed in place using hydrated granular bentonite. Soil-gas sample points were installed in the sidewalk in a similar manner using a hammer-drill to create a 7/8-inch diameter hole to approximately 16 inches below the sidewalk, then installing a soil-gas sample point in a sand pack, and sealing to the surface with cement grout. Sample tubing was capped upon completion of installations.

Soil-gas and sub-slab sample points were allowed to equilibrate for at least 24 hours prior to sampling. A leak test was performed at each location before sampling by releasing helium gas into a shroud placed over the sample point. A minimum of 30% by volume helium gas was established in the shroud before purging approximately 100 to 150 milliliters (ml) of vapor from the sample line and sand pack. The purged vapor was introduced directly to a portable helium meter or transferred to a Tedlar® bag and then analyzed for helium using a portable helium meter. Helium concentrations in the purge sample of less than 10% of the shroud concentration (<30,000 parts per million (ppm)) were considered acceptable. A leak test was also performed on the sample train prior to sample collection at each location by applying vacuum to the sample train and verifying that the vacuum was maintained and there were no leaking fittings. Soil-gas and sub-slab vapor samples were collected using 1 liter canisters.

2.6 LNAPL INVESTIGATIONS

Due to the variable nature and distribution of LNAPL at the Site, several investigation approaches were used to evaluate LNAPL and its recoverability. Initially, soil cores obtained during monitoring well installation were carefully observed for evidence of LNAPL. Five LNAPL monitoring wells, NMW-1 through NMW-5, were installed at specific locations to evaluate the potential presence of LNAPL in certain historical operation areas. LNAPL monitoring wells were installed in the same manner as described for groundwater monitoring wells above. Site-wide groundwater gauging and in-well LNAPL thickness measurements were conducted on a monthly basis from July 2011 until February 2013 to evaluate LNAPL behavior at the Site. The results of the monthly gauging activities and the relationship between groundwater depth and LNAPL thickness are discussed in Section 4.5.

LNAPL samples were collected from two monitoring wells, MW-5 and NMW-3, for analysis of specific gravity, density, viscosity, and interfacial surface tension. LNAPL samples were collected from three monitoring wells, MW-5, MW-14, and MW-15 for additional hydrocarbon forensic laboratory analysis. The LNAPL sample from MW-14 was further analyzed for paraffins, isoparaffins, olefins, naphthenes, and aromatics (PIANO), organic lead speciation and manganese. The results of these analyses are discussed in Section 4.5.

LNAPL baildown testing was performed at three monitoring wells, MW-12, MW-13, and MW-15 to evaluate LNAPL mobility and recoverability. LNAPL transmissivity at the three wells was also evaluated using the LNAPL skimming technique described in ASTM E2856-13 (ASTM, 2013); see Section 4.5 for further discussion.

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

3.1 SURFACE FEATURES

As indicated by the topographic survey map provided as Figure 8, the Site is generally flat with remnants of tank containment berms present in several areas of the Site. A gravel road enters the Site from the east from Somerset Road and continues across the site to the western perimeter. The gravel paved area extends into the northern area of the Site as indicated on Figure 2. Some remnants of railroad sidings are present on the western edge of the Site. Two buildings currently remain on the Site, a former laboratory/office building and a boiler building. The former laboratory/office building is a single story, approximately 900 square foot (sq ft) slab-on-grade brick structure. The boiler building is an approximately 1,300 sq ft sheet metal building containing two boilers.

Elevation changes over the Site are less than five feet and generally associated with the bermed areas. Rainfall runoff from much of the Site, particularly the northern tract, is controlled by berms in former Site operational areas. Outside of these bermed areas, runoff is generally to the east toward Somerset Road. Runoff from the narrow area west of the bermed areas, on the western edge of the Site, is toward a shallow drainage ditch adjacent to the western perimeter of the Site as indicated on the topographic map provided as Figure 8.

3.2 METEOROLOGY

The climate in the San Antonio area is primarily influenced by winds carrying continental weather systems into the area from the northwest and by maritime weather systems from the Gulf of Mexico brought into the area by southeast winds. Winters are typically mild and moderated by the effects of the Gulf of Mexico; however, freezing temperatures occur on average about 20 days each year when strong cold fronts occur. Winter temperatures can vary as much as 40 to 50 degrees in a day due to sun exposure and dry west winds. Summer conditions are more tropical with prevailing south or southeast winds. Summers are typically long and hot with daily temperatures above 90° F 80 percent of the time. Summer conditions frequently extend into the fall months. The annual average monthly temperature for the area is 69.1° F with monthly averages ranging from 51.8°F (January) to 84.4°F (August) (NOAA, 2012).

The San Antonio area is located between the semi-arid region of west Texas and the much wetter and humid region of east Texas, resulting in large variations in monthly and annual precipitation

amounts. Typical annual precipitation is around 29 inches but may range from around 10 to 50 inches from one year to another. San Antonio is located approximately 140 miles from the Gulf of Mexico and is occasionally affected by tropical storms bringing strong winds and heavy rains. Relative humidity is generally above 80 percent during the morning hours most of the year, dropping to near 50 percent in late afternoon. Average monthly precipitation ranges from 1.61 inches to 3.53 inches with most rainfall coming in the summer months (NOAA, 2012).

3.3 GEOLOGY AND HYDROGEOLOGY

3.3.1 Regional Geologic and Hydrogeologic Setting

The San Antonio area is located within two physiographic provinces, the Edwards Plateau to the northwest and the Gulf Coastal Plain to the southeast (USGS, 1995). These two provinces are divided by the Balcones Fault Zone, which extends south from McLennan County through the northern portion of Bexar County, and then to the west to Val Verde County. The Edwards Plateau, located northwest of the fault zone, is characterized by resistant limestone and dolomite units of the Lower Cretaceous that create a high plateau northwest of San Antonio. East of the fault zone the sediments consist of non-resistant chalk and calcareous clays. The area within the fault zone is known as the Balcones Escarpment, which is characterized by an escarpment feature along the fault line as a result of the difference in resistance to erosion between the lithologic units (Abbott and Woodruff, 1986). The Gulf Coastal Plain southeast of the Balcones Fault Zone is characterized by low to moderate relief with surficial geologic units consisting of sands and clays of Quaternary and Tertiary age (USGS, 1995). The Site is located along the southeast margin of the Balcones Escarpment within the Gulf Coast Plain.

Surficial and shallow subsurface geologic materials at the Site consist of Quaternary-aged fluviatile terrace deposits (Figure 9). These deposits consist of gravel, silt, sand, and clay (Barnes, 1983), and are generally 40 to 50 feet thick at the Site. The terrace deposits are underlain by shale and clays of the Cretaceous-aged Navarro Group which extend approximately 450 feet bgs. The Navarro Group is underlain by the Taylor Group (approximately 450 feet thick), which includes the Pecan Gap and Anacacho Formations. The Austin Chalk, Eagle Ford formation, Buda Limestone and Del Rio Formation (also known as the Grayson Shale), which together are approximately 140 feet thick (Sellards, 1919; and Arnow, 1959), separate the Taylor Group from the underlying Edwards Aquifer. The Edwards Aquifer underlies these formations at a depth of approximately 1,500 ft bgs in the vicinity of the Site (CH2M Hill, 2003).

None of the formations above the Edwards Aquifer in the vicinity of the Site are considered major or minor aquifers of Texas (Ashworth & Hopkins, 1995). The shale and clays of the Navarro Group and the Taylor Marl, consisting of 900 feet of geologic units in the vicinity of the Site, are not known to yield water to wells in Bexar County. The shallowest formation known to supply sufficient water for domestic or livestock use in the San Antonio region is the Austin Chalk. Higher yielding wells in the Austin Chalk are predominantly found in northern Bexar County, distant from the Site, and may be hydraulically connected with the Edwards Aquifer by faults within the Balcones Fault Zone (Arnow, 1959). A review of TWDB records indicates 11 wells are installed in the Austin Chalk in Bexar County, all of which are north of the Site with the nearest being 9 miles away (TWDB, 2016). The underlying Eagle Ford Shale is not known to yield water to wells, and the Buda Limestone only yields small quantities of water for domestic or livestock use near its outcrop. The Del Rio Clay (Grayson Shale) also does not yield water to wells completed in Bexar County (Arnow, 1959).

The major aquifer in the region is the Edwards Aquifer, which covers approximately 4,350 square miles, but is designated a "sole source" water supply for the City of San Antonio. The aquifer is characterized as highly permeable as a result of fracturing and dissolution of the limestone creating permeable solution zones and channels. The Edwards Aquifer is primarily recharged by surface-water infiltration provided by the streams throughout the Edwards Plateau (USGS, 1995). The top of the Edwards Aquifer is between 1,261 and 1,290 ft bgs in the immediate vicinity of the Site based on borings logs of San Antonio Water Supply (SAWS) wells at Station 5 installed between 1948 and 1967, located 0.3 mile southeast of the Site (TWDB, 2016). Other well records obtained in the KAFB water well search (see Section 3.3.2) indicate the top of the Edwards Aquifer ranges from 948 to 1,287 ft bgs in the areas around the Site.

An evaluation of the stratigraphy, faulting, water-bearing units, and potential for hydraulic communication between the shallow water-bearing terrace deposit and the underlying Edwards Aquifer in the vicinity of the Site was performed in 2002 by the Texas Bureau of Economic Geology (Hovorka, et. al. 2002). This study evaluated the hydraulic gradient between the shallow groundwater zone and the Edwards Aquifer, and assessed the potential for faults and water wells to serve as potential pathways between the two units. A literature survey performed for the evaluation indicated that the faults and fractures that may exist in the vicinity of the Site are unlikely to have high transmissivity and a follow up assessment (Miller, 2003) agreed that

"diffusion alone would require thousands of years for COCs to reach the Edwards Aquifer and that faults or fractures are unlikely pathways…" The two reports concluded that during normal or high water levels in the Edwards Aquifer, a sufficient hydraulic gradient does not exist to allow communication between the shallow terrace deposit groundwater zone and the Edwards Aquifer (gradient is upwards).

3.3.2 Water-Well Survey Results

An extensive water well survey was conducted in the vicinity of the Site as part of East Kelly AFB investigations (AFBCA and AFCEE, 2001). This survey was conducted in several phases from 1988 until 2001, and included a records search, a field survey and water well sample collection/analyses. The survey identified two shallow aquifer water wells within approximately 2,000 feet of the Site, both of which were identified as having been plugged and abandoned. Two other shallow water wells (total depth of 50 ft bgs) were identified located at 9486 Somerset Road in the KAFB well search, approximately 4 miles southwest of the Site, belonging to a mobile home park. Water well records accessed through TWDB (TWDB, 2016) indicate the wells are not used. Given the age and character of the neighborhoods surrounding the Site, and the long-time presence of a municipal water supply for the area, it is unlikely that new domestic wells have been constructed in the shallow water-bearing zone in the vicinity of the Site since the KAFB survey was performed. Representatives of the San Antonio Water System (SAWS, 2016) indicated that they were not aware of any recent water well permitting/drilling activities in the area. During the KAFB survey, Bexar Metropolitan Health District (BMHD) checked electrical connections with water service connections to confirm that there were no properties receiving electricity but no water service, potentially allowing operation from an on-site well (TNRCC, 1998). In addition, as noted previously, City of San Antonio ordinances 80574 §15 and 86747 §1, most recently updated in June 2014 and included herein as Appendix C-3, prohibit issuance of new well permits in areas where an existing water supply is available from San Antonio Water System or other water purveyor (CSA, 1994; CSA, 1997).

3.3.3 Site Hydrogeologic Framework

The site-specific geologic and hydrogeologic characteristics have been assessed through the use of historical geologic information provided in the previous investigations (Raba-Kistner, 1991; ERM, 2004) and geologic data obtained as part of the RI. The soils encountered during the RI and described in the previous investigations are consistent with the published descriptions of the

terrace deposits and Navarro Group described in Section 3.3.1. The stratigraphy at the Site is separated into four general units from the ground surface to a total depth of approximately 50 ft bgs: (1) Upper Clay Unit; (2) Interbedded sand/gravel and silt/clay units; (3) Basal Terrace Deposit Sands and Gravels; and (4) Lower Clay Unit/Navarro Group. Descriptions of the lithologic units are discussed below and geologic cross-sections are provided as Figures 10 through 18:

- Upper Clay Unit – This unit is characterized by fill, clay and silty clay intervals with calcium carbonate nodules from ground surface to a depth of approximately 12 to 22 ft bgs. The clays and silty clays are gray to tan in color, and frequently contain caliche nodules.

- Interbedded Sand/Gravel and Silt/Clay Units - The upper clay unit grades into sand and gravel units ranging in thickness from less than one foot thick to over five feet thick with clay/silt interbeds, generally from 12 to 30 ft bgs. The clay interbeds (within the water-bearing zone) are most prevalent on the west and southwest portions of the Site and pinch out just beyond the northeastern boundary of the Site. The sand units are characterized as tan and gray in color, and contain some clay and gravel. The gravel units are characterized as tan and gray, with varying amounts of clay and sand, and frequently contain cobbles and chert fragments. Interbedding of the upper clay unit with the underlying sand and gravel units results in a saturated zone that is separated from the underlying zone by a low-permeability clay layer of variable thickness. This saturated zone is in hydraulic communication with the underlying water-bearing zone and is therefore not considered a separate water-bearing unit.

- Basal Terrace Deposit Sands and Gravels – The lower portions of the terrace deposits overlying the Navarro Group are generally of sandy or clayey gravels. The thickness of this unit ranges from approximately 10 to 20 feet across the Site to less than 10 feet in some areas to the east of the Site (as noted in the boring for MW-11).

- Navarro Group – The lower clay unit is a gray and reddish-brown clay interval found approximately 40 to 45 ft bgs. Due to the thickness of this unit, the base of the Navarro Group (approximately 450 ft bgs, as noted in Section 3.3.1) was not encountered during investigations conducted at the Site.

3.3.3.1 Upper Water Bearing Zone

An upper water-bearing zone consisting of the interbedded sand/gravel and clay/silt unit was identified at the Site during the RI. The zone is most evident on the western boundary of the Site and pinches out east of the Site. The upper zone was not encountered at wells MW-10 and MW-11 located east of the Site. During the early phase of the RI, monitoring wells MW-7 through MW-11 were installed to the top of the Navarro Group and were screened within the Basal Terrace Deposit Sands and Gravels. Monitoring wells MW-12 through MW-30 were installed to penetrate the upper water-bearing zone only. Monitoring wells installed at the Site as part of previous Site investigations (MW-1 through MW-6) penetrate both the upper and lower water-bearing zones. In much of the area the upper water-bearing zone is separated from the lower zone by a thin clay layer; however, the potentiometric surface and geologic conditions indicate that there is hydrologic communication between the upper and lower zones.

3.3.3.2 Lower Water Bearing Zone

The lower water-bearing zone at the Site consists of the basal saturated terrace sands and gravels present above the Navarro Group. The lower water-bearing zone is typically encountered at the Site from approximately 25 to 40 ft bgs. During the initial phase of the RI, five monitoring wells (MW-7 through MW-11) were installed in the lower water-bearing zone. The dissolved COC concentration data from these wells (very low petroleum hydrocarbon concentrations, presence of chlorinated hydrocarbons from the East KAFB VOC plume) suggested that some degree of separation between the lower water-bearing zone and the upper water-bearing zone, is present at the Site. Based on the low concentrations of COCs present in the lower water-bearing zone, subsequent monitoring wells installed at the Site were installed in the upper water-bearing zone. As described previously, six monitoring wells (MW-1 through MW-6) installed during the 1991 Raba-Kistner investigation are screened through both the upper and lower water-bearing zones. The potential mixing of water from the two zones should be kept in mind when evaluating analytical data collected from these pre-existing wells and it is recommended these wells be plugged and abandoned following EPA approval of this RI report.

3.3.4 Groundwater Movement and Flow Conditions

Monthly groundwater-level gauging events were conducted at the Site from July 2011 through February 2013 (total of 20 events) to evaluate groundwater flow conditions. The depth to groundwater measured at the Site during the RI was typically around 20 to 25 ft bgs but rose to

approximately 12 ft bgs in early 2016. Previous investigations conducted at the Site indicate that the depth to water at the Site ranges from approximately 10 to 19 ft bgs (TNRCC, 2001; ERM, 2004). Lower water levels observed during the RI are most likely attributable to severe drought conditions present throughout Texas during the majority of the RI period (2011 through 2016). Based on groundwater potentiometric levels measured in the investigation area, the direction of groundwater flow in this unit is toward the east-southeast with an approximate gradient of 0.001 ft/ft; however, the groundwater gradient is, at times, effectively zero (i.e., no gradient). Groundwater-level data are presented on Table 5 and the respective potentiometric surface maps presented on Figures 19 through 42.

Slug tests were performed at five monitoring wells installed in the upper water-bearing zone to estimate the hydraulic conductivity of this zone. Data collected during these tests are provided in Appendix F. As shown on Table 6, the estimated hydraulic conductivities of the upper water-bearing zone ranged from 2.1×10^{-3} cm/sec to 9×10^{-3} cm/sec, which is within the range of typical values for a sand to a coarse sand unit (Freeze and Cherry, 1979). Based on these estimated hydraulic conductivities and approximate groundwater gradient of 0.001 ft/ft, the specific discharge of the upper water-bearing zone ranges from about 9×10^{-6} cm/sec to 2.1×10^{-6} cm/sec (2.2 to 9.3 ft/year). Dividing this range by a typical effective porosity of 0.3 for sand/gravel (Freeze and Cherry, 1979) yields an average linear groundwater velocity of 7 to 31 ft/year.

Hydraulic conductivity data were used to estimate the potential yield of a water well installed in the upper water-bearing zone consistent with the TCEQ guidance for classifying groundwater resources (TCEQ, 2010). This evaluation is included on Table 6. The thickness of the saturated zone varies across the Site due to the site stratigraphy (depositional environment). The saturated zone thicknesses used in this calculation are based on the water table elevations observed at the time the tests were conducted. This evaluation indicates that a 4-inch well installed in the upper water-bearing zone would yield approximately 2,000 to 3,000 gallons of water per day (GPD). TCEQ groundwater classification criteria uses a threshold of <150 GPD for Class 3 groundwater and between 150 GPD and 144,000 GPD for a Class 2 groundwater, indicating that the upper water-bearing zone at the Site would be considered a Class 2 groundwater resource per the TCEQ criteria. The yield threshold to be considered a Class 1 groundwater resource is 144,000 GPD, well above the volume capable of being produced by the upper groundwater-bearing zone at the Site.

The clay and shale of the Navarro Group serves as the lower confining unit for the alluvial water-bearing units and effectively restricts deeper vertical migration of shallow groundwater at the Site. The Navarro Group and other Upper Cretaceous units consisting of clays, limestone, and shale serve as a regional aquitard separating the alluvial terrace water-bearing deposits from the deeper Edwards Aquifer which lies approximately 1,200 ft bgs in the vicinity of the Site based on SAWS wells 0.3 mile from the Site (TWDB, 2016).

3.3.5 General Groundwater Chemistry

Groundwater at the Site is relatively neutral with pH values ranging from 6.22 to 7.26. DO concentrations range from 0.3 mg/L to 4.64 mg/L and are variable across the Site depending on sampling event (temporal variability), water-bearing zone, and location within the dissolved COC groundwater plume (variability due to aerobic biodegradation). In general, DO values within the plume area were typically less than 1 mg/L, which is generally considered indicative of anaerobic conditions. ORP values range from 85 millivolts (mV) to -355 mV, with most readings around -100 to -150 mV. Similar to the DO values, ORP values are variable across the Site but generally lower within the BTEX or hydrocarbon plume area. SC of groundwater across the Site vicinity ranged from 550 to 7070 umhos/cm with the majority of the readings between 800 and 2000 umhos/cm. Turbidity values ranged as high as 222 NTUs, with most of the data less than 40 NTUs. Higher turbidity values were usually associated with recently installed monitoring wells. General groundwater-chemistry data are summarized in Table 7.

3.3.6 Conceptual Hydrogeologic Model

The results of the RI indicate that the uppermost water-bearing zone at the Site is comprised of a shallow saturated zone underlain by a zone of lower hydraulic conductivity clay that grades into the deeper saturated sands and gravels of the basal terrace deposits. The upper and lower water-bearing zones have very little separation on the western (upgradient) boundary of the Site. The zones show the greatest divergence in the northeast portion of the Site, where the clay underlying the upper zone becomes thicker and the upper zone eventually pinches out. The thickness, continuity and relatively lower hydraulic conductivity of the clay layer separating the water-bearing zones, along with the vertical gradients between these zones, determine the extent and magnitude of groundwater movement between these zones. It is likely that some groundwater movement occurs between the zones where the clay between the zones is relatively thin (e.g., boring B-4, well MW-1, and well MW-4). In other areas where the clay is thicker, such as the

eastern portion of the Site (e.g., MW-6 and MW-9) appreciable groundwater flow between these two zones is unlikely.

The upper water-bearing zone has a relatively low hydraulic gradient of 0.001 ft/ft extending across the Site from west to east and into the adjacent neighborhood. The gradient and flow direction may be slightly influenced by water in the drainage ditch on the western boundary of the Site (when present). Based on the hydraulic conductivity and low hydraulic gradient, the upper water-bearing zone has a relatively low specific discharge rate (2.2 to 9.3 ft/year), resulting in a relatively slow movement of groundwater within the water-bearing zone (7 to 31 ft/year as discussed in Section 3.3.4).

3.4 LAND USE AND DEMOGRAPHY

3.4.1 Land Use

The Site is located approximately five miles southwest of downtown San Antonio. Land use north and west of the Site is primarily commercial/industrial, including Port of San Antonio (former East KAFB) to the west, and multiple light industrial, auto salvage, repair, and/or service station facilities to the northeast and southwest. The Site is bordered to the north by an auto service center and to the west by Union Pacific Railroad railroad tracks, an auto repair and parts establishment, and East KAFB. Residential, commercial, and industrial development is present to the south and east, and Somerset Road is adjacent to the Site to the east.

The City of San Antonio land use zoning classification for the Site is light industrial (CSADSD, 2016; CSA, 2009). According to the City's Unified Development Code (CSA, 2012), the Light Industrial District "provides for a mix of light manufacturing uses, office parts, flex-space and limited retail."

3.4.2 Demographics

The Site is located within the city limits of San Antonio, the seventh largest city in the United States. San Antonio is approximately 407.56 square miles in size and is the seat of Bexar County. According to a 2005 population estimate, the population of San Antonio was 1,256,509, the median age of San Antonio residents is 31.5 years, and the median family income is $46,484 (EPA, 2008). According to the 2010 US Census data, approximately 95.8% of the population in the neighborhoods surrounding the site identified themselves as Hispanic. Individuals identified

as African-American constitute 0.3% of the population and 3.4% identified as White Non-Hispanic. The average age of residents in the vicinity of the Site is 33 and 29% of the neighborhood population is under the age of 18. Of the approximately 6,000 families in the area, an estimated 550 (9%) had a household income below the poverty line in 2014 (American Community Survey 5-Year Estimates, 2014). No schools or day care facilities are located with 200 feet of the Site. Ten schools are located within one mile of the Site (ATSDR, 2003).

3.5 ECOLOGY

A number of Site inspections were conducted from 2006 through 2016 to evaluate existing land use characteristics, observe and characterize wildlife and terrestrial habitats, and for Site maintenance (e.g., fence repair, mowing, etc.) purposes. The Site is surrounded by a chain-link security fence. Roughly one-third of the Site is comprised of gravel parking lots, paved road, and extensively re-worked soil and bare patches of dirt. The remaining portion of the Site is a routinely maintained grass lot with several grassy containment berms still present. A few small shrubs/trees grow along the fence line and are periodically cut back.

3.5.1 Terrestrial Habitats

After Site operations ceased in approximately the late 1980s or early 1990s, and EPA removal actions were performed in 2001 to remove equipment and residual materials, the Site became overgrown with vegetation. In 2007, the R&H Oil Company Site Group, through PBW, contracted for repair/upgrade of the Site perimeter fencing and gate system, removal of general debris, cutting of overgrowth, and mowing of the Site. Since that time the Site has been maintained by a regular mowing and maintenance program.

The ground surface at the Site consists of gravel parking lots, bare patches of dirt and grass with several grassy containment berms still present no trees are present at the Site and minimal undisturbed habitat is present due to regular mowing and Site maintenance (Appendix A-1). The portions of the Site that could potentially serve as ecological habitat are small in area, heavily disturbed because of the regular ground maintenance and previous removal activities, and unattractive to wildlife. There are no forested areas, brush lands, wetlands, or undisturbed field areas that would serve as valuable terrestrial habitat. As such, small mammal and bird use is observed to be minimal. Given the general absence of attractive habitat on the Site and the urban setting in general, the Site is not conducive to any appreciable use by resident wildlife and the

ecological risk assessment approach used for the RI reflects the limited potential exposure to terrestrial receptors at the Site.

3.5.2 Aquatic and Wetland Habitats

The location and path of the drainage ditch west of the Site is shown on Figure 6. The ditch originates north of the Site and collects drainage from East KAFB and other industrial properties (e.g., salvage yards, repair facilities, etc.) to the north. As such, the ditch contains a substantial amount of debris including trash, tires, rubble, and other urban refuse. An evaluation of the ditch and downstream areas was performed as part of the Former East KAFB Ecological Risk Assessment (CH2M Hill, 2004). As noted therein, the ditch is typically dry and, further downstream, mostly concrete lined. The ditch drains to Sixmile Creek which originates approximately 2,000 feet south of the Site near the intersection of Wabash and Wagner Streets where other storm drains contribute to the cumulative flow. The East KAFB evaluation noted the urban nature of Sixmile Creek at that point and characterized the creek as "an intermittent stream, located in a disturbed area, that meets acute water quality criteria specified in Table 1 of 30 TAC 307.6; lacks appreciable instream, edge, and riparian habitat, forage and shelter in or along the watercourse" (CH2M Hill, 2004).

Sediment (as a viable ecological medium) is not considered present in the ditch due to the extended periods of time when the ditch is dry. The primary vegetation found along the ditch is terrestrial plants and weeds. As noted previously, surface drainage and runoff from a limited portion of the Site may flow into the ditch depending on specific rainfall/runoff conditions. Although there is no evidence of significant soil erosion on-site, COCs entrained in soil particles may have migrated to the ditch. To evaluate potential impacts to the ditch, surface water samples were collected during the RI as described in Section 2.4. Because the presence of water in the ditch is intermittent and the ditch does not contain consistent aquatic habitat, the surface water samples were evaluated by comparing measured COC concentrations against screening criteria for mammalian and avian receptors. Three additional surface soil samples were collected at the western fence line to support the SLERA and provide additional information that the urban drainage ditch to the west of the Site has not been impacted by potential historical surface-water runoff from the Site. A summary of the SLERA conclusions is provided in Section 6.2.

As described in the Zone 4 Ecological Risk Assessment Report for the Former East KAFB (CH2M Hill, 2004)(Section 2.5.3), National Wetland Inventory (NWI) maps indicated that the nearest

wetland area in the vicinity is a portion of the Sixmile Creek concrete channel that has become overgrown with some opportunistic in-channel vegetation. This area is approximately 0.4 miles southeast of the Site.

3.5.3 Plant and Animal Species

In the vegetated areas of the Site, the single dominant vegetation type is grassland, with most plants typically not exceeding 4 to 6 inches in height because of mowing. The grassland community is composed of a limited variety of native grasses and other opportunistic herbaceous groundcover species that are typical to this area of Texas. A variety of small shrubs and trees are present on the fence line, the most notable of which are new growth mesquite trees and acacia bushes.

During Site visits conducted for the RI, no terrestrial animals were observed on-site with the exception of feral dogs that inhabit the adjacent residential neighborhoods. Birds, such as the American robin, mockingbird, dove and killdeer, were observed at the Site on various visits. Since there is some vegetative cover at the Site around the fence line, it is possible that small ranging mammals and some avian species might inhabit and/or forage at the Site although it is unlikely that the Site serves as a significant ecological resource. In addition, regular ground maintenance makes the Site unsuitable for widespread foraging and nesting, which is supported by the lack of observable wildlife during Site visits. These visits have, however, occurred during the day, which typically would reduce the chances of seeing small ranging mammals and other wildlife since many are less active during the day.

3.5.4 Threatened and Endangered Species

There are no known occurrences of federal or state-listed threatened or endangered plant or animal species, or natural communities within the Site boundaries, and none have been observed at the Site during numerous visits. Given the general absence of attractive habitat on the Site and the urban setting in general, it is unlikely that the Site is used by resident wildlife, including common, threatened, or endangered species. According to the Zone 4 Ecological Risk Assessment Report for the Former East KAFB (CH2M Hill, 2004), there are no known occurrences of federal or state-listed threatened, or endangered plant or animal species in the vicinity. The US Fish and Wildlife Service also supported this conclusion for the former KAFB site (USFWS, 2004).

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 INTRODUCTION

As noted previously, a phased Site investigation approach involving the comparison of investigation data to established EEVs and background concentrations was used to assess the nature and extent of contamination in each environmental medium investigated. Details of the specific Site investigation activities performed as part of that approach were provided in Section 2.0. Consistent with the suggested RI report format (Table 3-13 in EPA, 1988), this section of the RI report presents the results and findings of the investigation activities, particularly as they pertain to documenting the nature and extent of contamination.

RI data are generally discussed by specific environmental medium (e.g. soil, groundwater, etc.) in the subsections below. The text of each section provides a discussion of extent evaluation screening criteria and background (where applicable) exceedances with supporting tables and figures demonstrating how the lateral and vertical extent (where appropriate) of contamination has been identified. The Site database, which includes all laboratory analytical data, is provided in electronic form (on DVD) in Appendix G of this report. Electronic copies of the analytical laboratory and data validation reports (grouped by media and then laboratory sample delivery group) are also provided in Appendix G.

4.2 DATA VALIDATION

Consistent with QAPP procedures, third-party data validation was performed on 100% of the environmental samples collected for COC. Analytical results presented in this section include the QAPP-specified RI data validation qualifiers, which are defined as follows:

none	No QC deficiencies noted.
J	The analyte is confirmed present, but the reported value is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The reported value is an estimated quantity, and the result may be biased high.
J-	The reported value is an estimated quantity, and the result may be biased low.
R	The data are not usable due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.

U Analyte was not detected above 5x (10x for common laboratory contaminants acetone, 2-butanone, cyclohexanone, methylene chloride, and phthalates) the level in an associated blank.

UJ Analyte not detected at or above the sample detection limit, but the reported limit is an estimated quantity. The associated numerical value is an approximate concentration that may be inaccurate or imprecise.

A data validation qualifier of J may be assigned solely because the analytical result was qualified by the laboratory as an estimated concentration between the sample detection limit and the sample quantitation limit. When an option exists to assign two different flags, the flag higher in the data quality hierarchy was assigned (R > UJ > U > J > J+ or J-). The data validation qualifier U is reflected a less-than symbol (<) preceding the data to indicate that the compound is not considered to be detected.

Field completeness, which is assessed by comparing the number of valid field samples to the total number of field samples planned, was calculated as 99.0% for the original scope of the RI. The objective established in the QAPP for completeness of field sampling was 90%. Laboratory completeness, which is assessed by comparing the number of valid measurements obtained to the total number of measurements, was calculated for each medium (based on all analyses performed, including samples beyond the original scope of the RI) and compared to the goals established in the QAPP (90% on a sample level (i.e., for all COPCs combined) and 80% on an analyte level (i.e., for each COPC individually). Of the 21,766 analytes reported, 56 results were rejected due to quality issues. Laboratory completeness on a sample level was 99.7% for groundwater, 100% for surface water, 99.8% for soils and 100% for soil gas. The lowest individual analyte completeness percentage was for 3,3'-dichlorobenzidine, an analyte that is commonly known to be difficult to analyze, at 89.0% for groundwater; the rest of the completeness percentages by analyte were 96.7% or higher.

4.3 SOILS

As described in Section 2.3, the majority of the soil samples collected as part of this investigation program included: (1) surface soil samples from the 0 to 0.5 ft bgs depth interval; (2) shallow soil samples from the 0.5 to 5 ft bgs depth interval; and (3) deep soil samples from the >5 ft bgs depth interval. Soil samples were collected from soil borings advanced for installation of monitoring wells at the Site. The on-site soil data is summarized in Tables 8 through 11. Analytical data from

Site soil samples were used to evaluate the extent of COC impacts through a comparison to EEVs established for soil as listed in Table 2 of this report. The potential extent of soil impacts was considered to be the areas of historical former operations within the boundaries of the R&H Oil and Tropicana Energy properties. To evaluate the extent of impacted soils, concentrations were compared to the EEVs on an individual sample basis. EEVs were not established for TPH during the preparation of the Work Plan; however, a TPH mixture PCL was established for TPH using the TCEQ TRRP Tier 1 TPH PCL calculator and the data from sample location MW-13R (see Appendix H). Risk associated with TPH was evaluated as part of the RI in the BHHRA. On-site soil sampling results exceeding EEVs are presented on Table 12 and shown on Figures 43 and 44.

4.3.1 On-Site Soil

Extent of Surface and Shallow Soil Contamination Evaluation

Surface and shallow soils at the Site were evaluated through the collection of soil samples from the ground surface to a depth of 5 ft bgs. As indicated on Table 12, surface and shallow soil sample EEV exceedances were observed at all on-site soil sample locations (see Figure 43).

EEV exceedances in Surface soils (0-0.5 ft bgs) are characterized by elevated TPH, metals, and polycyclic aromatic hydrocarbons (PAHs). Lighter hydrocarbons, such as benzene and other gasoline-related compounds, were not found in the surficial soils at concentrations exceeding the EEVs. EEV exceedances in shallow soil samples (0.5-5 ft bgs) were limited to TPH, lead, mercury, and benzene. Tarry material is present at the ground surface in the northern portion of the Site (Figure 43) and appears to seep to the surface during hot periods. Based on photos taken during the EPA-lead removal actions in 2001 (Weston, 2002), these seeps appear to have been present prior to the removal actions. Sampling or other characterization of this material was not conducted during the RI, however, further characterization of the tarry seeps will be performed as needed as part of remedial design/remedial action (RD/RA) activities to implement the remedy selected for the Site. Soil containment berms related to historical tank locations remain at the Site as shown on Figure 43. Soil samples were collected near the base of the berms (surface samples from soil borings NMW-4 and NMW-5). Additional characterization of the soil in the berms may be performed if needed as part of RD/RA activities.

Extent of Deep Soil Contamination Evaluation

Deep soil samples were collected from within the vadose zone from depths greater than 5 ft bgs, and from soil intervals exhibiting the greatest field evidence of potential hydrocarbon impacts, typically staining or elevated OVM readings. Field observation of potential hydrocarbon impacts was most frequently noted at a depth interval between 10 and 20 ft bgs, which is generally consistent with the range of water-table fluctuation at the Site. Because the soil sampling was conducted during a drought period, the vadose zone extended to a depth of approximately 20 ft bgs during the soil sampling portion of the RI, allowing samples to be collected from depths that may be considered in the saturated zone during periods of normal to higher precipitation.

As indicated on Table 12, TPH, arsenic, lead and generally short-chain hydrocarbons were detected in deep soils at concentrations exceeding the EEVs. The COCs exceeding the EEVs in deep soils are compounds commonly associated with gasoline-type sources and did not include many of the metals or PAH compounds observed in the surface soils. The depths and locations of these exceedances suggest that the elevated concentrations are associated with LNAPL present (or historically present) near or on the top of the water table. COC concentrations measured in deep soils in the northwest portion of the Site are generally greater than concentrations measured in other areas of the Site. These results are consistent with the overall conceptual site model developed for the Site that concludes that a gasoline source in the northwest area of the Site has resulted in LNAPL migrating vertically to the water table and a dissolved BTEX plume extends downgradient to the eastern side the Site. Historical Site data indicates that the water table at the Site fluctuates as much as 10 feet, creating a soil interval from approximately 10 ft to 20 ft bgs where BTEX COCs associated with LNAPL present at the fluctuating water table are sorbed on soils or remain trapped in the pore space of the soil. Soil boring records from the deep wells installed during the 1991 Raba-Kistner investigation (provided in Appendix E) suggest that petroleum hydrocarbon impacts do not extend below the surface of the uppermost water-bearing zone. This conclusion is based on the organic vapor meter (OVM) screening conducted during the 1991 drilling activities, which show the most elevated OVM measurements in borings MW-1, MW-2, MW-3, and MW-6 at depths between 10 and 25 ft bgs, with OVM concentrations decreasing to low/non-detect at deeper depths. These data indicate the vertical extent of impacts in deep soil is limited to the vadose zone above the water table (within the 10 to 20 ft fluctuation area).

4.3.2 Off-Site Soil

Although not included in the scope of work presented in the Work Plan, several soil samples were collected at various depths during the installation of off-site monitoring wells MW-21 and MW-22, located to the east of the Site, and analyzed for TPH, metals, VOCs and SVOCs (consistent with the approved Work Plan). The purpose of these data was to assist in the interpretation of soil-gas data obtained from the co-located soil-gas points SG-21 and SG-22. The data obtained from these soil samples are presented on Table 13. Several metals were detected in these samples at concentrations exceeding the EEVs; however, no metals were detected at concentrations exceeding the representative background metal concentrations. One COC, ethylbenzene, was detected at a concentration exceeding the EEV at well MW-21 (14-15 ft sample interval). No COCs in samples collected from the 6-7 ft or 11-12 ft sample intervals at well MW-21 were detected at concentrations exceeding the EEVs (or representative background concentration for metals).

4.4 GROUNDWATER

As described previously, groundwater is present at the Site in one groundwater bearing unit that is described as two zones, an upper water-bearing zone and lower water-bearing zone. The upper water-bearing zone is comprised of interbedded clay, sand and gravel, while the lower water-bearing zone is deposits consisting primarily of sands and gravels. Details regarding investigation methods, including well installation in the specific zones, are provided in Section 2.2. The characteristics of the water-bearing zones, including lithology, structure, hydraulic characteristics, and groundwater flow directions, are described in Section 3.3.3.

Groundwater samples were analyzed for the complete suite of groundwater analytes as specified in the Work Plan, the FSP, and the QAPP during the first three sampling events conducted at the Site (February/June 2011, October 2011, and May 2012). Based on the data obtained during those initial sampling events, VOCs were identified as the primary COCs and samples collected during the subsequent sampling events conducted in April 2014 and May 2015 were only analyzed for VOCs. The analytical data from these samples were used to evaluate the nature and extent of COCs in groundwater at the Site and in the Site vicinity. This evaluation consisted of comparing individual sample results to the groundwater EEVs presented on Table 3 of this report. The EEVs are based on Texas Commission on Environmental Quality (TCEQ) protective concentration

levels (PCLs) for groundwater ingestion and US EPA Generic Vapor Intrusion Screening Levels from the current EPA Vapor Intrusion Screening Level (VISL) calculator (V 3.4).

Site-wide groundwater concentration data for the primary COCs (BTEX) are presented on Figures 45 through 48. These figures include all BTEX data from all sampling events, with isoconcentration contours based on the most recently collected data at each well location. Since only select wells were sampled as part of the two most recent groundwater sampling events (May 2015 and December 2015), these BTEX contours, based on the most recent data for each well, consider data from multiple sampling events. As such, these figures illustrate the temporal variability and concentration trends at each well while also depicting the areal distribution. As indicated on these figures, the highest BTEX concentrations are found in the northwest corner of the Site, which is considered the primary source area for the dissolved BTEX groundwater plume. This area was reported to be a rail loading area for gasoline during the refinery operations and forensic analysis of LNAPL samples collected from wells in this area characterized the LNAPL as a weathered gasoline (TDWR, 1981). The distribution of BTEX from the source area is consistent with the physical characteristics of the individual compounds (i.e., the greater spatial distribution of benzene is associated with the greater solubility of benzene relative to toluene, ethylbenzene, and xylenes) and the hydrologic conditions at the Site, (i.e., generally southeastern groundwater gradient and an historical northwestern hydraulic gradient in portions of the Site due to operation of the East KAFB groundwater recovery system).

BTEX concentration trends observed in each well over the course of the RI are presented on Figures 49 through 52 and indicate a generally decreasing concentration trend at each well.

On-Site Extent of COCs in Groundwater

The extent of COCs in groundwater at the Site was evaluated through collection and analysis of samples from 17 groundwater monitoring wells installed on the Site. Six of the monitoring wells, MW-1 through MW-6, were installed with screen intervals in both the upper and lower water-bearing zones as part of the gasoline release investigation conducted in 1990, described in Section 1.2.3.1. The remaining on-site wells, MW-12 through MW-20, MW-23, MW-24, and MW-30, were installed in the upper water-bearing zone with the screen interval across the water table. This evaluation consisted of a comparison of individual sample concentrations to EEVs which are provided on Table 3. Detected concentrations in groundwater samples that exceeded the

EEVs are summarized in Table 14. In additional to TPH, the following three metals compounds, 11 VOCs, and 3 SVOC compounds exceeded their respective EEVs:

Arsenic
Lead
Manganese
Total Petroleum Hydrocarbons
1,2,4-Trimethylbenzene
1,2-Dichloropropane
1,3,5-Trimethylbenzene
Benzene
Ethylbenzene
Methyl tert-butyl ether
Methylene Chloride
Naphthalene
Toluene
Vinyl chloride
Xylenes, Total
2,4-Dimethylphenol
2-Methylnaphthalene
3 & 4 Methylphenol

Of these compounds, the following COCs were the most predominant:

Benzene
Ethylbenzene
Toluene
Arsenic

With the exception of arsenic, these COCs are consistent with a gasoline-type source. None of the other COCs observed at concentrations exceeding the EEVs have been detected in off-site monitoring wells downgradient of the Site at concentrations exceeding the EEVs. On-site groundwater data are provided by monitoring event date (with separate tables for TPH, metals, VOCs, and SVOCS, as applicable) on Tables 15 through 29.

Based on the composition and concentrations of dissolved COCs present in Site groundwater, it appears that a primary source of COCs in groundwater is likely historical gasoline loading operations conducted on rail sidings in the northwest portion of the Site. Although other petroleum hydrocarbon products were handled at the Site, and several different types of LNAPL are present at the Site, the dissolved COC groundwater plume found throughout the Site is consistent with a BTEX plume originating from gasoline-type releases. Consequently, BTEX compounds have been used as indicator compounds to evaluate the nature and extent of groundwater impacts at the Site. Isoconcentration maps of dissolved BTEX compounds for each

of the site-wide groundwater monitoring events are provided in Figures 45 through 48. Isoconcentration maps prepared for the BTEX plume indicate elevated concentrations in the suspected source area along the northwestern portion of the Site with steadily decreasing dissolved concentrations moving across the Site to the east (downgradient). Dissolved benzene concentrations in the northwest portion of the Site are typically in the range of 22 mg/L to 31 mg/L at wells MW-12, MW-14, and MW-18, and decrease to below the EEV of 0.005 mg/L in off-site monitoring wells east of Somerset Road. Toluene, ethylbenzene and xylenes generally exhibit similar concentration trends. Toluene is significantly more elevated at well MW-14 than other locations and the xylene EEV exceedances were limited to only that well.

Data collected from monitoring wells MW-1 through MW-6 represent groundwater samples collected from across the upper and lower water bearing zones at the Site. Consequently, these data may not be representative of the BTEX plume found in the upper water-bearing zone, nor the less or non-impacted lower water-bearing zone. Data obtained from these wells are frequently inconsistent with the overall conceptual site model and, as such, when contouring the BTEX concentrations at the Site (see Figures 45 through 48), were not used.

Elevated arsenic concentrations present within the BTEX plume area are likely associated with reducing groundwater conditions resulting from degradation of petroleum hydrocarbons. The increased solubility of naturally-occurring arsenic under these reducing conditions is discussed further in Section 5.3.2.

Lead was detected at concentrations exceeding the EEV of 0.015 mg/l at well MW-3 (two sampling events of three), well MW-4 (one sampling event of three), and well MW-6 (one sampling event of three). Manganese was detected above the EEV in one well, MW-13, during one of two sampling events.

Off-Site Extent of COCs in Groundwater (downgradient)

The extent of COCs in off-site groundwater downgradient of the Site was evaluated through the collection and analysis of groundwater samples from seven monitoring wells installed in the neighborhood located southeast of the Site. As discussed previously, five monitoring wells (MW-7 through MW-11) were installed in the lower water-bearing zone in this area as part of the first phase of the RI. Based on the evaluation of lithologic data from the boreholes for these wells, two additional off-site monitoring wells (MW-21 and MW-22) were installed in the upper water-bearing zone. The monitoring wells installed in the lower water-bearing zone were sampled

during all three site-wide groundwater monitoring events, while the two wells installed in the upper water-bearing zone were sampled three times, including the most recent site-wide monitoring event. The analytical data from these samples were used to evaluate the potential extent of COCs in off-site groundwater.

The results of the off-site groundwater sampling events are provided on Tables 29 through 34 (grouped by event). As indicated therein, only two COCs, tetrachloroethene and arsenic, were detected at concentrations exceeding the EEVs in any of the downgradient off-site wells (tetrachlorethene in February and October 2011 (Tables 30 and 31); arsenic in May 2012 (Table 32)). In particular it is noted that the primary Site COCs, BTEX compounds, were not detected in any samples from the off-site downgradient wells at concentrations exceeding the EEVs, effectively defining the downgradient extent of groundwater contamination. The LNAPL observed on-site has most likely reached residual saturation levels and the LNAPL is not likely to be migrating as supported by the absence of LNAPL in any off-site wells.

Arsenic concentrations were below the laboratory detection limit in samples collected for the RI except for three samples collected during the May 2012 sampling event (Table 24) at wells MW-7, MW-8, and MW-21. Arsenic was detected in well MW-21, installed in the upper water-bearing zone, at a concentration of 0.019 mg/L, exceeding the EEV of 0.01 mg/L. As described in Section 5.3.2, aerobic degradation of petroleum hydrocarbons in shallow groundwater at the Site consumes dissolved oxygen and creates reducing groundwater conditions. The reducing conditions may increase the solubility of naturally occurring arsenic, resulting in elevated arsenic concentrations in areas where petroleum hydrocarbon biodegradation is occurring (Johnson and Schreiber, 2003; Ghosh et al, 2003). Based on the groundwater geochemistry present at the Site, slightly elevated arsenic concentrations observed in groundwater in the vicinity of the Site are most likely due to increased solubility of naturally occurring arsenic as a result of reducing conditions, and the arsenic will become immobile when aerobic conditions are encountered.

Tetrachloroethene was detected slightly above the EEV of 0.005 mg/L in samples from two monitoring wells, MW-10 and MW-11, detected during two of the five sampling events (MW-10 in February 2011 at 0.0059 mg/L; MW-11 in February 2011 at 0.0073 mg/L (Table 30), and in October 2011 at 0.0068 J+ mg/L (Table 31)) . Tetrachloroethene is a primary component of the regional chlorinated hydrocarbon plume present in the area and originating from the upgradient former East KAFB as described in Section 1.2.3.4. Tetrachloroethene was not detected in groundwater samples collected from wells located within the boundaries of the Site, consistent

with the generally anaerobic conditions at the Site (resulting from petroleum hydrocarbon degradation) that are conducive to the reductive dehalogenation of chlorinated ethanes. In contrast, other areas within the regional chlorinated hydrocarbon plume (including these downgradient monitoring wells) with less favorable conditions for reductive dehalogenation contain chlorinated ethenes.

Off-Site Extent of COCs in Groundwater (upgradient)

An evaluation of groundwater conditions upgradient of the Site included the sampling of two existing East KAFB monitoring wells and the installation and sampling of four additional off-site monitoring wells. As described previously, the on-site groundwater data indicate that the primary source area for groundwater impacts is located in the northwest corner of the Site. Migration of COCs in the upgradient (northwest) direction is influenced by three factors; (1) an historical LNAPL total head that allowed limited migration of LNAPL and associated dissolved COCs in a direction counter to the regional groundwater flow direction; (2) a relatively low groundwater gradient which would allow a greater amount of dispersion in the upgradient direction; and (3) a nearby groundwater recovery system operated at East KAFB from approximately 2000 to 2013.

The groundwater recovery system at the adjacent East KAFB (now Port of San Antonio) consisted of horizontal recovery wells that drew shallow groundwater from an area that includes the Site. East KAFB documents regarding the influence of the groundwater recovery system and transport of R&H Oil/Tropicana Energy COCs onto the off-site area north and northwest of the Site includes the following observations/conclusions:

- "BTEX had not been observed above the GWPS in the Zone 4 wells near the R&H Oil/Tropicana Energy Superfund Site prior to 2002." (CB&I, 2014)
- "Sampling conducted in 2003 after extraction began at the Zone 4 GWTP indicate an increase in BTEX in SS052MW097 (adjacent to a recovery well) and just downgradient of East Kelly." (CB&I, 2014)
- "The extraction well may have drawn BTEX in from the east." (CB&I, 2014)

The operation of the groundwater recovery system potentially drew petroleum-hydrocarbon impacted groundwater and possibly source material (LNAPL) north and west of the Site.

Based on the data obtained during the groundwater monitoring events conducted in April 2014, and May and December 2015, groundwater impacts extend north and west of the Site (see Figures

45 through 48). During the December 2015 monitoring event, the primary COC indicator compound benzene was observed at 14 mg/L at well MW-25 approximately 200 ft north of MW-12 (approximate source area) and at 7.6 mg/L in well MW-26 approximately 200 ft west of MW-12 in the northwest corner of the Site. Benzene was detected at concentrations of 0.32 and 0.16 mg/L at the East KAFB well located 300 ft northwest of the source area (SS052MW097) and has not been detected at the East KAFB well located 450 ft west of the source area (SS052MW125).

4.5 LNAPL

Several different types of LNAPL are present at the Site based on knowledge of historical activities and data collected during the RI. A summary of the physical and chemical properties of various LNAPL samples collected at the Site is provided on Table 35. LNAPL observed in the northwest portion of the Site (wells MW-12 and MW-14) is lighter in color and lower viscosity with a gasoline odor. Forensic laboratory analysis of this LNAPL during the RI indicates that it is a weathered gasoline consistent with gasoline produced between 1960 and 1983, based on the lead additives present in the LNAPL. The forensics analysis report is included in Appendix G. LNAPL observed in the central portion of the Site (collected at MW-5) is similar to a fuel oil, typically black material of medium viscosity. Analytical testing performed on this material suggests a mixture of diesel fuel-range and oil-range hydrocarbons are present, with slight variations depending on the sample location. LNAPL present between the northwest corner and the central portion of the Site (e.g., NMW-3) reflects a mixture of the gasoline and oil-based LNAPLs.

The distribution of LNAPL based on apparent in-well LNAPL thickness measurements during groundwater-level gauging events is presented on Figures 54 through 77. The extent of mobile LNAPL (i.e., LNAPL that enters the well screen from the formation) at the Site is temporally variable and dependent on the water levels at a particular time. LNAPL at the Site has migrated vertically through the vadose zone, reaching maximum depths of approximately 20 ft below ground surface during periods of drought. Consequently, LNAPL is most prevalent in Site monitoring wells during drought conditions when the water table is sufficiently low to reduce pore entry pressure and allow LNAPL to flow from the soil pore space into the monitoring well. When the water table rises above the LNAPL, hydrostatic forces prevent LNAPL movement, trapping it below the water table as residual LNAPL.

Figure 78 presents hydrographs of the groundwater elevations and LNAPL thicknesses for 12 monitoring wells at the Site. As shown on this figure, slight increases in the water-table elevations observed between June 2011 and late 2014 were typically associated with corresponding decreases in the occurrence and in-well thickness of LNAPL in wells across the Site. A more extreme rise in the water table, as shown during the May 2015 gauging event, shows a sharp decrease in the thicknesses of LNAPL present in the monitoring wells. Figures 54 through 77 illustrate the effect of water-table elevation changes on the distribution of measurable LNAPL across the Site. Historical Site data indicate that the water table at the Site fluctuates as much as 10 feet, creating a zone from approximately 10 ft to 20 ft bgs where LNAPL present on the fluctuating water table is sorbed on soils or remains trapped in the pore spaces of the soil. Soil boring records from the deep wells installed during the 1991 Raba-Kistner investigation suggest that petroleum hydrocarbon impacts do not extend below the upper water-bearing zone.

LNAPL was evacuated from wells containing greater than 0.5 feet of LNAPL for a period of six months, from August 2012 to January 2013. Removal of the LNAPL was accomplished using a bailer, and the recovered LNAPL was measured using a graduated beaker. During this period, approximately 9.5 gallons of LNAPL were recovered from all of the wells (cumulative). Some wells, such as MW-3, continued to have LNAPL accumulate in the well throughout the testing period, where as other wells, such as MW-18, did not contain sufficient LNAPL for bailing after the first evacuation. Total recovery volumes decreased each month, with the August 2012 recovery event totaling 4.3 gallons and the final recovery event in January 2013 recovering only 0.4 gallons. LNAPL was collected in DOT-approved drums and staged on-site. IDW will be disposed of as part of the remedial action for the Site.

LNAPL baildown tests were performed at three monitoring wells, MW-12, MW-13, and MW-15 during the RI. Conditions at these monitoring wells were allowed to equilibrate for approximately six months prior to the baildown testing; however, LNAPL thicknesses within the wells showed continual slight fluctuations due to water table fluctuations. During the tests, LNAPL was rapidly removed using a bailer and then the depths to the air/LNAPL and LNAPL/water interfaces were measured during recovery. Following removal of LNAPL during the baildown tests, short-term and long-term recovery of LNAPL to the wells was monitored. Baildown test data are provided in Appendix I. The baildown test data were used to estimate the LNAPL transmissivity at the Site. LNAPL transmissivities estimated using this method ranged from 0.056 to 0.7 ft^2/day.

An additional test for LNAPL transmissivity was performed at well MW-13 in January 2015. This test consisted of manually skimming LNAPL from the well until a relatively consistent level of drawdown was maintained and a stabilized/consistent removal rate was observed. This is a simplified application of the skimming method described in the ASTM International Standard E2856-13 *Standard Guide for Estimation of LNAPL Transmissivity (ASTM, 2013)*. The test is performed by repeatedly removing LNAPL from the well before the in-well thickness recovers to within 25% of its pre-purge value. The skimming is continued until the observed recovery rates are within 25% of each other for several purges. Using this method, the LNAPL transmissivity measured at well MW-13 was estimated at approximately 0.1 ft^2/day, similar in magnitude to the transmissivities observed during the baildown tests described above. The data and methodology used for the calculations are provided in Appendix I.

Based on these two separate LNAPL transmissivity evaluation approaches at multiple locations, it is projected that the LNAPL transmissivity at the Site could be expected to range from approximately 0.1 to 0.7 ft^2/day. These values can be compared against a de minimis recoverability criterion of 0.8 ft^2/day suggested by the Interstate Technical and Regulatory Council (ITRC) in their guidance document *Evaluating LNAPL Remedial Technologies for Achieving Project Goals* (ITRC, 2009a). As such, LNAPL recovery would be expected to be marginally effective, except perhaps under drought conditions. These conditions were present during the initial part of the RI and reflected lower-water table elevations more conducive to LNAPL recovery.

4.6 SOIL GAS

The presence of organic COCs in the vadose zone soil gas was evaluated through shallow soil-gas and sub-slab vapor sampling. Soil-gas sample locations are presented on Figure 7 and a summary of the data provided on Table 36. Three potential sources may result in COCs being present in Site soil gas; 1) volatilization of COCs from sources in shallow soils (i.e., pockets of LNAPL saturated soils near the ground surface); 2) volatilization of COCs from LNAPL trapped in deeper soil; and 3) volatilization of COCs dissolved in groundwater.

The distribution of COCs in soil gas across the Site is consistent with the current understanding of Site conditions (see Figure 79 for benzene concentrations measured in soil gas across the Site). COC soil-gas concentrations are most elevated in shallow soils located near source areas (i.e., shallow petroleum hydrocarbon saturated soils as evidenced by observations made during

monitoring well installation). On-site soil-gas points were typically installed 5 ft bgs, and in some cases were in close proximity to petroleum hydrocarbon affected soils in the sample interval and resulted in elevated soil-gas concentrations. Petroleum hydrocarbon vapors degrade relatively rapidly by bacteria in the presence of oxygen; however, oxygen availability in clay soils is limited at 5 ft bgs, limiting the influence of biodegradation on COC concentration. Similarly, two off-site soil-gas sample locations, SG-21 and SG-22, are installed below an asphalt surface which limits oxygen exchange in the shallow vadose zone. COC soil-gas concentrations are significantly lower (approximately three orders of magnitude) at locations where the COC presence is likely attributable to volatilization from deeper LNAPL or groundwater sources (e.g., SG-12, SG-17 and SG-20). Consequently, the extent of COCs in Site soil gas is correlated to the type of source material, with the greatest COC concentrations occurring in the northern portion of the Site (R&H Oil) where shallow source materials are present (SG-18 and SG-19). COC concentrations in soil-gas samples collected from below the slab of the brick building on the Site (SS-1, SS-2, and SS-3) were below the laboratory detection limit except for low concentrations of xylenes (and acetone, a common laboratory contaminant). These sub-slab sample locations (Figure 7) are towards the downgradient edge of the property boundary and the xylene concentrations are likely the result of volatilization of COCs from the dissolved groundwater plume. Additionally, these sub-slab sample locations are within approximately 50 feet of a shallow source area (SG/MW-16) and thus illustrate the lack of horizontal migration of COCs in soil gas. Potential horizontal migration of elevated soil-gas COC concentrations from SG/MW-16, in the northeast part of the Site, to areas to the east is not indicated as reflected by the relatively low COC concentrations observed at soil-gas point SG-25. Three soil gas samples were collected below the sidewalk on the east side of Somerset Road (SG-26, SG-27, and SG-28). These samples did not contain benzene at detectable concentrations and detected COCs in these samples were relatively low (benzene concentrations were below the laboratory detection limit in all samples).

The concentration of COCs in the dissolved groundwater plume decrease rapidly beyond the Site boundary, from approximately 5 mg/L benzene at the boundary to 0.0003 mg/L benzene at well MW-21, approximately 160 ft from the boundary. Benzene concentrations measured in soil-gas and sub-slab samples are presented on Figure 79. Based on these results, the extent of elevated COC concentrations in soil-gas would be expected to be limited to on-site soils located near shallow soil source areas. Potential risks associated with vapor intrusion are limited to on-site areas as described in the BHHRA (PBW, 2016) and summarized in Section 6.1. The potential vapor-intrusion cancer risk to a hypothetical off-site receptor was estimated to be 4×10^{-6}

(BHHRA Tables C-12 and C-21). Benzene and ethylbenzene are the primary contributors to this potential risk. Lines of evidence that indicate on-site soil gas or potential vapor sources are not likely to present a risk to off-site receptors to the north or to the east via lateral migration are described below and in Section 6.1.

The predominant COCs observed in soil gas at the Site were the more volatile and soluble petroleum hydrocarbons such as benzene, toluene, ethylbenzene and xylenes. These compounds and their concentrations are consistent with the results of the soil, groundwater and LNAPL investigations and the overall conceptual site model developed for the Site.

Research conducted over the past 15 years has demonstrated that petroleum vapor intrusion (PVI) from soil gas is not likely if certain conditions exist. Specifically, PVI is not likely to occur if there is a separation distance of approximately five feet between a petroleum hydrocarbon source and building, although there is also research that suggests PVI will only occur if shallow petroleum hydrocarbon sources are found directly beneath a building, or if mobile LNAPL or dissolved COC groundwater plumes with high concentrations of petroleum hydrocarbons are in direct contact with buildings (EPA, 2015; Davis et al, 2009; McHugh et al, 2010). Neither the dissolved COC groundwater plume, nor LNAPL present at the Site, extends off-site into areas where houses are present; therefore, it is highly unlikely that vapor intrusion of petroleum vapors would occur in areas where houses and/or receptors are present. As discussed previously, restrictive covenants placed on the Site will protect against potential future PVI exposure in new construction by requiring additional Site evaluation to address PVI risk and implementation of controls to mitigate potential PVI.

4.7 DITCH SURFACE WATER

Surface water samples were collected from the drainage ditch at five locations adjacent to the Site and north of the Site (upstream, see Figure 6) as described in Section 2.4. Samples were analyzed for metals, VOCs, and SVOCs, and results are provided on Table 37. COCs were not detected in surface water samples collected from the adjacent drainage ditch at concentrations exceeding the screening levels established in the approved Work Plan.

5.0 CONTAMINANT FATE AND TRANSPORT

Potential routes of contaminant migration were evaluated through preliminary CSMs for human health and ecological pathways (Figures 80 and 81, respectfully), first developed in the Work Plan. These CSMs identified potentially complete exposure pathways at the Site for human or ecological receptors. This analysis was performed to evaluate the exposure potential and the risk of effects on ecosystem components and human receptors and helped guide the risk assessments. In order for an exposure pathway to be considered complete, it must contain: 1) a source of the compound; 2) a mechanism for transport of the compound from the source (this is not always true with direct contact pathways); 3) a potential point of contact between the receptor and the compound; and 4) a route of exposure from the contact point to the receptor. Exposure pathways are considered complete only if all of the components are present. If one or more of the criteria are not met, there is no mechanism for exposure of the receptor to the compound.

Consistent with the suggested RI report format (Table 3-13 in EPA, 1988), this section of the RI report describes the fate and transport characteristics of COCs at the Site, starting first with a discussion of potential routes of migration as evaluated in the human health and ecological CSMs (Section 5.1), and then followed by consideration of contaminant persistence and migration characteristics (Section 5.2).

5.1 POTENTIAL ROUTES OF MIGRATION

Separate human health and ecological CSMs were developed for the different receptors. These CSMs were first presented in the Work Plan and were subsequently updated in the BHHRA for the human health CSM (Figure 80) and SLERA for the ecological CSM (Figure 81), and include consideration of contaminant release mechanisms, environmental fate and transport characteristics of those COCs, potential receptors and potential exposure routes/pathways to those receptors.

5.1.1 Human Health Pathways

The potential COCs at the Site were released from historical operations and then migrated to groundwater via transport through the vadose zone. Volatilization and dust generation has the potential to cause some COCs in soil to be transported off site; however, as detailed below in Section 5.2.1, Site data do not suggest that this potential pathway is significant. Once in groundwater, VOCs and other compounds are subject to natural attenuation processes such as

retardation, diffusion, and degradation while migrating with the groundwater, and VOCs may volatilize through the soil pore space and be emitted into outdoor or indoor air.

As shown on Figure 80, complete pathways were primarily associated with on-site exposure to soil and inhalation of ambient/indoor air. The groundwater ingestion pathway is hypothetically complete; however, existing institutional controls prevent exposure to groundwater at the Site and in the Site vicinity. The potential risks associated with complete pathways were quantified in the BHHRA, as summarized in Section 6.0. This CSM was used to develop the quantitative exposure assessment of the BHHRA. Complete pathways are indicated with "C" in the potential receptors column. Incomplete pathways are denoted with an "I".

5.1.2 Ecological Pathways

Based on the Site history and the potential exposure and receptors most likely to occur at the Site, the SLERA focused on the surface and shallow soils at the Site, as well as surface water in the nearby drainage ditch. Potentially complete pathways evaluated in the SLERA are shown in the ecological conceptual site model (Figure 81). The potentially complete exposure pathways for the Site include direct contact with surface and shallow soil on-site, and surface water at the drainage ditch. Surface water in the drainage ditch was evaluated, although as discussed in previous sections, there is no evidence to suggest that the Site-related COCs have migrated to the ditch. In general, biota can be exposed to chemical stressors through direct exposure to abiotic media (soil or surface water), or through ingestion of forage or prey that have accumulated compounds from these media. Exposure routes are the mechanisms by which a chemical may enter a receptor's body. Possible exposure routes include: 1) absorption across external body surfaces such as cell membranes, skin, integument, or cuticle from the soil or water; and 2) ingestion of food and incidental ingestion of soil or surface water along with food. Potential impacts from these complete exposure pathways were the focus of the SLERA.

5.1.3 Air Transport Pathways

Potential air transport pathways identified at the Site include inhalation of indoor/ambient air by potential on-site receptors due to COC volatilization from soil or groundwater, and dispersion of COCs from airborne dust. The air inhalation pathway is limited to COCs that are sufficiently volatile to partition into the vapor phase (i.e., VOCs). Volatile compounds were detected in soil-gas samples collected from shallow soils at the Site, indicating that volatilization of COCs from

shallow source areas, deep soils or groundwater is occurring. Based on these findings, the air transport pathway is complete for volatile COCs at the Site.

The second potential mode of airborne contaminant transport at the Site is entrainment of COC-containing particles in wind. This pathway is a function of particle size, moisture content, degree of vegetative cover, surface roughness, size and topography of the source area, and meteorological conditions (wind velocity, wind direction, wind duration, precipitation, and temperature). Movement of airborne COCs occurs when wind speeds are high enough to dislodge particles; higher wind velocities are required to dislodge particles than are necessary to maintain suspension. In general, only fine-grained particles are susceptible to transport in air. The predominantly vegetated surface soils of the Site (as shown on Site photographs in Appendix A-1) are not generally conducive to dust generation and particle transport. As discussed in Section 4.3, surface–soil samples collected throughout the Site typically indicated that only benzo(a)pyrene (at MW-18 and NMW-5) and dibenzo(a,h) anthracene (NMW-5) exceeded their respective screening levels. COCs in surface soils are very limited in area and thus airborne transport of COCs via dispersion of dust from possible source areas at the Site does not appear to be a significant or complete pathway.

5.1.4 Groundwater Transport Pathways

As discussed in Section 4.4, groundwater at the Site contains elevated concentrations of arsenic and a number of VOCs, including benzene, ethylbenzene, toluene, and xylenes. In addition to dissolved phase concentrations of these COCs, visible LNAPL was observed within the soil matrix in the soil cores for several monitoring wells as well as measured in wells. Soil samples collected at depth from the cores at most borings contained many of these primary groundwater COCs along with several PAHs.

The groundwater pathway for potential transport of primary groundwater COCs or other COCs is lateral migration within the water-bearing zone and vertical migration as LNAPL in localized areas. Vertical migration to deeper water-bearing units below the Navarro Group is effectively precluded by the extensive thickness and low vertical hydraulic conductivity of the underlying stratigraphic units as detailed in Section 3.3.3.

Dissolution of organic compounds from LNAPL into the groundwater is a predominant issue regarding sourcing of COCs to groundwater pathways. A discussion of LNAPL stability and degradation is provided below in Section 5.2. Within the saturated zone, COC transport occurs

primarily in the dissolved phase. The persistence of COCs in groundwater is affected by a number of naturally occurring physical, chemical and biological processes, such as biodegradation, dispersion, dilution, adsorption, and volatilization. As noted above, the primary groundwater COCs consist of BTEX and related compounds. All of these compounds readily degrade through natural biological processes. Benzene and other petroleum hydrocarbons have long been demonstrated to degrade under both aerobic and anaerobic conditions in the subsurface (Wiedemeier, et. al., 1999a). As detailed in Section 5.3.2, Site data provides considerable evidence that degradation of BTEX and related compounds is occurring.

5.2 CONTAMINANT PERSISTENCE

As noted in the human health and ecological CSMs described above, potential routes of migration for COCs occur in the primary transport media of air, soil and groundwater. Contaminant migration routes in these media are often interrelated. For example, dust from the Site ground surface may be transported via air and deposited in an adjacent area. From this deposition site, soil particles may be mobilized in the dissolved and/or solid phases by runoff during storm events, or remobilized by wind.

The physical and chemical characteristics of COCs and their potential transport media affect the degree of contaminant persistence and rate of migration within that media. Physical characteristics include parameters such as grain size and moisture content for surface soil particles. Chemical characteristics include parameters such as soil/water distribution coefficient, adsorption potential and degradation characteristics. These chemical characteristics are specific to each COC present, and may also be affected by the physical characteristics of the media in which the chemical is present. For air migration pathways, physical characteristics are important because mobilization of soil particles by wind is often a dominant mechanism for potential air transport of COCs. Chemical characteristics, such as the volatility of a particular COC (as reflected by its Henry's Law constant) can also be very important for air pathways. Dissolved-phase transport is the dominant contaminant migration mechanism in groundwater; therefore, chemical characteristics are often most important with respect to that medium.

The presence of LNAPL at the Site influences the persistence of the dissolved COC groundwater plume by acting as a source for dissolved-phase COCs. The persistence of the LNAPL itself is related to various factors, including the physical characteristics of the LNAPL and the natural processes that affect LNAPL fate and transport. As previously discussed, the LNAPL found in the

primary source area for the dissolved COC plume is weathered gasoline, which is comprised of shorter hydrocarbon chains and is generally more amenable to degradation than other longer-chain hydrocarbons. Natural processes play an important role in reducing the mass (and therefore persistence) of petroleum hydrocarbon sources, this mass reduction is described as natural source zone depletion (NSZD) (ITRC, 2009b). Similar to the natural attenuation of dissolved phase COCs in groundwater, the intrinsic processes associated with NSZD include volatilization of COCs directly from the LNAPL into the vadose zone soil gas, dissolution of LNAPL into the aqueous phase, and biodegradation of LNAPL by microbes. The rate of NSZD occurring at the Site has not been estimated, however, current research (Mahler et al, 2015) suggests that naturally occurring rates of degradation are comparable to rates achieved by common remedial technologies used to address LNAPL sources. Consistent with ITRC guidance (ITRC, 2009b), the observed stability of the dissolved COC plume at the Site is considered a further line of evidence that the LNAPL source at the Site is also relatively stable and dissolution processes have reached equilibrium.

5.3 CONTAMINANT MIGRATION

5.3.1 Contaminant Plume Stability

The stability of the dissolved phase plume for the primary groundwater COCs was evaluated by looking at temporal trends in benzene, ethylbenzene, toluene and xylene concentration data for all of the monitoring wells present at and near the Site (Figures 49 through 52). In these figures, the intra-well BTEX concentrations appear stable or decreasing over the monitoring period. Spatial benezene concentrations trends for each groundwater sampling event are presented on Figure 53.

As noted previously, based on the COC concentration gradients shown on Figures 45 through 48, the source area for the dissolved plume appears to be in the northwest portion of the Site, with dissolved concentrations steadily decreasing with distance from this source area. LNAPL has been observed in monitoring wells located throughout the dissolved plume; however, the dissolved concentrations within the plume do not appear to be significantly influenced by the presence of this LNAPL (i.e., LNAPL within the central area of the Site does not appear to be as significant of a contributor of contaminant mass to the dissolved phase plume as the northwest source is). The concentrations of dissolved COCs at the Site exhibit a decreasing trend across the Site from the northwest to the southeast (and upgradient to the northwest) as indicated by on Figure 53. No

petroleum hydrocarbon COC concentrations exceeding the EEVs were detected in groundwater samples from monitoring wells beyond the downgradient property boundary.

The observed stability of the dissolved BTEX plume at the Site and surrounding area is completely consistent with the behavior typically observed for these types of plumes. Numerous studies evaluating the behavior of BTEX plumes over the past 25 years indicate that most BTEX plumes are less than 200 ft in length and are stable or shrinking due to natural attenuation processes (Connor et al, 2015). The dissolved benzene concentration at the Site decreases by five orders of magnitude (from 25 mg/L to 0.00023 mg/L) over a distance of approximately 500 feet, indicating that significant natural attenuation of the dissolved plume is occurring. In addition to rapidly decreasing concentration trends, geochemical data discussed in Section 5.3.2 below indicates that the dissolved plume is undergoing significant biodegradation. Given the low groundwater flow velocity (due to the low hydraulic gradient) and the high rate of COC degradation, downgradient off-site transport of COCs has not been observed and is not expected.

5.3.2 Presence of Biodegradation Indicators

The biotic or abiotic processes that may affect plume behavior can be better understood by characterizing the subsurface geochemical environment. Although it may not be feasible or possible to directly measure the various processes involved, the processes frequently affect the geochemistry of the plume and create observable and measureable geochemical changes that can be used to infer which processes are occurring.

Biodegradation of fuel-type petroleum hydrocarbons (BTEX and related compounds) generally occurs as microbes metabolize fuels through an oxidative process that utilizes the fuel as an electron donor. Under aerobic conditions, microbes couple the oxidation of fuels (electron donors) to the reduction of oxygen (electron acceptor). As dissolved oxygen is depleted in the plume area, alternative electron acceptors such as nitrate, ferric iron, and sulfate are used in an anaerobic process. The efficiency of this biodegradation process is dependent on the oxidation-reduction potential (ORP) and availability of electron acceptors at a site (Wiedemeier et al, 1999a). Measurements or concentrations of these parameters are summarized on Table 7. A discussion of the parameters, processes, and their significance as indicators of biodegradation are provided in the following paragraphs:

Dissolved Oxygen – As noted above, dissolved oxygen is the preferred electron acceptor for microbial metabolism. For aerobic biodegradation to proceed, dissolved oxygen must be present

at a concentration greater than 1 mg/L; below this concentration anaerobic processes take over. Groundwater and surface-water recharge into the upper water-bearing zone in the vicinity of the Site results in an influx of oxygen into the groundwater system while biodegradation processes consume oxygen, resulting in a dynamic system. Dissolved oxygen concentrations less than 1 mg/L reflect the depletion of dissolved oxygen from aerobic biodegradation. Dissolved oxygen concentrations in groundwater in the vicinity of the Site are typically less than 1 mg/L within the dissolved plume area, and greater than 1 mg/L outside the plume area (see Table 7), suggesting that aerobic and anaerobic processes are occurring both on and off-site.

Oxidation-Reduction Potential - ORP is a measure of electron activity and can be used as an indicator of aerobic or anaerobic conditions. ORP measurements greater than approximately 740 millivolts (mV) indicate aerobic conditions and that oxygen is the primary electron acceptor (Wiedemeier et al, 1999b). As the ORP decreases below this range, the system is generally anaerobic and alternative electron acceptors are utilized. The preference for alternative electron acceptors is dependent on the ORP, with nitrate and manganese utilized at ORP values between 0 and 750 mV, followed by ferric iron around -50 mV, and sulfate or methane around -250 mV. ORP measurements in groundwater in the investigation area typically range between -200 to 0 mV, consistent with anaerobic/reducing conditions and the use of alternative electron acceptors to complete the oxidation of the fuel substrate.

pH - pH conditions can affect the presence and activity of microbial populations. Circumneutral pH conditions in the investigation area indicate that groundwater conditions are conducive to microbial activity.

Nitrate – Nitrate can be used as an electron acceptor for anaerobic biodegradation of fuels via the denitrification process. Nitrate is typically the first alternative electron acceptor to be used when oxygen is depleted, and slightly reducing conditions are required for denitrification to proceed. Nitrate is generally not present in fuel plumes, suggesting that indigenous bacteria adapt rapidly to utilizing this compound and that naturally occurring concentrations of nitrate are quickly consumed. Denitrification is indicated when there is a strong correlation between areas with elevated BTEX concentrations and depleted nitrate concentrations relative to background concentrations. Nitrate concentrations measured in the BTEX plume area during the RI were frequently below the laboratory detection limit of 0.05 mg/L while nitrate concentrations on the edge of the plume, upgradient, and side-gradient ranged from 2.8 to 5.9 mg/L. These

measurements indicate that biodegradation of the groundwater plume by denitrification is occurring in the investigation area.

Ferrous Iron - During anaerobic biodegradation of organic carbon, ferric iron ((Fe(III)) can serve as an electron acceptor and be reduced to ferrous iron (Fe(II)). Oxidation of BTEX compounds will typically result in elevated concentrations of Fe(II) in the plume area if biologically available Fe(III) is present in the aquifer matrix. Thus, the accumulation of Fe(II) in the plume area relative to FE(II) outside of the plume area can be an indicator of that biodegradation via Fe(III) reduction is probably occurring (Wiedemeier et al, 1999b). As indicated on Table 7, the concentrations of Fe(II) were typically higher within the plume (average concentration 2.14 mg/L), and lower outside of the plume (average concentration 0.49 mg/L), indicating that biodegradation is likely occurring by this pathway.

Sulfate – Sulfate-reducing bacteria will begin degrading fuels once the oxygen and nitrate in the groundwater system have been depleted. As these bacteria reduce sulfate to sulfide, the concentration of sulfate within the plume area will decrease relative to the concentration outside of the plume. During the RI investigation, the average concentration of sulfate within the plume was 11 mg/L while the average concentration outside of the plume was 33 mg/L. These measurements indicate that biodegradation of the BTEX plume by sulfate reduction is occurring in the vicinity of the Site.

Arsenic - The rapidly decreasing concentrations of dissolved petroleum hydrocarbons across the Site indicate that petroleum hydrocarbon degradation is occurring; typically a process that consumes oxygen and results in lowered dissolved oxygen and reducing conditions (anaerobic conditions). The presence of arsenic in Site groundwater is consistent with the expected area of reducing groundwater conditions. Low concentrations of arsenic were observed in Site soils during the RI, but not above the published Texas Specific Background Concentrations or EEV, suggesting that arsenic is naturally occurring in the Site soils and not associated with anthropogenic sources. Naturally occurring arsenic is usually tightly sorbed to soil and the aquifer matrix, commonly on hydrous ferrous oxide mineral surfaces. Several geochemical processes may contribute to sorbed arsenic being mobilized in groundwater, including reducing conditions that facilitate reduction of ferric iron and dissolution of hydrous ferrous oxide (Ghosh et al, 2003). In anaerobic/reducing conditions, ferric iron-reducing microorganisms can cause the reduction of solid phase Fe(III)-oxides present in the aquifer matrix to reduce to Fe(II) as a result of the oxidation of petroleum hydrocarbons. When Fe(III)-oxides are reduced, metals such as arsenic

that sorb tightly to Fe(III) can be released to groundwater (Johnson and Schreiber, 2003; Ghosh et al, 2003).

Because elevated arsenic levels in groundwater are only observed in the area where petroleum hydrocarbon degradation is present, the elevated arsenic is likely due to naturally occurring arsenic that was originally sorbed to aquifer material but has only been temporarily released due to the reducing conditions. Once the groundwater containing elevated iron and arsenic migrates from the reducing area of the aquifer (the area containing BTEX compounds), the iron precipitates as hydrous ferric oxide and allows for arsenic adsorption. The dissolved arsenic concentration decreases due to the increased adsorption occurring outside of the reducing area (Ghosh et al, 2003). This behavior is demonstrated at the Site as dissolved arsenic concentrations are highest (0.2 to 0.3 mg/L) in the plume source area (wells MW-12, MW-14) and decrease (non-detect to 0.019 mg/L) in areas downgradient of the Site (wells MW-20, MW-21 and MW-22).

As indicated by the above evaluation, the geochemical parameters measured during the RI indicate that biodegradation of the BTEX plume is occurring via several aerobic and anaerobic microbial processes. Biodegradation represents one of several processes affecting the extent and rate of contaminant migration in groundwater. The net overall effect of these various processes within the context of overall groundwater movement rates and directions can be assessed by considering the extent of observed contaminant migration relative to the timeframe over which that migration may have occurred. At the Site, petroleum hydrocarbon storage or refining operations began in the mid-1930s, yielding a timeframe for migration of COCs of approximately 80 years. As shown on Figures 45 through 48, and Figure 53, the lateral extent of the primary COCs in groundwater is approximately 500 feet (from the primary source area in the northwest corner of the Site to the southeast property boundary and limit of benzene plume). Dividing this distance by the potential migration period estimate of 80 years, the estimated COC migration rate is approximately 7 ft/year. This rate is in the range of estimated groundwater flow velocities (7 to 31 ft/yr) discussed in Section 3.3.4. Given the proximity of LNAPL to the downgradient (eastern) edge of the property boundary (MW-19) and estimated groundwater velocity, the extent of the plume would have extended 500 to 2,500 feet beyond the current footprint if significant natural attenuation (primarily degradation) was not occurring. The limited extent of COC migration, low groundwater velocity, demonstrated contaminant degradation, and age of the releases indicate the limited potential for future migration of COCs.

6.0 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

A baseline human health risk assessment (BHHRA) and screening level ecological risk assessment (SLERA) were completed for the Site. This section summarizes these risk assessments which were submitted to and approved by EPA as separate documents (PBW, 2013 and PBW, 2016).

6.1 Summary of Baseline Human Health Risk Assessment

A BHHRA is the systematic, scientific characterization of potential adverse effects resulting from exposures to hazardous agents or situations (NRC, 1983). The results of the BHHRA are used to support risk management decisions and determine if remediation or further action is warranted at a site. The Final BHHRA was approved by EPA on May 4, 2016. The discussion below briefly summarizes the evaluation and conclusions of the BHHRA. Details regarding the exposure assessment and toxicity assessment phases of the risk assessment process are provided in the final BHHRA (PBW, 2016).

6.1.1 Identification of COPCs

Soil, groundwater, soil gas, and drainage ditch surface water samples collected as part of the RI were evaluated in the BHHRA. For the BHHRA, all compounds detected in at least one investigation sample were evaluated. Compounds were screened from further consideration if: 1) they were detected at a low concentration (below one tenth of the screening value discussed below); or 2) they were measured at similar concentrations in background samples. All compounds that were measured in excess of the adjusted screening level (i.e., one tenth of the screening level) were retained for further evaluation in the BHHRA as a COPC.

6.1.2 Exposure Assessment

An exposure assessment estimates the extent of human contact with COPCs by characterizing potentially exposed populations (i.e., receptors), identifying actual or potential routes of exposure, and quantifying the intake (or dose) of human exposure. The exposure assessment also identifies possible exposure pathways that are appropriate for each potential receptor and exposure scenario and considers the source of contamination and fate and transport properties of the compound and surrounding environment. Exposure was evaluated for both current and potential future receptors to allow for evaluation of long-term risk management options.

Based on the exposure assessment, potentially exposed populations for the Site vicinity included: 1) on-site future industrial worker, 2) on-site future construction worker, 3) current and future youth trespasser, 4) current and future on-site maintenance worker, and 5) current and future off-site residential receptors.

Exposure point concentrations for soil, as represented by the 95% UCL, were estimated using EPA's ProUCL software program (EPA, 2010). The maximum on-site concentration in soil gas was used to estimate potential risks and hazards to the on-site industrial worker and the maximum off-site soil-gas concentration was used to estimate risks and hazards to the off-site resident. While a construction worker could also be exposed to VOCs migrating from groundwater or soil gas to outdoor air, that exposure and risk scenario was not calculated. However, risks related to inhalation of VOCs and particulates in the outdoor air from exposed soil were calculated for the on-site construction worker and industrial worker.

6.1.3 Toxicity Assessment

The toxicity assessment provides a description of the relationship between a dose of a chemical and the anticipated incidence of an adverse health effect. Toxicity data used in this BHHRA were taken from EPA's 2013 Regional Screening Tables and from TCEQ's Texas Risk Reduction Program Toxicity Factors Table dated June 29, 2012.

6.1.4 Risk Characterization

Risk characterization is the risk characterization phase that entails the integration of the exposure estimate (or dose) and the toxicity information to make qualitative estimates and/or qualitative statements regarding potential risk to human health. The BHHRA concluded that all potential cancer risk estimates fell within the allowable EPA risk range of 10^{-6} to 10^{-4} or less, except for the hypothetical on-site future industrial worker due to the vapor intrusion pathway for COCs in soil gas which indicated a potential risk greater than 10^{-4}. This potential risk is focused on the northern portion of the Site (referred to as the R&H Oil exposure area). If the soil-gas data from the Tropicana Energy exposure area are separated from the R&H Oil exposure area, the industrial worker scenario risks for the Tropicana Energy exposure area are less than 10^{-6}.

The potential vapor-intrusion cancer risk to a hypothetical off-site receptor was estimated to be 4 x 10^{-6}. Benzene and ethylbenzene are the primary contributors to this potential risk. Lines of evidence that indicate on-site soil gas or potential vapor sources are not likely to present a risk to off-site receptors to the north or to the east via lateral migration include:

- Elevated soil-gas concentrations are not observed at several monitoring points adjacent to sample points with high groundwater concentrations. If lateral transport of soil gas were occurring at the Site, benzene should be present in the on-site sub-slab samples.
- Recent EPA research published on petroleum vapor intrusion conclude that unless a receptor is in close proximity to the source, either the dissolved groundwater plume or NAPL, no risk is likely to be present. The R&H Oil off-site data indicates very low benzene concentrations off-site (downgradient) and that groundwater occurs approximately 10 to 20 feet below ground surface, which provides a zone for bioattenuation to occur.

For noncarcinogenic compounds, none of the estimated hazard indices (HIs) for the soil exposure pathways exceeded EPA's target HI of 1. Potential exposure from the vapor-intrusion pathway from COCs in groundwater for a hypothetical future industrial worker employed in an on-site building resulted in an HI greater than 1, with benzene being the primary driver.

The total TPH concentrations of several individual shallow subsurface soil samples exceed the Total TPH PCL (none of the shallow soil Total TPH concentrations exceed the volatilization from soil pathway ($^{Air}Soil_{Inh\text{-}VP}$) PCL developed for this Site). The 95% UCL calculated for Total TPH in shallow soils (68,718 mg/kg) also exceeds the Total TPH PCL (34,900 mg/kg) which suggests that direct contact with shallow soil at the Site may potentially pose an unacceptable health hazard to industrial workers. In addition, none of the shallow soil measured off-site exceed the Total TPH concentrations for residential receptors.

Per EPA request, the BHHRA compared groundwater COC concentrations to drinking water maximum concentration levels (MCLs) and/or groundwater ingestion PCLs ($^{GW}GW_{Ing}$) recognizing that no water wells have been identified in the Site vicinity and a City of San Antonio ordinance prohibits installation of water-supply wells in the area.

The comparison shows multiple analyte concentrations exceeding the drinking water standards in samples from on-site monitoring wells, particularly arsenic, benzene, ethylbenzene, toluene and xylene. Other VOCs and SVOCs have detection limits and/or detected concentrations in the on-site groundwater samples that are higher than the drinking water standards.

For off-site downgradient groundwater, a single detection of arsenic (0.019 mg/L in the sample from well MW-21) in the seven off-site groundwater samples analyzed for arsenic exceeded the MCL of 0.01 mg/L. Exceedances of the MCL (or TRRP PCL) were not observed at any other downgradient wells during the three groundwater monitoring events conducted off-site.

In groundwater samples collected west and north of the Site (cross or upgradient), monitoring well MW-25 has the highest detection of benzene at 14 mg/L (same concentration in two sampling events), ethylbenzene (2.2 and 2 mg/L) and naphthalene (0.56 mg/L and 0.54 mg/L), which exceed the drinking water screening values. Benzene was also detected in samples from MW-26 (7.6 mg/L) and MW-27 (0.0055 mg/L) at concentrations greater than the MCL (0.005 mg/L).

6.1.5 BHHRA Conclusions

The primary objective of the BHHRA was to evaluate the possible risks associated with COPCs in environmental media to human receptors at the R&H Oil/Tropicana Energy Site. Data were segregated by media and by location (e.g., on-site groundwater, off-site groundwater, on-site soil, on-site soil gas, off-site drainage ditch surface water, off-site soil gas and off-site soil). Exposure point concentrations were estimated for soil COPCs (95% UCL) exposures using EPA's ProUCL program when there were adequate numbers of samples. The maximum detected soil-gas concentrations were used in the vapor intrusion assessment. Exposure scenarios addressed current and potential future land use and included an on-site future industrial worker, on-site future construction worker, future use of shallow groundwater for drinking water (both on-Site and off-site), current and future youth trespasser, current and future on-site maintenance worker, current and future contact recreation receptor, and current and future off-site residential receptor.

Based on the calculated hazard indices, the BHHRA estimated all potential on-site and off-site noncarcinogenic hazards at below the threshold of 1 except for potential on-site vapor intrusion exposure to the on-site future industrial worker. The potential hazard for the hypothetical exposure scenario is driven by benzene. Shallow soil sample concentrations on-site exceed the Total TPH PCL derived for the mixture of TPH compounds measured in shallow soil. As such, exposure to shallow soils on-site might pose an unacceptable hazard to a future industrial worker at the Site. Potential carcinogenic risks from exposure to soil were calculated as less than 10^{-6} for the current trespasser and future construction worker, and a the low end of the allowable risk range of 10^{-4} to 10^{-6} for the current maintenance worker and the future industrial worker. Potential carcinogenic risks from vapor intrusion are estimated at 3×10^{-4} for the future industrial worker and at 4×10^{-6} for the off-site resident with benzene and ethylbenzene being the risk drivers.

Concentrations of some COPCs in the uppermost water-bearing unit, both on-site and off-site to the north, exceed drinking water standards; however, no water supply wells have been identified in the Site vicinity and a City of San Antonio ordinance prohibits construction of water wells in the area.

In summary, risks and hazards are below levels of concern for the current receptors/scenarios: current on-site maintenance worker and current youth trespasser. However, in the event that the property is used for industrial purposes in the future, exposure to an industrial worker from TPH in shallow soils and/or vapors in an enclosed space might pose an unacceptable risk. Restrictive covenants are currently in place at the Site and include the following restrictions: 1) property use is limited to commercial/industrial activities; 2) use of groundwater at the Site is prohibited and actions must be taken to prevent exposure to affected groundwater or soil if any activities may result in exposure to groundwater; and 3) protections must be taken to address potential exposures associated with future construction at the property, including mitigation of potential vapor intrusion if building construction proposed.

6.2 SUMMARY OF SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

The SOW for the RI/FS requires that an Ecological Risk Assessment (ERA) be conducted for the Site. The SOW specifies that the Respondents follow EPA's *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997a). This guidance document proposes an eight-step approach for conducting a scientifically-defensible ERA:

1. Screening-Level Problem Formulation and Ecological Effects Evaluation;
2. Screening-Level Preliminary Exposure Estimate and Risk Calculation;
3. Baseline Risk Assessment Problem Formulation;
4. Study Design and Data Quality Objectives;
5. Field Verification of Sampling Design;
6. Site Investigation and Analysis of Exposure and Effects;
7. Risk Characterization; and
8. Risk Management.

Steps 1 and 2 of the Ecological Risk Assessment (ERA) constitute the Screening Level Ecological Risk Assessment (SLERA), which was prepared and submitted to EPA on August 5, 2013 (PBW, 2013) and approved by EPA on September 26, 2013. The SLERA is to be used to

assess the need and, if required, the level of effort required to conduct a baseline ecological risk assessment, or to determine that no further action is necessary. The SLERA is also used to focus subsequent phases of the investigation by eliminating compounds from further evaluation (EPA, 2001).

The SLERA evaluated the potential for unacceptable risk for the ecologically relevant media at the Site: surface soil, shallow soil, and surface water at the nearby drainage ditch. The receptors included in this evaluation were invertebrates and plants potentially exposed to site-related compounds of potential ecological concern (COPECs) in surface soil and shallow soil, as well as mammalian and avian receptors potentially exposed to COPECs measured in surface water at the drainage ditch near the Site. The results and conclusions of the SLERA are provided in the following sections.

6.2.1 Potential Ecological Risks Associated with Soil

Initially, chronic soil exposures were assumed in the SLERA (Appendix B). Chromium, copper, lead, manganese, mercury, vanadium, zinc and high molecular weight PAHs were measured in at least one soil sample above a chronic screening value or background. Because of limited ecological resources at the Site, chronic exposures were determined to be unlikely, and as a result acute (episodic) exposure to mammalian and avian receptors to COPECs in surface and shallow soil was identified as the more appropriate assessment endpoint. Following the acute analysis, copper, lead, mercury, zinc and high molecular weight PAHs were found to be present at concentrations that would not cause unacceptable risk. Chromium, manganese and vanadium in soil were determined to be present at concentrations below soil background. The SLERA concluded that COPECs measured in the surface and shallow soil at the Site were below background levels or below levels where acute toxicity might be observed. Therefore, it is unlikely that potential soil exposure at the Site would result in adverse ecological risks.

6.2.2 Potential Ecological Risks Associated with Surface Water

Based on the comparison to screening levels derived for mammals and avian receptors drinking surface water, which was the assessment endpoint identified for the occasional surface water in the drainage ditch adjacent to the Site, concentrations of COPECs measured at the Site were below levels where toxicity might be observed. Therefore, adverse ecological risks to mammals and birds with potential surface-water exposure in the ditch adjacent to the Site are unlikely. No compounds were measured in the ditch surface water at a level that exceeded the acute water-

quality criteria for that compound. As such, it is unlikely that surface water occasionally present in the ditch results in an adverse impact to aquatic life.

6.2.3 Scientific Management Decision Point

Consistent with EPA guidance (EPA, 1997a), the SLERA concludes with a Scientific Management Data Point with four possible decisions for this point:

1. There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk;
2. The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue to Step 3;
3. The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted (i.e., continue to Step 3); or
4. There is adequate information to support a risk management decision such as taking action to eliminate an identified exposure pathway.

The SLERA indicates that there is adequate information to conclude that ecological risks associated with the Site are negligible. As such, there is no need to evaluate ecological risks further or proceed to Steps 3 through 8 of the ERA process. Likewise, it is unnecessary to develop remedial action objectives to protect ecological receptors at this Site because adverse ecological risks are unlikely.

7.0 SUMMARY AND CONCLUSIONS

7.1 SUMMARY

7.1.1 Nature and Extent of Contamination

Impacts at the Site are associated with petroleum hydrocarbons released by various operations conducted at the Site between the 1930s and the early 1990s. Materials handled at the Site included crude oil, refined gasoline (leaded), various oils for recycling, and raw unleaded gasoline for fuel blending. EPA removal actions conducted in 2001 removed the remaining potential sources of COCs (not including deep/residual LNAPL and all LNAPL-containing soil). The nature and extent of COCs in environmental media in the Site vicinity were evaluated in the RI through installation of 24 groundwater monitoring wells (in addition to six existing groundwater monitoring wells), five NAPL monitoring wells, 41 soil borings, 48 soil samples, 17 soil-gas sample points, three sub-slab vapor sampling points, five ditch surface water samples, and five NAPL samples. The sampling and analytical program rationale and methods were described in the RI/FS Work Plan, the Field Sampling Plan (FSP), and Quality Assurance Project Plan (QAPP). The key RI conclusions are summarized by area/media below. The extents of detected COCs in these media were evaluated through comparisons of sample concentrations to EEVs initially identified in the RI/FS Work Plan and updated in this report as appropriate. EEVs were risk-based values protective of residential exposures and provided a conservative basis for determination of COC extents for the Site's commercial/industrial property designation.

- Surface Seeps – A semi-solid tarry NAPL material is present in the shallow soils at various locations in the northern (R&H Oil) portion of the Site. The NAPL material appears at the ground surface as seeps in several areas. Sampling or other characterization of this material was not conducted during the RI, however, further characterization of the tarry seeps will be performed as needed as part of remedial design/remedial action (RD/RA) activities to implement the remedy selected for the Site.

- Shallow Vadose-Zone Soils – Surface and shallow soils at the Site were evaluated through the collection of soil samples from the ground surface to a depth of 5 ft bgs. As indicated on Table 12, surface and shallow soil sample EEV exceedances were observed at all on-site soil sample locations. EEV exceedances in Surface soils (0-0.5 ft bgs) are characterized by elevated TPH, metals, and polycyclic aromatic hydrocarbons (PAHs). Lighter hydrocarbons, such as benzene and other gasoline-related compounds, were not

found in the surficial soils at concentrations exceeding the EEVs. EEV exceedances in shallow soil samples (0.5-5 ft bgs) were limited to TPH, lead, mercury, and benzene.

- Deep Vadose-Zone Soils – TPH, arsenic, lead and generally short-chain hydrocarbons were detected in deep soils at concentrations exceeding the EEVs. The COCs exceeding the EEVs in deep soils are compounds commonly associated with gasoline-type sources and did not include many of the metals or PAH compounds observed in the surface soils. The depths and locations of these exceedances suggest that the elevated concentrations are associated with LNAPL present (or historically present) near or on the top of the water table.

- Groundwater – Shallow groundwater at the Site was typically found at depths that ranged from 18 to 22 ft bgs during the RI until early 2015, when the water table rose approximately 4-5 ft due to increased precipitation. With the exception of the western edge of the Site, the shallow groundwater is underlain by low permeability silty clays that inhibit hydraulic communication with deeper groundwater that is found in alluvial deposits above the Navarro Group. Several metals (arsenic, lead, and manganese) and semi-volatile organic compounds (2,4-dimethylphenol, 2-methylnaphthalene and 3&4 methylphenol) were detected in Site groundwater at concentrations exceeding the EEVs. However, VOCs typically associated with gasoline sources, such as BTEX, were the predominant COCs present in groundwater in the vicinity of the Site.

  The VOC concentrations are highest in the northwest portion of the Site (MW-12, MW-13, MW-14, MW-15 and MW-18, assumed source area) and decrease rapidly as the groundwater moves hydraulically downgradient towards the eastern boundary of the Site. Groundwater samples collected beyond the eastern boundary of the Site (in the upper and lower water-bearing zones) did not contain COCs at concentrations exceeding the EEVs with the exception of arsenic at one location (one sampling event), indicating that sufficient natural attenuation is occurring to prevent downgradient off-site migration of COCs that may be attributed to the Site. Chlorinated compounds associated with the East KAFB plume were observed in off-site wells at concentrations exceeding the EEVs, but were not found on-site at concentrations exceeding the EEVs. Elevated concentrations of dissolved petroleum hydrocarbon COCs are also present in groundwater upgradient of the Site and source area due to localized spreading during the release period, and also

potentially from operation of the East KAFB groundwater recovery system which caused groundwater to migrate north/northwest of the Site.

Monitoring wells MW-1 through MW-6 were installed during historical Site investigation activities and are screened across the entire water-bearing zone (upper zone and basal terrace deposit sand and gravels). Monitoring wells MW-7 through MW-11 are installed downgradient of the Site in the basal terrace deposit sand and gravels. Monitoring wells MW-12 through MW-30 are installed in the shallow portion of the water-bearing zone. COC concentrations observed in the lower water-bearing zone are typically much lower than those in the upper zone, indicating some separation between the zones. However, samples collected from wells MW-1 through MW-6 may represent a mixture of the two zones.

- Surface Water - A drainage ditch is present adjacent to the western perimeter of the Site. The ditch receives surface water runoff from an industrial area of San Antonio and is frequently dry except after rainfall events. According to a topographic survey prepared for the Site, a small portion of the Site drains towards the drainage ditch; however, the ground surface is relatively flat and well vegetated in this area, reducing the likelihood of surface water draining to the ditch. Surface-water samples were collected from the drainage ditch in October 2011 following a rainfall event. No COCs were detected in the surface-water samples at concentrations exceeding the EEVs.

- Soil Gas – Eleven soil-gas points were installed in the vicinity of wells MW-12 through MW-22, three soil-gas points were installed on the eastern perimeter of the Site, and three soil-gas points were installed in the sidewalk on the east side of Somerset Road, east of the Site. Three sub-slab sample points were installed in the abandoned building located near the entrance of the Site. With the exception of acetone and one detection of m,p-xylene, no COCs were detected in sub-slab vapor samples. The sub-slab samples were collected from a building located on the downgradient boundary of the property located directly over the dissolved groundwater plume. The sample location and results of the sub-slab samples indicate that vapor intrusion associated with the off-site dissolved groundwater plume is unlikely. The highest soil-gas concentrations were typically BTEX-related compounds (e.g., benzene concentrations ranging from 14,000 to 620,000 ug/m^3) associated with shallow vadose zone LNAPL sources in close proximity to the sample point (as opposed to affected groundwater or LNAPL trapped above the water

table). Soil-gas COC concentrations associated with LNAPL sources present at the surface of the water table, e.g., SG-12, SG-18, and SG-19 were considerably lower (i.e., benzene concentrations ranging from 33 to 270 ug/m^3). Soil gas samples collected below the sidewalk on the east side of Somerset Road (SG-26, SG-27, and SG-28) did not contain benzene at detectable concentrations; detected COCs in these samples were relatively low (benzene concentrations were below the laboratory detection limit in all samples).

- LNAPL - LNAPL is present in various areas of the Site in shallow vadose-zone soils and in deeper soils above the water table. Due to the wide variety of historical activities performed at the Site, the location and characteristics of the LNAPL vary considerably across the Site. LNAPL observed in the northwest portion of the Site is characteristic of gasoline. LNAPLs present in the central and southern areas of the Site are heavier and more characteristic of diesel fuel or oil. LNAPL was sufficiently mobile to infiltrate monitoring wells when the water table was depressed during drought conditions, however, as the water table elevation began to rise the volume and occurrence of LNAPL in wells across the Site decreased significantly. LNAPL migration has not been observed at the Site and would not be expected given the age of the releases (1930s to early 1990s).

7.1.2 Fate and Transport

The primary routes of COC migration or exposure identified at the Site are airborne dust particles and dissolved phase transport in groundwater. Results of surface and shallow soil sampling conducted for the RI indicate that the potential for contaminant transport by airborne dust is negligible due to the lack of COCs measured in shallow samples. Tarry seeps present at the Site are generally solid material which would not be expected to contribute to airborne dust and shallow NAPL materials are typically found several feet below ground surface (The majority of hydrocarbon-impacted surface soils were removed by EPA in 2001).

LNAPL has been observed primarily in monitoring wells located in the northern portion of the Site. LNAPL found in the northwest corner of the Site appears to be associated with gasoline produced between the 1960s and 1980s, while LNAPL found in the central/eastern portions of the Site appears to be heavier oils associated with the recycling and refining activities conducted in these areas. Due to the shallow geology of the Site being predominately silty clays, the low groundwater gradient, and rapid degradation of COCs, LNAPL migration appears to be limited

and has not been observed outside of the Site property boundary. LNAPL mobility, the ability of LNAPL to flow to a monitoring well, is influenced by the depth of the water table at the Site. During extreme drought conditions, up to 3 ft of LNAPL will accumulate in some wells; however, when the water table returns to higher elevations, LNAPL is only present in some wells at thicknesses less than 0.5 ft. This indicates that during normal precipitation conditions a significant portion of the LNAPL mass is trapped in the soil pore space below the water table and is not mobile or recoverable.

The primary source of dissolved COCs in groundwater is found in the northwest corner of the Site and appears to be related to the release of gasoline during rail loading activities. LNAPL in this area corresponds to gasoline produced during the 1960s to the 1980s and the dissolved COCs in groundwater are consistent with a gasoline release. Concentrations in the dissolved plume decrease rapidly in the downgradient direction until they become fully degraded near the eastern property boundary, approximately 500 ft from the source area. Groundwater flow velocity at the Site is very low, on the order of 7 to 31 ft/year, suggesting that the reduction in concentrations is primarily attributable to microbial degradation rather than abiotic processes such as diffusion, dispersion and advection. The absence of dissolved chlorinated compounds in the vicinity of the Site (associated with the East KAFB plume) also indicate COC breakdown by microbial activity. The steady decrease in COC concentrations across the Site from west to east also suggests that longer-chained hydrocarbons present in the center of the Site does not have much influence on the dissolved phase concentrations, i.e., the low solubility of the hydrocarbon in this material does not result in locally elevated dissolved phase concentrations. Affected groundwater extends off-site to the north/northwest of the Site due to three factors; (1) the lateral dispersion (including in the upgradient direction) of LNAPL historically leaking from above-ground structures as it infiltrated in to the subsurface through the vadose zone; (2) a relatively low groundwater gradient which would allow a greater amount of hydrodynamic dispersion in the upgradient direction; and (3) hydraulic effects of the nearby groundwater recovery system operated at East KAFB from approximately 2000 to 2013.

Two potential groundwater exposure pathways exist in the vicinity of the Site: volatilization of VOCs into the breathing zone, and ingestion of affected groundwater. Inhalation of VOCs sourced from the dissolved groundwater plume has been addressed for several scenarios. In the case of VOCs volatilizing and migrating into outdoor air, the human-health risk assessment concluded that the concentration of VOCs in ambient air would not present an unacceptable risk. In the case of VOCs in groundwater volatilizing and migrating into an overlying building, soil-

gas samples collected in the source area and from below a slab overlying the dissolved plume, indicate that volatilization of VOCs from the dissolved groundwater plume (or overlying LNAPL) do not present an unacceptable vapor-intrusion risk. Potential vapor-intrusion risks associated with shallow VOC source areas are present for future industrial workers (addressed by existing restrictive covenant placed on the Site). Lines of evidence that indicate on-site soil gas or potential vapor sources are not likely to present a risk to off-site receptors to the north or to the east via lateral migration include:

- Elevated soil-gas concentrations are not observed at several monitoring points adjacent to sample points with high groundwater concentrations. If lateral transport of soil gas were occurring at the Site, benzene should be present in the on-site sub-slab samples.
- Recent EPA research published on petroleum vapor intrusion conclude that unless a receptor is in close proximity to the source, either the dissolved groundwater plume or NAPL, no risk is likely to be present. The R&H Oil off-site data indicates very low benzene concentrations off-site (downgradient) and that groundwater occurs approximately 10 to 20 feet below ground surface, which provides a zone for bioattenuation to occur.

Ingestion of affected groundwater is considered a potentially complete pathway at the Site; however, use of groundwater in the vicinity of the Site is prohibited by City ordinance.

7.1.3 Risk Assessment

The BHHRA showed that risks and hazards are below levels of concern for the current on-Site maintenance worker and current youth trespasser exposed to surface soils. However, in the event that the property is used for industrial purposes in the future, exposure to an industrial worker from TPH in shallow soils and/or vapors in an enclosed space might pose an unacceptable risk.

Concentrations of some COCs in the upper groundwater-bearing unit, both on-site and off-site to the north exceed drinking water standards; however, no water-supply wells have been identified in the Site vicinity and a City of San Antonio ordinance prohibits construction of water wells in the area.

The SLERA concluded that potential risks to ecological receptors at the Site were unlikely due to the absence of COCs present in surficial soils and lack of suitable ecological habitat at the Site.

The potential vapor-intrusion cancer risk to a hypothetical off-site receptor was estimated to be 4 x 10^{-6} (BHHRA Tables C-16 and C-21). Maximum benzene and ethylbenzene concentrations

from sample SG-21 were used to calculate this potential risk, however, other soil gas samples collected downgradient of the Site (SG-26, SG-27, and SG-28) did not contain benzene at detectable concentrations, suggesting minimal risk in this area.

7.2 CONCLUSIONS

The RI characterized the nature and extent of COCs at the Site and in the vicinity of the Site, and the potential risks posed by COCs in various media. The northwest area of the Site contains COCs consistent with a gasoline release. The extent of the dissolved COC plume has been defined, with the downgradient edge present at the eastern property boundary/Somerset Road, and the northwest boundary extending onto the former East KAFB (currently owned by the Port of San Antonio). Based on the groundwater monitoring events conducted for the RI, the dissolved groundwater COC plume is stable or shrinking. Shallow groundwater in the area is not used and may not be used in accordance with a City ordinance that prevents the installation of any new wells. Consequently, the groundwater ingestion pathway is considered a hypothetically complete exposure pathway.

Shallow soils at the Site present a potential risk to on-site future industrial workers due to the presence of TPH. This risk is currently addressed by a restrictive covenant placed on the property. Semi-solid tarry seeps present on the ground surface are an issue that will be addressed as part of the RD/RA activities to implement the remedy selected for the Site.

LNAPL at the Site is judged to not be migrating, and the presence of LNAPL in monitoring wells is influenced by the elevation of the water table. Drought conditions present in the past have allowed LNAPL to migrate to a vertical depth of approximately 22-25 ft bgs, which is the approximate depth of a confining clay lens that is encountered in a portion of the Site. As the water table rises to more normal elevations, the mass of the LNAPL is generally submerged and no longer mobile. Due to the relationship between LNAPL mobility and depth to the water table, the effectiveness of LNAPL recovery using hydraulic recovery methods may be limited except during periods of drought.

8.0 REFERENCES

Abbott, P.L. and C.M. Woodruff, Jr., 1986. The Balcones Escarpment. Geological Society of America Annual Meeting, San Antonio, Texas, November 9-14, 1986.

Agency for Toxic Substances and Disease Registry (ATSDR), 2003. Public Health Assessment, R&H Oil Company & Tropicana Energy Company, San Antonio, Bexar County, Texas. December.

American Petroleum Institute (API), 2004. API Interactive LNAPL Guide Version 2.0, Aqui-Ver, Inc., Park City, UT.

Arnow, T., 1959. Ground-water Geology of Bexar County, Texas. Texas Board of Water Engineers Bulletin 5911, 62 pp.

Air Force Base Conversion Agency (AFBCA) and Air Force Center for Engineering Excellence (AFCEE), 2001. Kelly AFB Bexar County, Texas, Shallow Aquifer Assessment Phase IV Technical Report, Final. September,

Ashworth, John and J. Hopkins, 1995. Aquifers of Texas. Texas Water Development Board, Report 345. November.

ASTM, 2013. Standard Guide for Estimation of LNAPL Transmissivity. Designation E2856 – 13.

Barnes, V.E., 1983. Geologic Atlas of Texas – San Antonio Sheet. The University of Texas at Austin – Bureau of Economic Geology.

Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

CB&I Federal Services LLC (CBI), 2014. April 2014 BCT Meeting, Update of Performance Based Remediation Contract for Former Kelly AFB, April, 2014.

CH2M Hill, 2003. Final Zone 4 RCRA Facility Investigation Report – United States Air Force Installation Restoration Program, Former Kelly Air Force Base, San Antonio, Texas. Prepared for Air Force Real Property Agency. June.

CH2M Hill, 2004. Final Zone 4 Ecological Risk Assessment Report – United States Air Force Installation Restoration Program, Former Kelly Air Force Base, San Antonio, Texas. Prepared for Air Force Real Property Agency. March.

City of San Antonio (CSA), 1994. Ordinance 80574 § 15. August 4.

City of San Antonio (CSA), 1997. Ordinance 86747 § 1. October 2.

City of San Antonio (CSA), 2009. Ordinance 2009-06-18-0539. Amending the Official Zoning Map of the City of San Antonio by Amending Chapter 35, Unified Development Code, Section 35-304, of the City Code of San Antonio, Texas by Changing the Zoning District Boundary of Certain Properties. Case No. Z2009081 CD. SG: 06-18-09, Item No. Z-5. Amended.

City of San Antonio (CSA), 2012. Unified Development Code Section 35-310.12. Codified through Ordinance 2012-11-08-0877, effective November 8, 2012

City of San Antonio Development Services Department (CSADSD), 2016. Internet Mapping Application System Maps. May.

Connor, J. A., Kamath, R., Walker, K. L. and McHugh, T. E., 2015. Review of Quantitative Surveys of the Length and Stability of MTBE, TBA, and Benzene Plumes in Groundwater at UST Sites. *Groundwater*, 53: 195–206.

Davis, G., B. Patterson, and M. Trefry (Davis et al), 2009. Evidence for Instaneous Oxygen Limited Biodegradation of Petroleum Hydrocarbon Vapors in the Subsurface. *Groundwater Monitoring & Remediation*. 29 (1):126-137.

Duffield, G. 2007. AQTESOLV® Standard Version 4.5. Hydrosolve, Inc.

Environmental Resources Management (ERM), 2004. Preliminary Site Investigation Summary Report – R&H Oil Company Site, San Antonio, Texas. November.

Ecology & Environment, Inc. (E&E), 1998a. Removal Assessment Report for R&H Oil Company, San Antonio, Bexar County, Texas. October 30.

Ecology & Environment, Inc. (E&E), 1998b. Removal Assessment Report for Tropicana Energy Company, San Antonio, Bexar County, Texas. October 30.

Freeze, R. Allan, and John A. Cherry, 1979. Groundwater. Prentice-Hall, Inc.

Ghosh, R., W. Deutsch, S. Geiger, K. McCarthy, and D. Beckmann, 2003. Geochemistry, fate and transport of dissolved arsenic in petroleum hydrocarbon impacted groundwater. Paper read at Petroleum Hydrocarbons and Organic Chemicals in Groundwater, August 19–22, at Costa Mesa, California.

Hovorka, S.E., Paine, J.G., Reedy, R.C., Collins, E.W., and Lindley A., 2002. Evaluation of the Potential for Cross Contamination of the Edwards Aquifer from Dissolved Contaminants in the Shallow Groundwater Zone in the Vicinity of Kelly AFB via Faults and Wells. Bureau of Economic Geology. July.

Huntley, D., 2000. Analytic Determination of Hydrocarbon Transmissivity from Baildown Tests. *Groundwater* vol. 38, no. 1, pp. 46-54.

ITRC (Interstate Technology & Regulatory Council). 2009a. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. LNAPL-2. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. www.itrcweb.org.

ITRC (Interstate Technology & Regulatory Council). 2009b. Evaluating Natural Source Zone Depletion at Site with LNAPL. LNAPL-1. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. www.itrcweb.org.

Johnson, J.A., M. E. Schreiber, 2003. Characterizing the Transport of Dissolved Arsenic Associated with Petroleum-Impacted Aquifers. Proceedings of the 2003 American Petroleum Institute/National Groundwater Association Petroleum Hydrocarbons and

Organic Chemicals in Groundwater: Prevention, Detection, and Remediation Conference, Costa Mesa, California. August 2003.

McHugh, T., R. Davis, G. DeVaull, H. Hopkins, J. Menatti, and T. Peargin. 2010. Evaluation of vapor attenuation at petroleum hydrocarbon sites. *Soil and Sediment Contamination: An International Journal* 19(6):725-745.

Mahler, N., Palaia, T., Rewey, R., 2015. An Evaluation of Natural Source Zone Depletion Versus Active Remediation Rates. IPEC 22 November 2015 presentation, CH2M. November, 2015.

Miller, John K., 2003. An Independent Technical Assessment of the Final Report Prepared by the Bureau of Economic Geology on the Potential for Cross Contamination of the Edwards Aquifer at the Former Kelly Air Force Base. Mitretek Technical Report, prepared for Air Force Real Property Agency, Air Force Center for Environmental Excellence. July.

National Oceanic and Atmospheric Administration (NOAA), 2012. National Weather Service Weather Forecast Office, Austin/San Antonio Texas. http://www.srh.noaa.gov/ewx/?n=satclidata.htm Accessed July 11.

National Research Council (NRC), 1983. *Recommended Dietary Allowances, 10th ed. Report of the Food and Nutrition Board*, National Academy of Sciences, Washington, National Academy Press, Washington, DC. 285 p.

Pastor, Behling & Wheeler, LLC (PBW). 2010a. Final RI/FS Work Plan, R&H Oil/Tropicana Energy Site, San Antonio, Texas. September 24.

Pastor, Behling & Wheeler, LLC (PBW). 2010b. Sampling and Analysis Plan Field Sampling Plan, R&H Oil/Tropicana Energy Site, San Antonio, Texas. September 24.

Pastor, Behling & Wheeler, LLC (PBW). 2010c. Quality Assurance Project Plan, R&H Oil/Tropicana Energy Site, San Antonio, Texas. September 24.

Pastor, Behling & Wheeler, LLC (PBW). 2010d. Health and Safety Plan, R&H Oil/Tropicana Energy Site, San Antonio, Texas. September 24.

Pastor, Behling & Wheeler, LLC (PBW). 2013. Final Screening-Level Ecological Risk Assessment, R&H Oil/Tropicana Energy Site, San Antonio, Texas. September 24.

Pastor, Behling & Wheeler, LLC (PBW). 2016. Final Baseline Human Health Risk Assessment (BHHRA), R&H Oil/Tropicana Energy Site, San Antonio, Texas. February 5, updated April 22.

Raba-Kistner Consultants, Inc. (Raba-Kistner), 1991. Phase II Remedial Investigation, Tropicana Energy Company, Inc. May 28.

Roy F. Weston, Inc. (Weston), 2002a. Removal Report for R&H Oil Company, San Antonio, Bexar County, Texas. January.

Roy F. Weston, Inc. (Weston), 2002b. Removal Report for Tropicana Energy Company, San Antonio, Bexar County, Texas. January.

San Antonio Air Logistics Center (SAALC), 1999. Final Report – Addendum to Final Background Levels of Inorganics in soils at Kelly AFB. October.

Science Applications International Corporation (SAIC), 2008. Soil Gas Survey Activities Report, R&H Oil/Tropicana Energy Site, San Antonio, Texas. December 11.

Sellards, E.H., 1919. The Geology and Mineral Resources of Bexar County. University of Texas Bulletin 1932, Bureau of Economic Geology. June.

Settlement Agreement, 2010. R&H Oil/Tropicana Energy Site Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study, 2010. US EPA Docket No. 06-05-10.

Shaw Environmental & Infrastructure, Inc. (SHAW), 2013. Semiannual Compliance Plan Report, July through December 2012, Former Kelly AFB, San Antonio, Texas.

Texas Commission on Environmental Quality (TCEQ), 2010. Groundwater Classification. TCEQ Regulatory Guidance RG-366/TRRP-8, revised March 2010.

Texas Department of Water Resources, 1981. Interoffice Memorandum from Liska L. Mercer, Geologist Assistant District 8, to David Barker, Municipal Wastewater and Water Use Enforcement and Field Operations. Gasoline Contamination of Gravel Aquifer – Highway 81 South at Missouri Pacific Railroad Crossing – San Antonio, Bexar County. April 6.

Texas Natural Resource Conservation Commission (TNRCC), 1998. Memorandum of Call from Ray Newby, TNRCC SSDAT, to Sam Sanchez, Bexar Metropolitan Health District. May 13.

Texas Natural Resource Conservation Commission (TNRCC), 2000. Screening Site Inspection Report, R&H Oil Company, San Antonio, Bexar County, Texas, June.

Texas Natural Resource Conservation Commission (TNRCC), 2001. HRS Documentation Record, R&H Oil Company, San Antonio, Bexar County, Texas TXC 057 577 579. Prepared in cooperation with the US Environmental Protection Agency. April.

Texas Water Development Board, accessed 2016. Groundwater Data Viewer. http://www2.twdb.texas.gov/apps/WaterDataInteractive/GroundWaterDataViewer.

United States Air Force (USAF), 1999. Final Report, Addendum to Final Background Levels of Inorganics in Soils at Kelly AFB. October.

United States Environmental Protection Agency (EPA), 1986. *Guidelines for Carcinogenic Risk Assessment*. Federal Register. 51:33992.

United States Environment Protection Agency (EPA), 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (Interim Final). OSWER Directive 9355.3-01. EPA/540/G-89/004. October.

United States Environmental Protection Agency (EPA), 1997a. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final*. Office of Solid Waste and Emergency Response. OSWER 9285.7-25. EPA 540-R-97-006. June.

United States Environmental Protection Agency (EPA), 1997b. *Exposure Factors Handbook.* Office of Research and Development. EPA/600/P-95/002F. August.

United States Environmental Protection Agency (EPA), 2001. *ECO Update. Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments*. Office of Solid Waste and Emergency Response. Publication #9345.0-14. EPA 540/F-01/014. June.

United States Environmental Protection Agency (EPA), 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils. Office of Solid Waste and Emergency Response, Washington D.C. EPA-530-D-02-004. November.

United States Environment Protection Agency (EPA), 2003. R&H Oil/Tropicana Energy Site Update Presentation. February 5.

United States Environmental Protection Agency (EPA), 2004a. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*. Office of Solid Waste and Emergency Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. July.

United States Environmental Protection Agency (EPA), 2008. Community Involvement Plan, R&H Oil/Tropicana Energy Site, San Antonio, Bexar County, Texas. Region 6. July.

United States Environmental Protection Agency (EPA). 2009. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final.* EPA-540-R-070-002, OSWER 9285.7-82. Office of Superfund Remediation and Technology Innovation, Environmental Protection Agency, Washington, D.C. January.

United States Environmental Protection Agency (EPA), 2010. ProUCL Version 4.1 Users Guide (Draft) Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/softwaredocs.htm .

United States Environmental Protection Agency (EPA). 2015. *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites.* EPA-510-R-15-001, OSWER 9285.7-82. Office of Underground Storage Tanks, Environmental Protection Agency, Washington, D.C. June.

United States Department of the Interior Fish and Wildlife Service (USFWS), 2004. Letter to KAFB consultant CH2M Hill in response to inquiry about environmental impacts at KAFB. Robert T. Pine. December.

United States Geologic Survey (USGS), 1995. Geology and Hydrogeology for the Edwards Aquifer in the San Antonio Area, Texas. Water Resources Investigation Report 95-4186.

Villarreal, C.G., 2003. R&H Oil/Tropicana Energy Site Update Presentation. February 5, 2003. Chris G. Villarreal EPA Remedial Project Manager.

Wiedemeier, T.H., J.T. Wilson, D.H. Kampbell, R.N. Miller, and J.E. Hansen, 1999a. Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination in Groundwater. Air Force Center for Environmental Excellence. March 9.

Wiedemeier, T.H., H.S. Rifai, C.J. Newell, and J.T. Wilson, 1999b. Natural Attenuation of Fuels and Chlorinated Solvents in the Subsurface. John Wiley & Sons, New York.

TABLES

Table 1 – Site History Summary

Ownership and Operational History

Date	Activity	Key References[1]
1938	Aerial photographs show evidence of refinery operation at both northern and southern tracts of the Site.	TNRCC, 2000
July 1943	Flint Chemical Company purchased two lots in the northern tract.	TNRCC, 2001
December 1950 – October 1974	Refinery operated by Monarch Refining Company/Wing Corporation on certain northern tract lots and on the southern tract lots.	TNRCC, 2001
October 1974	Flint Ink Corporation purchased remaining Site tracts from Wing Corporation, continued to operate a refinery on only the northern tract lots. The southern tract lots were held as vacant land.	TNRCC, 2001
Northern Tract		
1987	Flint Ink Corporation sold northern tract lots to Golden Materials and Supply, Inc. which operated a used oil processing facility.	TNRCC, 2001
February 1989	Eldorado Refining and Marketing, Inc. purchased northern tract and converted operations to waste oil refining. Property was foreclosed on by T.C. Golden, Inc. in 1989.	TNRCC, 2001
Southern Tract		
April 1978	Flint Ink Corporation sold the southern tract lots to Southland Petroleum Company, Inc. who reportedly used the property to distribute petroleum products.	TNRCC, 2001
August 1984	Southland Petroleum Company, Inc. liquidated in bankruptcy, ownership of southern tract acquired by Southern State Bank.	TNRCC, 2001
March 1988	Tropicana Energy Company, Inc. purchased the southern tract lots and began blending ethanol and gasoline.	TNRCC, 2001
April 1992	Tropicana Energy Company, Inc. filed for bankruptcy and abandoned the Site.	TNRCC, 2001

Table 1 – Site History Summary

Regulatory and Investigation History

Date	Activity	Key References[1]
November 12, 1980	City Public Services (CPS) of San Antonio construction crew encountered hydrocarbon-impacted soil and groundwater at Hwy 81 (now New Laredo Highway) railroad crossing west of the Site.	TNRCC, 2001
April 1981	Texas Department of Water Resources (TDWR) investigation of groundwater encountered by CPS indicated black, oily liquid with strong gasoline odor present in shallow water-bearing zone.	TNRCC, 2001
October 4, 1983	Approximately 200 gallons of Maranda crude oil spilled at the northern tract. Cleanup of Somerset Road, the adjacent storm sewer, and associated hydrocarbon-impacted soils performed immediately following spill.	TNRCC, 2001
January 5, 1985	Approximately 200 gallons of Maranda sweet crude oil spilled at the northern tract in the parking lot and adjacent facility grounds due to overflow from holding tank. Spilled oil was reportedly recovered by facility personnel.	TNRCC, 2001
July 29, 1987	TNRCC conducted a sampling inspection on the northern tract. Waste and soil samples collected.	TNRCC, 2001
August 24, 1988	TNRCC conducted inspection of the northern tract and documented hydrocarbon stained soils near tanks, process areas and railcar loading area.	TNRCC, 2001
September 8, 1988	Based on August 24, 1988 inspection, Golden Materials and Supply, Inc. was issued a Notice of Violation (NOV) for failure to notify the Texas Water Commission (TWC) of the generation of wastes and failure to notify the EPA of their used oil fuel activities.	TNRCC, 2001
April 18-19, 1990	Approximately 8,000 gallons of natural gasoline spilled into bermed area on the southern tract and then flowed outside berm affecting an approximately 700 square yard area.	Raba Kistner, 1991
May 28, 1991	Phase II Remedial Investigation of April 18, 1990 gasoline spill completed by Raba-Kistner Consultants, Inc. Analytical results indicated presence of light to medium-range hydrocarbons in soil and groundwater samples.	Raba Kistner, 1991
December 6, 1995	Compliance Evaluation Inspection (CEI) conducted by TNRCC on northern tract. Samples from the sump, API separator, and soil near the railroad spur were sampled and found to contain hydrocarbon constituents.	TNRCC, 2001

Table 1 – Site History Summary

Date	Activity	Key References[1]
April – October 1998	Removal Assessments performed by EPA contractor, including multi-media sampling and analysis to estimate volumes of on-site materials and evaluate disposal options.	E&E, 1998a; E&E, 1998b
July 1998	TNRCC conducted a Screening Site Inspection (SSI) on the northern tract to determine if sufficient information existed to adequately characterize the waste sources and determine if releases had occurred.	TNRCC, 2000
June 14, 2001	Site proposed to the National Priorities List (NPL).	66 Fed. Reg. 32287 (June 14, 2001)
August – October 2001	Removal Actions performed on both northern and southern tracts of Site. Included removal of containers, equipment, piping, and waste materials.	Weston, 2002a; Weston, 2002b
December 2003	Public Health Assessment Performed for Site	ATSDR, 2003
March & April 2004	Some R&H Oil Company Site Group members voluntarily conducted a preliminary investigation involving the sampling of soil borings and groundwater from temporary monitoring wells on Site and at nearby off-site locations.	ERM, 2004
September - December 2008	Passive soil gas survey performed at Site by EPA contractor.	SAIC, 2008
September 2010	RI/FS Work Plan, Sampling and Analysis Plan, and QAPP submitted to EPA	PBW, 2010a, 2010b, 2010c
November 2010	Approval of RI/FS Work Plan, Sampling and Analysis Plan, and QAPP.	EPA, 2010c
January 2011 – December 2015	Remedial Investigation performed at the Site by PBW.	
September 2013	Receiver appointed by the 131st District Court in Bexar County for the properties that comprise the on-site portion of the R&H Oil/Tropicana Energy Site	
September 2013	Final Screening-Level Ecological Risk Assessment submitted. Approved September 26, 2013.	PBW, 2013
June 2014	Receiver recorded restrictive covenants on the deeds for the properties that comprise the on-site portion of the R&H Oil/Tropicana Energy Site	
February 2016	Final Baseline Human Health Risk Assessment submitted.	PBW, 2016

Note:

[1]Where noted above, TNRCC, 2000 and TNRCC, 2001 serve as secondary references for many of the listed activities. Additional details and primary references are provided in those documents.

TABLE 2
EXTENT EVALUATION VALUES: SOIL
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Chemicals of Interest	Laboratory Method Detection Limit[1] (mg/Kg)	Laboratory Reporting Limit[1] (mg/Kg)	Preliminary Screening Values				Extent Evaluation Value[8] (mg/Kg)	Potential Background Values		Representative Background Value (mg/Kg)
			EPA Residential Soil Screening Criteria[2] (mg/Kg)	TCEQ $^{Tot}Soil_{Comb}$ [5] (mg/Kg)	TCEQ $^{Air}Soil_{Inh\text{-}V}$ [6] (mg/Kg)	TCEEQ $^{GW}SOIL_{Img}$ [7] (mg/Kg)		TCEQ[4] (mg/Kg)	Kelly AFB[9] (mg/Kg)	
PETROLEUM HYDROCARBONS										
Total Petroleum Hydrocarbons	7.5	10	NA	NA	NA	NA	2.3E+03	NA	NA	
METALS										
Aluminum	0.29965	25	7.7E+04	6.4E+04	--	8.6E+04	6.4E+04	3.0E+04	--	3.0E+04
Arsenic	0.21793	1	6.8E-01	2.4E+01	--	2.5E+00	6.8E-01	5.9E+00	6.3E+00	6.3E+00
Barium	0.01132	1	1.5E+04	8.1E+03	--	2.2E+02	2.2E+02	3.0E+02	1.5E+02	3.0E+02
Chromium	0.05061	0.5	--	2.7E+04	--	1.2E+03	1.2E+03	3.0E+01	4.3E+01	4.3E+01
Cobalt	0.06762	0.5	2.3E+01	3.7E+02	--	1.1E+02	2.3E+01	7.0E+00	9.9E+00	9.9E+00
Copper	0.17370	0.5	3.1E+03	1.3E+03	--	5.2E+02	5.2E+02	1.5E+01	3.0E+01	3.0E+01
Lead	0.10483	0.5	4.0E+02	5.0E+02	--	1.5E+00	1.5E+00	1.5E+01	3.3E+01	3.3E+01
Manganese	0.03811	1.5	--	3.8E+03	--	5.8E+02	5.8E+02	3.0E+02	5.1E+02	5.1E+02
Mercury	0.05000	0.5	1.1E+01	2.1E+00	2.4E+00	3.9E-03	3.9E-03	4.0E-02	--	4.0E-02
Nickel	0.11660	1	1.5E+03	8.4E+02	--	7.9E+01	7.9E+01	1.0E+01	2.3E+01	2.3E+01
Selenium	0.23888	2	3.9E+02	3.1E+02	--	1.1E+00	1.1E+00	3.0E-01	--	3.0E-01
Thallium	0.27699	1.5	7.8E-01	6.3E+00	--	8.7E-01	7.8E-01		5.1E-01	5.1E-01
Vanadium	0.07907	0.5	3.9E+02	7.5E+01	--	4.4E+02	7.5E+01	5.0E+01	5.7E+01	5.7E+01
Zinc	0.10843	1.5	2.3E+04	9.9E+03	--	1.2E+03	1.2E+03	3.0E+01	7.3E+01	7.3E+01
VOCs										
1,1,1,2-Tetrachloroethane	0.00140	0.005	2.0E+00	3.9E+01	4.7E+01	7.1E-01	7.1E-01	---	--	--
1,1,1-Trichloroethane	0.00074	0.005	8.1E+03	3.2E+04	4.0E+04	8.1E-01	8.1E-01	---	--	--
1,1,2,2-Tetrachloroethane	0.00087	0.005	6.0E-01	3.0E+01	--	1.2E-02	1.2E-02	---	--	--
1,1,2-Trichloroethane	0.00073	0.005	1.1E+00	1.0E+01	1.2E+01	1.0E-02	1.0E-02	---	--	--
1,1-Dichloroethan	0.00087	0.005	3.6E+00	8.8E+03	1.9E+04	9.2E+00	3.6E+00	---	--	--
1,1-Dichloroethene	0.00122	0.01	2.3E+02	1.6E+03	2.7E+03	2.5E-02	2.5E-02	---	--	--
1,1-Dichloropropene	0.00065	0.005	--	2.6E+01	4.6E+01	6.7E-02	6.7E-02	---	--	--
1,2,3-Trichloropropane	0.00131	0.005	5.1E-03	2.0E-01	7.2E+00	2.7E-04	2.7E-04	---	--	--
1,2,4-Trichlorobenzene	0.00197	0.005	2.4E+01	7.0E+01	7.8E+01	2.4E+00	2.4E+00	---	--	--
1,2,4-Trimethylbenzene	0.00092	0.005	5.8E+01	7.9E+01	8.1E+01	2.4E+01	2.4E+01	---	--	--
1,2-Dibromo-3-chloropropane	0.00244	0.005	5.3E-03	8.0E-02	8.1E-02	8.7E-04	8.7E-04	---	--	--
1,2-Dibromoethane	0.00102	0.01	3.6E-02	4.3E-01	5.0E-01	1.0E-04	1.0E-04	---	--	--
1,2-Dichlorobenzene	0.00080	0.005	1.8E+03	3.9E+02	4.1E+02	8.9E+00	8.9E+00	---	--	--
1,2-Dichloroethane	0.00090	0.005	4.6E-01	6.4E+00	7.1E+00	6.9E-03	6.9E-03	---	--	--
1,2-Dichloropropane	0.00071	0.005	1.0E+00	3.1E+01	3.2E+01	1.1E-02	1.1E-02	---	--	--
1,3,5-Trimethylbenzene	0.00090	0.005	7.8E+02	5.9E+01	6.0E+01	2.7E+01	2.7E+01	---	--	--
1,3-Dichlorobenzene	0.00071	0.005	--	6.2E+01	6.3E+01	3.4E+00	3.4E+00	---	--	--
1,3-Dichloropropane	0.00063	0.005	1.6E+03	2.6E+01	4.6E+01	3.2E-02	3.2E-02	---	--	--
1,4-Dichlorobenzene	0.00066	0.005	2.6E+00	2.5E+02	6.1E+03	1.1E+00	1.1E+00	---	--	--
2,2-Dichloropropane	0.00182	0.005	--	3.1E+01	3.2E+01	6.0E-02	6.0E-02	---	--	--
2-Butanone	0.00190	0.01	2.7E+04	3.3E+04	1.0E+05	1.5E+01	1.5E+01	---	--	--
2-Chlorotoluene	0.00068	0.005	1.6E+03	1.1E+03	6.8E+03	4.5E+00	4.5E+00	---	--	--

TABLE 2
EXTENT EVALUATION VALUES: SOIL
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Chemicals of Interest	Laboratory Method Detection Limit[1] (mg/Kg)	Laboratory Reporting Limit[1] (mg/Kg)	Preliminary Screening Values				Extent Evaluation Value[8] (mg/Kg)	Potential Background Values		Representative Background Value (mg/Kg)
			EPA Residential Soil Screening Criteria[2] (mg/Kg)	TCEQ $^{Tot}Soil_{Comb}$ [5] (mg/Kg)	TCEQ $^{Air}Soil_{Inh\text{-}V}$ [6] (mg/Kg)	TCEEQ $^{GW}SOIL_{Img}$ [7] (mg/Kg)		TCEQ[4] (mg/Kg)	Kelly AFB[9] (mg/Kg)	
2-Hexanone	0.00101	0.01	2.0E+02	2.1E+02	4.2E+02	1.6E-01	1.6E-01	---	--	--
4-Chlorotoluene	0.00083	0.005	1.6E+03	1.6E+03	--	5.4E+00	5.4E+00	---	--	--
p-Isopropyltoluene	0.00102	0.005	--	8.2E+03	--	1.2E+02	1.2E+02	---	--	--
4-Methyl-2-pentanone	0.00147	0.01	3.3E+04	5.4E+03	3.0E+04	2.5E+00	2.5E+00	---	--	--
Acetone	0.00166	0.01	6.1E+04	5.9E+04	3.1E+05	2.1E+01	2.1E+01	---	--	--
Benzene	0.00063	0.005	1.2E+00	6.9E+01	8.4E+01	1.3E-02	1.3E-02	---	--	--
Bromobenzene	0.00099	0.005	2.9E+02	2.8E+02	5.0E+02	1.2E+00	1.2E+00	---	--	--
Bromodichloromethane	0.00066	0.005	2.9E-01	9.8E+01	--	3.3E-02	3.3E-02	---	--	--
Bromoform	0.00137	0.005	1.9E+01	2.8E+02	4.3E+02	3.2E-01	3.2E-01	---	--	--
Bromomethane	0.00083	0.01	6.8E+00	2.9E+01	3.9E+01	6.5E-02	6.5E-02	---	--	--
Carbon disulfide	0.00055	0.01	7.7E+02	3.3E+03	5.5E+03	6.8E+00	6.8E+00	---	--	--
Carbon tetrachloride	0.00113	0.005	6.5E-01	2.3E+01	3.1E+01	3.1E-02	3.1E-02	---	--	--
Chlorobenzene	0.00096	0.005	2.8E+02	3.2E+02	3.9E+02	5.5E-01	5.5E-01	---	--	--
Chloroethane	0.00140	0.01	1.4E+04	2.3E+04	7.9E+04	1.5E+01	1.5E+01	---	--	--
Chloroform	0.00066	0.005	3.2E-01	8.0E+00	8.0E+00	5.1E-01	3.2E-01	---	--	--
Chloromethane	0.00166	0.01	1.1E+02	8.4E+01	1.0E+02	2.0E-01	2.0E-01	---	--	--
cis-1,2-Dichloroethene	0.00318	0.005	1.6E+02	1.2E+02	4.7E+02	1.2E-01	1.2E-01	---	--	--
cis-1,3-Dichloropropene	0.00054	0.005	--	7.8E+00	1.6E+02	3.3E-03	3.3E-03	---	--	--
Dibromochloromethane (chlorodibro	0.00094	0.005	8.3E+00	7.2E+01	--	2.5E-02	2.5E-02	---	--	--
Dibromomethane	0.00075	0.005	2.4E+01	4.2E+01	4.2E+01	5.6E-01	5.6E-01	---	--	--
Dichlorodifluoromethane	0.00154	0.005	8.7E+01	7.5E+02	7.9E+02	1.2E+02	8.7E+01	---	--	--
Ethylbenzene	0.00102	0.005	5.8E+00	5.3E+03	1.5E+04	3.8E+00	3.8E+00	---	--	--
Hexachlorobutadiene	0.00113	0.005	1.2E+00	1.2E+01	1.5E+01	1.6E+00	1.2E+00	---	--	--
Methyl iodide (iodomethane)	0.00250	0.005	--	1.1E+02	--	5.7E-02	5.7E-02	---	--	--
Isopropylbenzene (Cumene)	0.00092	0.005	1.9E+03	3.0E+03	4.8E+03	1.7E+02	1.7E+02	---	--	--
tert-Butyl methyl ether (MTBE)	0.00183	0.005	4.7E+01	5.9E+02	7.1E+02	3.1E-01	3.1E-01	---	--	--
Methylene chloride	0.00219	0.01	5.7E+01	1.5E+03	6.6E+03	6.5E-03	6.5E-03	---	--	--
Naphthalene	0.00237	0.01	3.8E+00	1.2E+02	1.4E+02	1.6E+01	3.8E+00	---	--	--
n-Butylbenzene	0.00058	0.005	3.9E+03	3.3E+03	--	7.6E+01	7.6E+01	---	--	--
n-Propylbenzene	0.00095	0.005	3.8E+03	1.6E+03	3.3E+03	2.2E+01	2.2E+01	---	--	--
sec-Butylbenzene	0.00070	0.005	7.8E+03	3.3E+03	--	4.2E+01	4.2E+01	---	--	--
Styrene	0.00071	0.005	6.0E+03	4.3E+03	5.8E+03	1.6E+00	1.6E+00	---	--	--
tert-Butylbenzene	0.00095	0.005	7.8E+03	3.3E+03	--	5.0E+01	5.0E+01	---	--	--
Tetrachloroethene	0.00071	0.005	2.4E+01	4.2E+02	4.8E+02	2.5E-02	2.5E-02	---	--	--
Toluene	0.00138	0.005	4.9E+03	5.4E+03	3.2E+04	4.1E+00	4.1E+00	---	--	--
trans-1,2-Dichloroethene	0.00114	0.005	1.6E+03	3.7E+02	4.7E+02	2.5E-01	2.5E-01	---	--	--
trans-1,3-Dichloropropene	0.00058	0.005	--	2.6E+01	4.6E+01	1.8E-02	1.8E-02	---	--	--
Trichloroethene	0.00140	0.005	9.4E-01	1.1E+01	1.6E+01	1.7E-02	1.7E-02	---	--	--
Trichlorofluoromethane	0.00066	0.005	2.3E+04	2.5E+04	--	6.4E+01	6.4E+01	---	--	--
Vinyl chloride	0.00090	0.005	5.9E-02	3.4E+00	2.2E+01	1.1E-02	1.1E-02	---	--	--
Xylenes (total)	0.00113	0.005	5.8E+02	3.7E+03	4.8E+03	6.1E+01	6.1E+01	---	--	--

TABLE 2
EXTENT EVALUATION VALUES: SOIL
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Chemicals of Interest	Laboratory Method Detection Limit[1] (mg/Kg)	Laboratory Reporting Limit[1] (mg/Kg)	Preliminary Screening Values				Extent Evaluation Value[8] (mg/Kg)	Potential Background Values		Representative Background Value (mg/Kg)
			EPA Residential Soil Screening Criteria[2] (mg/Kg)	TCEQ $^{Tot}Soil_{Comb}$ [5] (mg/Kg)	TCEQ $^{Air}Soil_{Inh\text{-}V}$ [6] (mg/Kg)	TCEEQ $^{GW}SOIL_{Img}$ [7] (mg/Kg)		TCEQ[4] (mg/Kg)	Kelly AFB[9] (mg/Kg)	
SVOCs										
2,4,5-Trichlorophenol	0.06208	0.33	6.3E+03	6.7E+03	--	1.7E+01	1.7E+01	---	--	--
2,4,6-Trichlorophenol	0.00268	0.33	4.9E+01	6.7E+01	1.0E+03	8.7E-02	8.7E-02	---	--	--
2,4-Dichlorophenol	0.18000	0.33	1.9E+02	2.0E+02	--	1.8E-01	1.8E-01	---	--	--
2,4-Dimethylphenol	0.06360	0.33	1.3E+03	1.3E+03	--	1.6E+00	1.6E+00	---	--	--
2,4-Dinitrophenol	0.12800	1.6	1.3E+02	1.3E+02	--	4.7E-02	4.7E-02	---	--	--
2,4-Dinitrotoluene	0.03290	0.33	1.7E+00	6.9E+00	--	2.7E-03	2.7E-03	---	--	--
2,6-Dinitrotoluene	0.20900	0.33	3.6E-01	6.9E+00	--	2.4E-03	2.4E-03	---	--	--
2-Chloronaphthalene	0.21500	0.33	4.8E+03	5.0E+03	--	3.3E+02	3.3E+02	---	--	--
2-Chlorophenol	0.02330	0.33	3.9E+02	4.1E+02	--	8.2E-01	8.2E-01	---	--	--
2-Methylnaphthalene	0.18900	0.33	2.4E+02	2.5E+02	--	8.5E+00	8.5E+00	---	--	--
2-Nitroaniline	0.19500	0.33	6.3E+02	1.1E+01	2.4E+01	1.1E-02	1.1E-02	---	--	--
2-Nitrophenol	0.18000	0.33	--	1.3E+02	--	6.7E-02	6.7E-02	---	--	--
Cresol, p- (4-methylphenol)	0.00279	0.33	6.3E+03	3.3E+02	--	3.2E-01	3.2E-01	---	--	--
3,3'-Dichlorobenzidine	0.06400	1.6	1.2E+00	1.0E+01	--	3.1E-02	3.1E-02	---	--	--
3-Nitroaniline	0.21200	0.33	--	1.2E+01	3.1E+01	1.3E-02	1.3E-02	---	--	--
4,6-Dinitro-2-methylphenol	0.20700	1.6	5.1E+00	6.7E+00	--	2.3E-03	2.3E-03	---	--	--
4-Bromophenyl phenyl ether	0.20000	0.33	--	2.7E-01	5.0E+00	1.8E-01	1.8E-01	---	--	--
4-Chloro-3-methylphenol	0.19200	0.33	6.3E+03	3.3E+02	--	2.3E+00	2.3E+00	---	--	--
4-Chloroaniline	0.06600	0.33	2.7E+00	2.3E+01	--	1.0E-02	1.0E-02	---	--	--
4-Chlorophenyl phenyl ether	0.19800	0.33	--	1.5E-01	1.3E+00	1.6E-02	1.6E-02	---	--	--
4-Nitroaniline	0.18000	1.6	2.7E+01	1.9E+02	6.2E+02	5.4E-02	5.4E-02	---	--	--
4-Nitrophenol	0.18000	1.6	--	1.3E+02	--	5.0E-02	5.0E-02	---	--	--
Acenaphthene	0.18900	0.33	3.6E+03	3.0E+03	--	1.2E+02	1.2E+02	---	--	--
Acenaphthylene	0.19200	0.33	--	3.8E+03	--	2.0E+02	2.0E+02	---	--	--
Aniline	0.05100	0.33	9.5E+01	5.9E+01	6.7E+01	1.8E-01	1.8E-01	---	--	--
Anthracene	0.20700	0.33	1.8E+04	1.8E+04	--	3.4E+03	3.4E+03	---	--	--
Benzo(a)anthracene	0.20730	0.33	1.6E-01	5.6E+00	1.9E+03	8.9E+00	1.6E-01	---	--	--
Benzo(a)pyrene	0.18511	0.33	1.6E-02	5.6E-01	4.4E+02	3.8E+00	1.6E-02	---	--	--
Benzo(b)fluoranthene	0.01934	0.33	1.6E-01	5.7E+00	3.2E+03	3.0E+01	1.6E-01	---	--	--
Benzo(g,h,i)perylene	0.17530	0.33	--	1.8E+03	--	2.3E+04	1.8E+03	---	--	--
Benzo(k)fluoranthene	0.02941	0.33	1.6E+00	5.7E+01	7.8E+04	3.1E+02	1.6E+00	---	--	--
Benzyl alcohol	0.12730	0.33	6.3E+03	6.7E+03	--	2.9E+00	2.9E+00	---	--	--
Bis(2-Chloroethoxy)methane	0.18600	0.33	1.9E+02	2.5E+00	5.8E+00	5.9E-03	5.9E-03	---	--	--
Bis(2-Chloroethyl)ether	0.03298	0.33	2.3E-01	1.4E+00	1.8E+00	1.1E-03	1.1E-03	---	--	--
Bis(2-Chloroisopropyl)ether	0.00884	0.33	3.1E+03	4.1E+01	1.1E+02	9.5E-02	9.5E-02	---	--	--
Bis(2-Ethylhexyl)phthalate	0.20004	0.33	3.9E+01	4.3E+01	--	8.2E+01	3.9E+01	---	--	--
Butyl benzyl phthalate	0.20070	0.33	2.9E+02	1.6E+03	--	1.3E+02	1.3E+02	---	--	--
Chrysene	0.20173	0.33	1.6E+01	5.6E+02	3.0E+05	7.7E+02	1.6E+01	---	--	--
Dibenz(a,h)anthracene	0.18983	0.33	1.6E-02	5.5E-01	1.0E+03	7.6E+00	1.6E-02	---	--	--

TABLE 2
EXTENT EVALUATION VALUES: SOIL
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Chemicals of Interest	Laboratory Method Detection Limit[1] (mg/Kg)	Laboratory Reporting Limit[1] (mg/Kg)	Preliminary Screening Values				Extent Evaluation Value[8] (mg/Kg)	Potential Background Values		Representative Background Value (mg/Kg)
			EPA Residential Soil Screening Criteria[2] (mg/Kg)	TCEQ $^{Tot}Soil_{Comb}$[5] (mg/Kg)	TCEQ $^{Air}Soil_{Inh\text{-}V}$[6] (mg/Kg)	TCEEQ $^{GW}SOIL_{Img}$[7] (mg/Kg)		TCEQ[4] (mg/Kg)	Kelly AFB[9] (mg/Kg)	
Dibenzofuran	0.19669	0.33	7.3E+01	2.7E+02	--	1.7E+01	1.7E+01	---	--	--
Diethyl phthalate	0.20413	0.33	5.1E+04	5.3E+04	--	7.8E+01	7.8E+01	---	--	--
Dimethyl phthalate	0.19970	0.33	--	5.3E+04	--	3.1E+01	3.1E+01	---	--	--
Di-n-butyl phthalate	0.21297	0.33	6.3E+03	6.2E+03	--	1.7E+03	1.7E+03	---	--	--
Di-n-octyl phthalate	0.21357	0.33	6.3E+02	6.4E+02	--	4.1E+05	6.3E+02	---	--	--
Fluoranthene	0.21082	0.33	2.4E+03	2.3E+03	--	9.6E+02	9.6E+02	---	--	--
Fluorene	0.20319	0.33	2.4E+03	2.3E+03	--	1.5E+02	1.5E+02	---	--	--
Hexachlorobenzene	0.20812	0.33	2.1E-01	1.0E+00	9.8E+00	5.6E-01	2.1E-01	---	--	--
Hexachlorocyclopentadiene	0.02227	0.33	1.8E+00	7.2E+00	7.3E+00	9.6E+00	1.8E+00	---	--	--
Hexachloroethane	0.02991	0.33	1.8E+00	4.6E+01	2.5E+03	6.4E-01	6.4E-01	---	--	--
Indeno(1,2,3-cd)pyrene	0.18100	0.33	1.6E-01	5.7E+00	1.3E+04	8.7E+01	1.6E-01	---	--	--
Isophorone	0.19387	0.33	5.7E+02	4.9E+03	—	1.5E+00	1.5E+00	---	--	--
Nitrobenzene	0.04740	0.33	5.1E+00	3.4E+01	3.4E+01	1.8E-01	1.8E-01	---	--	--
n-Nitrosodi-n-propylamine	0.02859	0.33	7.8E-02	4.0E-01	--	1.8E-04	1.8E-04	---	--	--
Pentachlorophenol	0.02212	1.6	1.0E+00	7.3E-01	--	9.2E-03	9.2E-03	---	--	--
Phenanthrene	0.20300	0.33	--	1.7E+03	--	2.1E+02	2.1E+02	---	--	--
Phenol	0.03736	0.33	1.9E+04	9.5E+02	--	9.6E+00	9.6E+00	---	--	--
Pyrene	0.22085	0.33	1.8E+03	1.7E+03	--	5.6E+02	5.6E+02	---	--	--

Notes:
1. Method Detection Limit and Reporting Limit provided by Test America Laboratory, Houston, Texas.
2. EPA Screening Values from the EPA Generic Tables for Screening Levels, Residential Soil Supporting, updated May 2016.
3. TCEQ Protective Concentration Levels are the Tier 1 values for residential soils and a 30-acre source area, updated March 4, 2016.
4. TCEQ Background concentrations from Figure 30 TAC 350.51(m).
5. $^{Tot}Soil_{Comb}$ PCL = TCEQ Protective Concentration Level for 30 acre source area Residential total soil combined pathway (includes inhalation; ingestion; dermal pathways).
6. $^{Air}Soil_{Inh\text{-}V}$ PCL = TCEQ Protective Concentration Level for 30 acre source area Commercial/Industrial soil-to-air pathway (inhalation of volatiles and particulates).
7. $^{GW}Soil_{Ing}$ PCL = TCEQ Protective Concentration Level for 30 acre source area Residential soil leaching to groundwater pathway.
8. The Extent Evaluation Value is the lower value of the EPA Screening Level or TCEQ PCL. The TPH EEV is the site-specific TRRP PCL based on TPH fractionation data.
9. Kelly AFB Background concentration values from "Final Report, Addendum to Final Background Levels of Inorganics in Soils at Kelly AFB", October 1999,

TABLE 3 - EXTENT EVALUATION VALUES: GROUNDWATER
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Chemicals of Interest	Laboratory Method Detection Limit[1] (mg/L)	Laboratory Reporting Limit[1] (mg/L)	Preliminary Screening Values		Screening Value (mg/L)	Extent Evaluation Comparison Value (mg/L)
			TCEQ Protective Concentration Levels[2] $^{GW}GW_{Ing}$ (mg/L)	US EPA VISL Calculator Evaluation Values[3] 10^{-6} risk (mg/L)		
PETROLEUM HYDROCARBONS						
C6-C12	0.83	2	9.8E-01	--	9.8E-01	9.8E-01
>C12-C28	0.96	2	9.8E-01	--	9.8E-01	9.8E-01
>C28-C35	0.96	2	9.8E-01	--	9.8E-01	9.8E-01
C6-C35 (Total)	1.60	2	9.8E-01	--	9.8E-01	9.8E-01
METALS						
Aluminum	0.00599	0.5	2.4E+01	--	2.4E+01	2.4E+01
Arsenic	0.00328	0.01	1.0E-02	--	1.0E-02	1.0E-02
Barium	0.0016	0.02	2.0E+00	--	2.0E+00	2.0E+00
Chromium	0.00155	0.01	1.0E-01	--	1.0E-01	1.0E-01
Cobalt	0.00063	0.01	2.4E-01	--	2.4E-01	2.4E-01
Copper	0.00145	0.01	1.3E+00	--	1.3E+00	1.3E+00
Lead	0.0029	0.01	1.5E-02	--	1.5E-02	1.5E-02
Manganese	0.00084	0.01	1.1E+00	--	1.1E+00	1.1E+00
Mercury	0.00002	0.002	2.0E-03	6.70E-01	2.0E-03	2.0E-03
Nickel	0.00165	0.01	4.9E-01	--	4.9E-01	4.9E-01
Selenium	0.00417	0.04	5.0E-02	--	5.0E-02	5.0E-02
Thallium	0.00784	0.03	2.0E-03	--	2.0E-03	2.0E-03
Vanadium	0.00169	0.01	4.4E-02	--	4.4E-02	4.4E-02
Zinc	0.00217	0.03	7.3E+00	--	7.3E+00	7.3E+00
VOCs						
1,1,1,2-Tetrachloroethane	0.00009	0.001	3.5E-02	3.71E+00	3.5E-02	3.5E-02
1,1,1-Trichloroethane	0.00012	0.001	2.0E-01	7.42E+03	2.0E-01	2.0E-01
1,1,2,2-Tetrachloroethane	0.00016	0.001	4.6E-03	3.23E+00	4.6E-03	4.6E-03
1,1,2-Trichloroethane	0.00018	0.001	5.0E-03	5.21E+00	5.0E-03	5.0E-03
1,1-Dichloroethane	0.00016	0.001	4.9E+00	7.64E+00	4.9E+00	4.9E+00
1,1-Dichloroethene	0.00013	0.001	7.0E-03	1.96E+02	7.0E-03	7.0E-03
1,1-Dichloropropene	0.00013	0.001	9.1E-03	--	9.1E-03	9.1E-03
1,2,3-Trichloropropane	0.00011	0.001	3.0E-05	2.23E+01	3.0E-05	3.0E-05
1,2,4-Trichlorobenzene	0.00020	0.001	7.0E-02	3.59E+01	7.0E-02	7.0E-02
1,2,4-Trimethylbenzene	0.00010	0.001	1.2E+00	2.90E+01	1.2E+00	1.2E+00
1,2-Dibromo-3-chloropropane	0.00039	0.002	2.0E-04	2.81E-02	2.0E-04	2.0E-04
1,2-Dibromoethane	0.00018	0.002	5.0E-05	1.76E-01	5.0E-05	5.0E-05
1,2-Dichlorobenzene	0.0001	0.001	6.0E-01	2.66E+03	6.0E-01	6.0E-01
1,2-Dichloroethane	0.00013	0.001	5.0E-03	2.24E+00	5.0E-03	5.0E-03
1,2-Dichloropropane	0.00016	0.001	5.0E-03	2.44E+00	5.0E-03	5.0E-03
1,3,5-Trimethylbenzene	0.00008	0.001	1.2E+00	--	1.2E+00	1.2E+00
1,3-Dichlorobenzene	0.00013	0.001	7.3E-01	--	7.3E-01	7.3E-01
1,3-Dichloropropane	0.00012	0.001	9.1E-03	--	9.1E-03	9.1E-03
1,4-Dichlorobenzene	0.00005	0.001	7.5E-02	2.59E+00	7.5E-02	7.5E-02
2,2-Dichloropropane	0.00009	0.001	1.3E-02	--	1.3E-02	1.3E-02
2-Butanone	0.00076	0.002	1.5E+01	2.24E+06	1.5E+01	1.5E+01
2-Chlorotoluene	0.00017	0.001	4.9E-01	--	4.9E-01	4.9E-01
2-Hexanone	0.00031	0.002	1.2E-01	8.21E+03	1.2E-01	1.2E-01
4-Chlorotoluene	0.00180	0.001	4.9E-01	--	4.9E-01	4.9E-01
4-Methyl-2-pentanone	0.00031	0.002	2.0E+00	5.55E+05	2.0E+00	2.0E+00
Acetone	0.002	0.002	2.2E+01	2.26E+07	2.2E+01	2.2E+01
Benzene	0.00013	0.001	5.0E-03	1.59E+00	5.0E-03	5.0E-03
Bromobenzene	0.00014	0.001	2.0E-01	6.20E+02	2.0E-01	2.0E-01
Bromodichloromethane	0.00014	0.001	1.5E-02	8.76E-01	1.5E-02	1.5E-02
Bromoform	0.00012	0.001	1.2E-01	1.17E+02	1.2E-01	1.2E-01
Bromomethane	0.00022	0.002	3.4E-02	1.74E+01	3.4E-02	3.4E-02
Carbon disulfide	0.00007	0.002	2.4E+00	1.24E+03	2.4E+00	2.4E+00
Carbon tetrachloride	0.00013	0.001	5.0E-03	4.15E-01	5.0E-03	5.0E-03
Chlorobenzene	0.00011	0.001	1.0E-01	4.10E+02	1.0E-01	1.0E-01
Chloroethane	0.00019	0.002	9.8E+00	2.30E+04	9.8E+00	9.8E+00
Chloroform	0.00012	0.001	2.4E-01	8.14E-01	2.4E-01	2.4E-01

TABLE 3 - EXTENT EVALUATION VALUES: GROUNDWATER
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Chemicals of Interest	Laboratory Method Detection Limit[1] (mg/L)	Laboratory Reporting Limit[1] (mg/L)	Preliminary Screening Values		Screening Value (mg/L)	Extent Evaluation Comparison Value (mg/L)
			TCEQ Protective Concentration Levels[2] $^{GW}GW_{Ing}$ (mg/L)	US EPA VISL Calculator Evaluation Values[3] 10^{-6} risk (mg/L)		
Chloromethane	0.00015	0.002	7.0E-02	2.60E+02	7.0E-02	7.0E-02
cis-1,2-Dichloroethene	0.00016	0.001	7.0E-02	--	7.0E-02	7.0E-02
cis-1,3-Dichloropropene	0.00011	0.001	1.7E-03	--	1.7E-03	1.7E-03
Dibromochloromethane	0.00045	0.001	1.1E-02	3.25E+00	1.1E-02	1.1E-02
Dibromomethane	0.00052	0.001	1.2E-01	1.24E+02	1.2E-01	1.2E-01
Dichlorodifluoromethane	0.00014	0.001	4.9E+00	7.44E+00	4.9E+00	4.9E+00
Ethylbenzene	0.00013	0.001	7.0E-01	3.49E+00	7.0E-01	7.0E-01
Hexachlorobutadiene	0.00017	0.001	1.2E-02	3.03E-01	1.2E-02	1.2E-02
Isopropylbenzene (Cumene)	0.00006	0.001	2.4E+00	8.87E+02	2.4E+00	2.4E+00
Methyl iodide (iodomethane)	0.002	0.002	3.4E-02	--	3.4E-02	3.4E-02
Methylene chloride	0.00042	0.002	5.0E-03	7.63E+02	5.0E-03	5.0E-03
Naphthalene	0.00047	0.001	4.9E-01	4.59E+00	4.9E-01	4.9E-01
n-Butylbenzene	0.00009	0.001	1.2E+00	--	1.2E+00	1.2E+00
n-Propylbenzene	0.00025	0.001	9.8E-01	2.43E+03	9.8E-01	9.8E-01
p-Isopropyltoluene	0.00100	0.001	2.4E+00	--	2.4E+00	2.4E+00
sec-Butylbenzene	0.00014	0.001	9.8E-01	--	9.8E-01	9.8E-01
Styrene	0.00010	0.001	1.0E-01	9.28E+03	1.0E-01	1.0E-01
tert-Butyl methyl ether (MTBE)	0.00015	0.001	2.4E-01	4.50E+02	2.4E-01	2.4E-01
tert-Butylbenzene	0.00016	0.001	9.8E-01	--	9.8E-01	9.8E-01
Tetrachloroethene	0.00008	0.001	5.0E-03	1.49E+01	5.0E-03	5.0E-03
Toluene	0.00014	0.001	1.0E+00	1.92E+04	1.0E+00	1.0E+00
trans-1,2-Dichloroethene	0.00012	0.001	1.0E-01	--	1.0E-01	1.0E-01
trans-1,3-Dichloropropene	0.00011	0.001	9.1E-03	--	9.1E-03	9.1E-03
Trichloroethene	0.00013	0.001	5.0E-03	1.19E+00	5.0E-03	5.0E-03
Trichlorofluoromethane	0.00008	0.001	7.3E+00	1.84E+02	7.3E+00	7.3E+00
Vinyl chloride	0.00013	0.002	2.0E-03	1.47E-01	2.0E-03	2.0E-03
Xylenes (total)	0.00032	0.001	1.0E+01	4.93E+02	1.0E+01	1.0E+01
SVOCs						
2,4,5-Trichlorophenol	0.00025	0.015	2.4E+00	--	2.4E+00	2.4E+00
2,4,6-Trichlorophenol	0.00018	0.015	2.4E-02	--	2.4E-02	2.4E-02
2,4-Dichlorophenol	0.00015	0.015	7.3E-02	--	7.3E-02	7.3E-02
2,4-Dimethylphenol	0.00031	0.015	4.9E-01	--	4.9E-01	4.9E-01
2,4-Dinitrophenol	0.00039	0.015	4.9E-02	--	4.9E-02	4.9E-02
2,4-Dinitrotoluene	0.00100	0.015	1.3E-03	--	1.3E-03	1.3E-03
2,6-Dinitrotoluene	0.00008	0.015	1.3E-03	--	1.3E-03	1.3E-03
2-Chloronaphthalene	0.00008	0.015	2.0E+00	--	2.0E+00	2.0E+00
2-Chlorophenol	0.00013	0.015	1.2E-01	--	1.2E-01	1.2E-01
2-Methylnaphthalene	0.00007	0.015	9.8E-02	--	9.8E-02	9.8E-02
2-Nitroaniline	0.00019	0.015	7.3E-03	--	7.3E-03	7.3E-03
2-Nitrophenol	0.00022	0.015	4.9E-02	--	4.9E-02	4.9E-02
3,3'-Dichlorobenzidine	0.00018	0.015	2.0E-03	--	2.0E-03	2.0E-03
3-Nitroaniline	0.00018	0.015	7.3E-03	--	7.3E-03	7.3E-03
4,6-Dinitro-2-methylphenol	0.00083	0.015	2.4E-03	--	2.4E-03	2.4E-03
4-Bromophenyl phenyl ether	0.00010	0.015	6.1E-05	--	6.1E-05	6.1E-05
4-Chloro-3-methylphenol	0.00017	0.015	1.2E-01	--	1.2E-01	1.2E-01
4-Chloroaniline	0.00021	0.015	4.6E-03	--	4.6E-03	4.6E-03
4-Chlorophenyl phenyl ether	0.00010	0.015	6.1E-05	--	6.1E-05	6.1E-05
Cresol, p- (4-methylphenol)	0.00011	0.015	1.2E-01	--	1.2E-01	1.2E-01
4-Nitroaniline	0.00025	0.015	4.6E-02	--	4.6E-02	4.6E-02
4-Nitrophenol	0.00056	0.015	4.9E-02		4.9E-02	4.9E-02
Acenaphthene	0.00007	0.015	1.5E+00	--	1.5E+00	1.5E+00
Acenaphthylene	0.00008	0.015	1.5E+00	--	1.5E+00	1.5E+00

TABLE 3 - EXTENT EVALUATION VALUES: GROUNDWATER
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Chemicals of Interest	Laboratory Method Detection Limit[1] (mg/L)	Laboratory Reporting Limit[1] (mg/L)	Preliminary Screening Values		Screening Value (mg/L)	Extent Evaluation Comparison Value (mg/L)
			TCEQ Protective Concentration Levels[2] $^{GW}GW_{Ing}$ (mg/L)	US EPA VISL Calculator Evaluation Values[3] 10^{-6} risk (mg/L)		
Aniline	0.00008	0.015	1.6E-01	--	1.6E-01	1.6E-01
Anthracene	0.00007	0.015	7.3E+00	--	7.3E+00	7.3E+00
Benzo(a)anthracene	0.00012	0.015	1.3E-03	--	1.3E-03	1.3E-03
Benzo(a)pyrene	0.00008	0.015	2.0E-04	--	2.0E-04	2.0E-04
Benzo(b)fluoranthene	0.00016	0.015	1.3E-03	**	1.3E-03	1.3E-03
Benzo(g,h,i)perylene	0.00013	0.015	7.3E-01	--	7.3E-01	7.3E-01
Benzo(k)fluoranthene	0.00012	0.015	1.3E-02	--	1.3E-02	1.3E-02
Benzyl alcohol	0.00017	0.015	2.4E+00	--	2.4E+00	2.4E+00
Bis(2-Chloroethoxy)methane	0.00013	0.015	8.3E-04	--	8.3E-04	8.3E-04
Bis(2-Chloroethyl)ether	0.00015	0.015	8.3E-04	1.22E+01	8.3E-04	8.3E-04
Bis(2-Chloroisopropyl)ether	0.0004	0.015	1.3E-02	9.26E+01	1.3E-02	1.3E-02
Bis(2-Ethylhexyl)phthalate	0.00037	0.015	6.0E-03	--	6.0E-03	6.0E-03
Butyl benzyl phthalate	0.00012	0.015	4.8E-01	--	4.8E-01	4.8E-01
Chrysene	0.00013	0.015	1.3E-01	**	1.3E-01	1.3E-01
Dibenz(a,h)anthracene	0.0005	0.015	2.0E-04	--	2.0E-04	2.0E-04
Dibenzofuran	0.00008	0.015	9.8E-02	**	9.8E-02	9.8E-02
Diethyl phthalate	0.00150	0.015	2.0E+01	--	2.0E+01	2.0E+01
Dimethyl phthalate	0.00007	0.015	2.0E+01	--	2.0E+01	2.0E+01
Di-n-butyl phthalate	0.00011	0.015	2.4E+00	--	2.4E+00	2.4E+00
Di-n-octyl phthalate	0.00016	0.015	2.4E-01	--	2.4E-01	2.4E-01
Fluoranthene	0.00008	0.015	9.8E-01	--	9.8E-01	9.8E-01
Fluorene	0.00007	0.015	9.8E-01	**	9.8E-01	9.8E-01
Hexachlorobenzene	0.00011	0.015	1.0E-03	8.78E-02	1.0E-03	1.0E-03
Hexachlorocyclopentadiene	0.00013	0.015	5.0E-02	1.89E-01	5.0E-02	5.0E-02
Hexachloroethane	0.0001	0.015	1.7E-02	1.61E+00	1.7E-02	1.7E-02
Indeno(1,2,3-cd)pyrene	0.0001	0.015	1.3E-03	--	1.3E-03	1.3E-03
Isophorone	0.00011	0.015	9.6E-01	--	9.6E-01	9.6E-01
Nitrobenzene	0.00011	0.015	4.9E-02	7.16E+01	4.9E-02	4.9E-02
n-Nitrosodi-n-propylamine	0.0001	0.015	1.3E-04	--	1.3E-04	1.3E-04
Pentachlorophenol	0.00061	0.015	1.0E-03	--	1.0E-03	1.0E-03
Phenanthrene	0.00009	0.015	7.3E-01	--	7.3E-01	7.3E-01
Phenol	0.00004	0.015	7.3E+00	--	7.3E+00	7.3E+00
Pyrene	0.00009	0.015	7.3E-01	**	7.3E-01	7.3E-01

Notes:
1. Method Detection Limit and Reporting Limit provided by Test America Laboratory, Houston, Texas.
2. TCEQ Protective Concentration Levels are the Tier 1 residential values for Class 1/2 groundwater (groundwater ingestion), updated March 4, 2016.
3. Maximum Contaminant Levels (MCLs) are used for TCEQ PCLs when an MCL is established.
4. EPA Evaluation Values from EPA Vapor Intrusion Screening Level calculator Verson 3.4.6 January 19, 2016 which supersedes the 2002 OSWER guidance (EPA, 2002) cited for this pathway in the RI/FS Work Plan.
5. -- = No evaluation value published.
6. ** Target soil gas concentration exceeds the maximum possible vapor concentration (pathway incomplete).

TABLE 4
MONITORING WELL SUMMARY
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Monitoring Well Screen Interval (ft bgs)	Total Boring Depth (ft bgs)	Top of Casing Elevation (ft AMSL)	Ground Surface Elevation (ft AMSL)
On-site wells installed 1990-1991 across upper and lower zones				
MW-1	10-40	40	657.29	657.1
MW-2	11-42	42	659.25	656.6
MW-3	10-48	48	657.34	357.7
MW-4	10-44	44	660.21	657.1
MW-5	10.5-43	43	656.93	657.3
MW-6	10-54.5	54.5	656.95	657.3
Off-site wells installed in lower zone				
MW-7	30-45	45	655.13	655.35
MW-8	30-45	45	654.42	654.59
MW-9	25-40	45	654.17	654.47
MW-10	23-38	45	653.57	653.86
MW-11	25-40	42.5	654.55	654.78
On-site wells installed in upper zone				
MW-12	10-25	25	659.9	657.2
MW-13	10-25	25	662.65	659.7
MW-14	10-25	25	660.17	657.1
MW-15	10-25	25	659.94	657.2
MW-16	10-25	25	659.2	656.4
MW-17	10-25	25	659.23	656.6
MW-18	10-25	25	660.6	657.7
MW-19	10-25	25	658.37	655.5
MW-20	10-30	30	659.38	656.5
MW-23	10-25	25	662.62	659.39
MW-24	10-30	30	662.14	658.73
MW-30	10-25	25	660.20	657.21
Off-site wells installed in upper zone				
MW-21	8-23	23	654.19	654.56
MW-22	10-25	25	654.07	654.53
MW-25	10-25	25	656.88	657.18
MW-26	10-25	25	657.70	657.98
MW-27	10-30	30	658.39	655.51
MW-28	10-30	30	658.08	658.38
MW-29	10-25	25	655.08	655.34
On-site wells installed in upper zone				
NMW-1	10-25	25	662.3	659.2
NMW-2	10-25	25	660.61	657.8
NMW-3	10-25	25	660.63	657.5
NMW-4	10-25	25	660.99	658
NMW-5	10-25	25	660.45	657.7

NOTES:
1. AMSL = Above Mean Sea Level (expressed in U.S. Survey Feet).
2. Ft bgs = Feet Below Ground Surface.
3. Elevations are relative to NAVD 88.
4. Boring logs and monitoring well construction diagrams provided in Appendix E.

TABLE 5
MONITORING WELL GAUGING SUMMARY - July 25, 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
On-site Wells								
MW-1	7/25/2011	10-40	657.29	20.33	ND	--	636.96	636.96
MW-2	7/25/2011	11-42	659.25	22.41	ND	--	636.84	636.84
MW-3	7/25/2011	10-48	657.34	21.92	20.14	1.78	635.42	636.81
MW-4	7/25/2011	10-44	660.21	23.2	ND	--	637.01	637.01
MW-5	7/25/2011	10.5-43	656.93	20.16	20	0.16	636.77	636.89
MW-6	7/25/2011	10-54.5	656.95	20.28	20.18	0.1	636.67	636.75
MW-12	7/25/2011	10-25	659.9	22	21.95	0.05	637.9	637.94
MW-13	7/25/2011	10-25	662.65	25.07	ND	--	637.58	637.58
MW-14	7/25/2011	10-25	660.17	23.53	22.96	0.57	636.64	637.08
MW-15	7/25/2011	10-25	659.94	23.18	22.9	0.28	636.76	636.98
MW-16	7/25/2011	10-25	659.2	22.41	ND	--	636.79	636.79
MW-17	7/25/2011	10-25	659.23	22.5	ND	--	636.73	636.73
MW-18	7/25/2011	10-25	660.6	23.55	23.4	0.15	637.05	637.17
MW-19	7/25/2011	10-25	658.37	22.25	21.42	0.83	636.12	636.77
MW-20	7/25/2011	10-30	659.38	22.48	ND	--	636.9	636.90
NMW-1	7/25/2011	10-25	662.3	24.78	24.43	0.35	637.52	637.79
NMW-2	7/25/2011	10-25	660.61	23.68	ND	--	636.93	636.93
NMW-3	7/25/2011	10-25	660.63	25.28	23.03	2.25	635.35	637.11
NMW-4	7/25/2011	10-25	660.99	23.79	ND	--	637.2	637.20
NMW-5	7/25/2011	10-25	660.45	23.41	ND	--	637.04	637.04
Off-site Wells								
MW-7	7/25/2011	30-45	655.13	18.6	ND	--	636.53	636.53
MW-8	7/25/2011	30-45	654.42	18.13	ND	--	636.29	636.29
MW-9	7/25/2011	25-40	654.17	17.6	ND	--	636.57	636.57
MW-10	7/25/2011	23-38	653.57	17.9	ND	--	635.67	635.67
MW-11	7/25/2011	25-40	654.55	17.83	ND	--	636.72	636.72

Notes:

1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - August 23, 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	8/23/2011	10-40	657.29	21.05	ND	--	636.24	636.24
MW-2	8/23/2011	11-42	659.25	23.13	ND	--	636.12	636.12
MW-3	8/23/2011	10-48	657.34	23.64	20.56	3.08	633.7	636.10
MW-4	8/23/2011	10-44	660.21	23.9	ND	--	636.31	636.31
MW-5	8/23/2011	10.5-43	656.93	20.95	20.7	0.25	635.98	636.18
MW-6	8/23/2011	10-54.5	656.95	21.08	20.78	0.3	635.87	636.10
MW-7	8/23/2011	30-45	655.13	19.23	ND	--	635.9	635.90
MW-8	8/23/2011	30-45	654.42	18.76	ND	--	635.66	635.66
MW-9	8/23/2011	25-40	654.17	18.25	ND	--	635.92	635.92
MW-10	8/23/2011	23-38	653.57	17.75	ND	--	635.82	635.82
MW-11	8/23/2011	25-40	654.55	18.5	ND	--	636.05	636.05
MW-12	8/23/2011	10-25	659.9	23.03	22.47	0.56	636.87	637.31
MW-13	8/23/2011	10-25	662.65	25.8	ND	--	636.85	636.85
MW-14	8/23/2011	10-25	660.17	24.62	23.54	1.08	635.55	636.39
MW-15	8/23/2011	10-25	659.94	24.58	23.53	1.05	635.36	636.18
MW-16	8/23/2011	10-25	659.2	23.1	ND	--	636.1	636.10
MW-17	8/23/2011	10-25	659.23	23.16	ND	--	636.07	636.07
MW-18	8/23/2011	10-25	660.6	24.8	23.4	1.4	635.8	636.89
MW-19	8/23/2011	10-25	658.37	22.85	22.14	0.71	635.52	636.07
MW-20	8/23/2011	10-30	659.38	23.2	ND	--	636.18	636.18
NMW-1	8/23/2011	10-25	662.3	25.37	25.12	0.25	636.93	637.13
NMW-2	8/23/2011	10-25	660.61	24.38	ND	--	636.23	636.23
NMW-3	8/23/2011	10-25	660.63	25.68	23.75	1.93	634.95	636.46
NMW-4	8/23/2011	10-25	660.99	24.5	ND	--	636.49	636.49
NMW-5	8/23/2011	10-25	660.45	24.12	ND	--	636.33	636.33

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - September 15, 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	9/15/2011	10-40	657.29	21.64	ND	--	635.65	635.65
MW-2	9/15/2011	11-42	659.25	23.87	ND	--	635.38	635.38
MW-3	9/15/2011	10-48	657.34	24.30	21.16	3.14	633.04	635.49
MW-4	9/15/2011	10-44	660.21	24.51	ND	--	635.70	635.70
MW-5	9/15/2011	10.5-43	656.93	23.10	21.07	2.03	633.83	635.41
MW-6	9/15/2011	10-54.5	656.95	22.00	21.33	0.67	634.95	635.47
MW-7	9/15/2011	30-45	655.13	19.89	ND	--	635.24	635.24
MW-8	9/15/2011	30-45	654.42	19.40	ND	--	635.02	635.02
MW-9	9/15/2011	25-40	654.17	18.89	ND	--	635.28	635.28
MW-10	9/15/2011	23-38	653.57	18.35	ND	--	635.22	635.22
MW-11	9/15/2011	25-40	654.55	19.10	ND	--	635.45	635.45
MW-12	9/15/2011	10-25	659.90	23.42	23.10	0.32	636.48	636.73
MW-13	9/15/2011	10-25	662.65	26.29	ND	--	636.36	636.36
MW-14	9/15/2011	10-25	660.17	25.23	24.15	1.08	634.94	635.78
MW-15	9/15/2011	10-25	659.94	27.02	23.96	3.06	632.92	635.31
MW-16	9/15/2011	10-25	659.20	23.68	ND	--	635.52	635.52
MW-17	9/15/2011	10-25	659.23	23.74	ND	--	635.49	635.49
MW-18	9/15/2011	10-25	660.60	25.61	24.50	1.11	634.99	635.86
MW-19	9/15/2011	10-25	658.37	23.36	22.76	0.6	635.01	635.48
MW-20	9/15/2011	10-30	659.38	23.82	ND	--	635.56	635.56
NMW-1	9/15/2011	10-25	662.30	25.75	25.51	0.24	636.55	636.74
NMW-2	9/15/2011	10-25	660.61	25.00	ND	--	635.61	635.61
NMW-3	9/15/2011	10-25	660.63	25.77	24.49	1.28	634.86	635.86
NMW-4	9/15/2011	10-25	660.99	25.20	25.05	0.15	635.79	635.91
NMW-5	9/15/2011	10-25	660.45	24.74	ND	--	635.71	635.71

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - October 10, 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	10/10/2011	10-40	657.29	21.51	ND	--	635.78	635.78
MW-2	10/10/2011	11-42	659.25	23.71	ND	--	635.54	635.54
MW-3	10/10/2011	10-48	657.34	23.10	21.31	1.79	634.24	635.64
MW-4	10/10/2011	10-44	660.21	24.37	ND	--	635.84	635.84
MW-5	10/10/2011	10.5-43	656.93	22.82	21.02	1.8	634.11	635.51
MW-6	10/10/2011	10-54.5	656.95	21.51	21.34	0.17	635.44	635.57
MW-7	10/10/2011	30-45	655.13	19.78	ND	--	635.35	635.35
MW-8	10/10/2011	30-45	654.42	19.35	ND	--	635.07	635.07
MW-9	10/10/2011	25-40	654.17	18.78	ND	--	635.39	635.39
MW-10	10/10/2011	23-38	653.57	18.26	ND	--	635.31	635.31
MW-11	10/10/2011	25-40	654.55	19.02	ND	--	635.53	635.53
MW-12	10/10/2011	10-25	659.90	25.65	23.35	2.3	634.25	636.04
MW-13	10/10/2011	10-25	662.65	26.57	ND	--	636.08	636.08
MW-14	10/10/2011	10-25	660.17	25.40	24.2	1.2	634.77	635.71
MW-15	10/10/2011	10-25	659.94	27.55	23.83	3.72	632.39	635.29
MW-16	10/10/2011	10-25	659.20	23.64	ND	--	635.56	635.56
MW-17	10/10/2011	10-25	659.23	23.95	23.6	0.35	635.28	635.55
MW-18	10/10/2011	10-25	660.60	25.44	24.82	0.62	635.16	635.64
MW-19	10/10/2011	10-25	658.37	22.88	22.72	0.16	635.49	635.61
MW-20	10/10/2011	10-30	659.38	23.40	ND	--	635.98	635.98
NMW-1	10/10/2011	10-25	662.30	26.15	25.9	0.25	636.15	636.35
NMW-2	10/10/2011	10-25	660.61	24.88	ND	--	635.73	635.73
NMW-3	10/10/2011	10-25	660.63	25.49	24.52	0.97	635.14	635.90
NMW-4	10/10/2011	10-25	660.99	25.42	25.2	0.22	635.57	635.74
NMW-5	10/10/2011	10-25	660.45	24.62	ND	--	635.83	635.83

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - November 16, 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	11/16/2011	10-40	657.29	21.70	ND	--	635.59	635.59
MW-2	11/16/2011	11-42	659.25	23.89	ND	--	635.36	635.36
MW-3	11/16/2011	10-48	657.34	23.65	21.48	2.17	633.69	635.38
MW-4	11/16/2011	10-44	660.21	24.60	ND	--	635.61	635.61
MW-5	11/16/2011	10.5-43	656.93	23.38	21.12	2.26	633.55	635.31
MW-6	11/16/2011	10-54.5	656.95	21.51	21.34	0.17	635.44	635.57
MW-7	11/16/2011	30-45	655.13	19.90	ND	--	635.23	635.23
MW-8	11/16/2011	30-45	654.42	19.50	ND	--	634.92	634.92
MW-9	11/16/2011	25-40	654.17	19.00	ND	--	635.17	635.17
MW-10	11/16/2011	23-38	653.57	18.43	ND	--	635.14	635.14
MW-11	11/16/2011	25-40	654.55	19.24	ND	--	635.31	635.31
MW-12	11/16/2011	10-25	659.90	25.61	23.28	2.33	634.29	636.11
MW-13	11/16/2011	10-25	662.65	27.43	26.57	0.86	635.22	635.89
MW-14	11/16/2011	10-25	660.17	25.49	24.31	1.18	634.68	635.60
MW-15	11/16/2011	10-25	659.94	27.82	23.98	3.84	632.12	635.12
MW-16	11/16/2011	10-25	659.20	23.85	ND	--	635.35	635.35
MW-17	11/16/2011	10-25	659.23	24.48	23.77	0.71	634.75	635.30
MW-18	11/16/2011	10-25	660.60	25.47	24.86	0.61	635.13	635.61
MW-19	11/16/2011	10-25	658.37	23.50	22.86	0.64	634.87	635.37
MW-20	11/16/2011	10-30	659.38	23.89	ND	--	635.49	635.49
NMW-1	11/16/2011	10-25	662.30	26.13	25.9	0.23	636.17	636.35
NMW-2	11/16/2011	10-25	660.61	25.11	ND	--	635.50	635.50
NMW-3	11/16/2011	10-25	660.63	25.79	24.77	1.02	634.84	635.64
NMW-4	11/16/2011	10-25	660.99	25.62	25.26	0.36	635.37	635.65
NMW-5	11/16/2011	10-25	660.45	24.86	ND	--	635.59	635.59

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - December 13, 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	12/13/2011	10-40	657.29	21.17	ND	--	636.12	636.12
MW-2	12/13/2011	11-42	659.25	23.30	ND	--	635.95	635.95
MW-3	12/13/2011	10-48	657.34	22.01	21.2	0.81	635.33	635.96
MW-4	12/13/2011	10-44	660.21	24.05	ND	--	636.16	636.16
MW-5	12/13/2011	10.5-43	656.93	21.93	20.72	1.21	635.00	635.94
MW-6	12/13/2011	10-54.5	656.95	21.63	20.84	0.79	635.32	635.94
MW-7	12/13/2011	30-45	655.13	19.32	ND	--	635.81	635.81
MW-8	12/13/2011	30-45	654.42	18.85	ND	--	635.57	635.57
MW-9	12/13/2011	25-40	654.17	18.37	ND	--	635.8	635.80
MW-10	12/13/2011	23-38	653.57	17.82	ND	--	635.75	635.75
MW-11	12/13/2011	25-40	654.55	18.65	ND	--	635.9	635.90
MW-12	12/13/2011	10-25	659.90	25.64	23.05	2.59	634.26	636.28
MW-13	12/13/2011	10-25	662.65	27.45	26.36	1.09	635.2	636.05
MW-14	12/13/2011	10-25	660.17	24.82	23.83	0.99	635.35	636.12
MW-15	12/13/2011	10-25	659.94	26.92	23.55	3.37	633.02	635.65
MW-16	12/13/2011	10-25	659.20	23.30	ND	--	635.9	635.90
MW-17	12/13/2011	10-25	659.23	23.66	23.22	0.44	635.57	635.91
MW-18	12/13/2011	10-25	660.60	25.00	24.34	0.66	635.6	636.11
MW-19	12/13/2011	10-25	658.37	22.86	22.3	0.56	635.51	635.95
MW-20	12/13/2011	10-30	659.38	23.33	ND	--	636.05	636.05
NMW-1	12/13/2011	10-25	662.30	26.10	25.88	0.22	636.2	636.37
NMW-2	12/13/2011	10-25	660.61	24.55	ND	--	636.06	636.06
NMW-3	12/13/2011	10-25	660.63	25.42	24.16	1.26	635.21	636.19
NMW-4	12/13/2011	10-25	660.99	25.08	24.8	0.28	635.91	636.13
NMW-5	12/13/2011	10-25	660.45	24.30	ND	--	636.15	636.15

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - January 23, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	1/23/2012	10-40	657.29	20.59	ND	--	636.70	636.70
MW-2	1/23/2012	11-42	659.25	22.70	ND	--	636.55	636.55
MW-3	1/23/2012	10-48	657.34	21.78	20.5	1.28	635.56	636.56
MW-4	1/23/2012	10-44	660.21	23.46	ND	--	636.75	636.75
MW-5	1/23/2012	10.5-43	656.93	20.57	20.27	0.3	636.36	636.59
MW-6	1/23/2012	10-54.5	656.95	21.50	20.18	1.32	635.45	636.48
MW-7	1/23/2012	30-45	655.13	18.73	ND	--	636.4	636.40
MW-8	1/23/2012	30-45	654.42	18.25	ND	--	636.17	636.17
MW-9	1/23/2012	25-40	654.17	17.79	ND	--	636.38	636.38
MW-10	1/23/2012	23-38	653.57	17.23	ND	--	636.34	636.34
MW-11	1/23/2012	25-40	654.55	18.01	ND	--	636.54	636.54
MW-12	1/23/2012	10-25	659.90	23.10	22.66	0.44	636.8	637.14
MW-13	1/23/2012	10-25	662.65	27.26	25.71	1.55	635.39	636.60
MW-14	1/23/2012	10-25	660.17	24.08	23.27	0.81	636.09	636.72
MW-15	1/23/2012	10-25	659.94	24.07	23.22	0.85	635.87	636.53
MW-16	1/23/2012	10-25	659.20	22.67	ND	--	636.53	636.53
MW-17	1/23/2012	10-25	659.23	22.94	22.68	0.26	636.29	636.49
MW-18	1/23/2012	10-25	660.60	24.05	23.76	0.29	636.55	636.78
MW-19	1/23/2012	10-25	658.37	22.45	21.66	0.79	635.92	636.54
MW-20	1/23/2012	10-30	659.38	22.75	ND	--	636.63	636.63
NMW-1	1/23/2012	10-25	662.30	25.51	25.3	0.21	636.79	636.95
NMW-2	1/23/2012	10-25	660.61	23.96	ND	--	636.65	636.65
NMW-3	1/23/2012	10-25	660.63	24.77	23.62	1.15	635.86	636.76
NMW-4	1/23/2012	10-25	660.99	24.42	24.25	0.17	636.57	636.70
NMW-5	1/23/2012	10-25	660.45	23.71	ND	--	636.74	636.74

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - February 20, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	2/20/2012	10-40	657.29	19.21	ND	--	638.08	638.08
MW-2	2/20/2012	11-42	659.25	21.30	ND	--	637.95	637.95
MW-3	2/20/2012	10-48	657.34	20.07	19.08	0.99	637.27	638.04
MW-4	2/20/2012	10-44	660.21	19.64	ND	--	640.57	640.57
MW-5	2/20/2012	10.5-43	656.93	19.91	19.88	0.03	637.02	637.04
MW-6	2/20/2012	10-54.5	656.95	19.55	18.87	0.68	637.40	637.93
MW-7	2/20/2012	30-45	655.13	17.29	ND	--	637.84	637.84
MW-8	2/20/2012	30-45	654.42	16.87	ND	--	637.55	637.55
MW-9	2/20/2012	25-40	654.17	16.40	ND	--	637.77	637.77
MW-10	2/20/2012	23-38	653.57	15.85	ND	--	637.72	637.72
MW-11	2/20/2012	25-40	654.55	16.66	ND	--	637.89	637.89
MW-12	2/20/2012	10-25	659.90	22.20	22.00	0.2	637.7	637.86
MW-13	2/20/2012	10-25	662.65	25.94	24.47	1.47	636.71	637.86
MW-14	2/20/2012	10-25	660.17	22.28	21.95	0.33	637.89	638.15
MW-15	2/20/2012	10-25	659.94	22.40	22.3	0.1	637.54	637.62
MW-16	2/20/2012	10-25	659.20	21.25	ND	--	637.95	637.95
MW-17	2/20/2012	10-25	659.23	21.34	21.3	0.04	637.89	637.92
MW-18	2/20/2012	10-25	660.60	22.54	ND	--	638.06	638.06
MW-19	2/20/2012	10-25	658.37	20.50	20.4	0.1	637.87	637.95
MW-20	2/20/2012	10-30	659.38	21.31	ND	--	638.07	638.07
NMW-1	2/20/2012	10-25	662.30	24.46	24.42	0.04	637.84	637.87
NMW-2	2/20/2012	10-25	660.61	22.53	ND	--	638.08	638.08
NMW-3	2/20/2012	10-25	660.63	22.47	22.35	0.12	638.16	638.25
NMW-4	2/20/2012	10-25	660.99	23.04	23.02	0.02	637.95	637.97
NMW-5	2/20/2012	10-25	660.45	22.31	ND	--	638.14	638.14

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - March 14, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	3/14/2012	10-40	657.29	18.75	ND	--	638.54	638.54
MW-2	3/14/2012	11-42	659.25	20.80	ND	--	638.45	638.45
MW-3	3/14/2012	10-48	657.34	19.16	18.81	0.35	638.18	638.45
MW-4	3/14/2012	10-44	660.21	21.27	ND	--	638.94	638.94
MW-5	3/14/2012	10.5-43	656.93	18.41	18.4	0.01	638.52	638.53
MW-6	3/14/2012	10-54.5	656.95	18.84	18.42	0.42	638.11	638.44
MW-7	3/14/2012	30-45	655.13	16.82	ND	--	638.31	638.31
MW-8	3/14/2012	30-45	654.42	16.60	ND	--	637.82	637.82
MW-9	3/14/2012	25-40	654.17	15.87	ND	--	638.3	638.30
MW-10	3/14/2012	23-38	653.57	15.33	ND	--	638.24	638.24
MW-11	3/14/2012	25-40	654.55	16.16	ND	--	638.39	638.39
MW-12	3/14/2012	10-25	659.90	21.32	21.17	0.15	638.58	638.70
MW-13	3/14/2012	10-25	662.65	25.42	24	1.42	637.23	638.34
MW-14	3/14/2012	10-25	660.17	21.72	21.48	0.24	638.45	638.64
MW-15	3/14/2012	10-25	659.94	21.61	21.58	0.03	638.33	638.35
MW-16	3/14/2012	10-25	659.20	20.76	ND	--	638.44	638.44
MW-17	3/14/2012	10-25	659.23	20.83	20.81	0.02	638.4	638.42
MW-18	3/14/2012	10-25	660.60	21.94	ND	--	638.66	638.66
MW-19	3/14/2012	10-25	658.37	19.99	19.92	0.07	638.38	638.43
MW-20	3/14/2012	10-30	659.38	20.84	ND	--	638.54	638.54
NMW-1	3/14/2012	10-25	662.30	24.00	23.84	0.16	638.3	638.42
NMW-2	3/14/2012	10-25	660.61	22.07	ND	--	638.54	638.54
NMW-3	3/14/2012	10-25	660.63	21.96	ND	--	638.67	638.67
NMW-4	3/14/2012	10-25	660.99	22.45	ND	--	638.54	638.54
NMW-5	3/14/2012	10-25	660.45	21.81	ND	--	638.64	638.64

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - April 11, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	4/11/2012	10-40	657.29	18.67	ND	--	638.62	638.62
MW-2	4/11/2012	11-42	659.25	20.74	ND	--	638.51	638.51
MW-3	4/11/2012	10-48	657.34	19.09	18.74	0.35	638.25	638.52
MW-4	4/11/2012	10-44	660.21	21.16	ND	--	639.05	639.05
MW-5	4/11/2012	10.5-43	656.93	18.31	18.3	0.01	638.62	638.63
MW-6	4/11/2012	10-54.5	656.95	18.89	18.51	0.38	638.06	638.36
MW-7	4/11/2012	30-45	655.13	16.71	ND	--	638.42	638.42
MW-8	4/11/2012	30-45	654.42	16.58	ND	--	637.84	637.84
MW-9	4/11/2012	25-40	654.17	15.84	ND	--	638.33	638.33
MW-10	4/11/2012	23-38	653.57	15.32	ND	--	638.25	638.25
MW-11	4/11/2012	25-40	654.55	16.12	ND	--	638.43	638.43
MW-12	4/11/2012	10-25	659.90	20.98	ND	--	638.92	638.92
MW-13	4/11/2012	10-25	662.65	25.37	23.94	1.43	637.28	638.40
MW-14	4/11/2012	10-25	660.17	21.84	21.49	0.35	638.33	638.60
MW-15	4/11/2012	10-25	659.94	21.35	21.32	0.03	638.59	638.61
MW-16	4/11/2012	10-25	659.20	20.86	ND	--	638.34	638.34
MW-17	4/11/2012	10-25	659.23	20.91	20.9	0.01	638.32	638.33
MW-18	4/11/2012	10-25	660.60	21.88	ND	--	638.72	638.72
MW-19	4/11/2012	10-25	658.37	19.91	19.84	0.07	638.46	638.51
MW-20	4/11/2012	10-30	659.38	20.81	ND	--	638.57	638.57
NMW-1	4/11/2012	10-25	662.30	23.76	23.54	0.22	638.54	638.71
NMW-2	4/11/2012	10-25	660.61	21.96	ND	--	638.65	638.65
NMW-3	4/11/2012	10-25	660.63	22.58	21.85	0.73	638.05	638.62
NMW-4	4/11/2012	10-25	660.99	22.38	ND	--	638.61	638.61
NMW-5	4/11/2012	10-25	660.45	21.76	ND	--	638.69	638.69

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - May 9, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	5/9/2012	10-40	657.29	19.03	ND	--	638.26	638.26
MW-2	5/9/2012	11-42	659.25	21.14	ND	--	638.11	638.11
MW-3	5/9/2012	10-48	657.34	19.22	19.12	0.1	638.12	638.20
MW-4	5/9/2012	10-44	660.21	20.71	ND	--	639.50	639.50
MW-5	5/9/2012	10.5-43	656.93	18.97	18.95	0.02	637.96	637.98
MW-6	5/9/2012	10-54.5	656.95	19.21	18.96	0.25	637.74	637.94
MW-7	5/9/2012	30-45	655.13	17.12	ND	--	638.01	638.01
MW-8	5/9/2012	30-45	654.42	16.76	ND	--	637.66	637.66
MW-9	5/9/2012	25-40	654.17	16.28	ND	--	637.89	637.89
MW-10	5/9/2012	23-38	653.57	15.87	ND	--	637.7	637.70
MW-11	5/9/2012	25-40	654.55	16.54	ND	--	638.01	638.01
MW-12	5/9/2012	10-25	659.90	21.28	ND	--	638.62	638.62
MW-13	5/9/2012	10-25	662.65	25.86	24.33	1.53	636.79	637.98
MW-14	5/9/2012	10-25	660.17	22.12	ND	--	638.05	638.05
MW-15	5/9/2012	10-25	659.94	21.87	21.85	0.02	638.07	638.09
MW-16	5/9/2012	10-25	659.20	21.14	ND	--	638.06	638.06
MW-17	5/9/2012	10-25	659.23	21.35	21.34	0.01	637.88	637.89
MW-18	5/9/2012	10-25	660.60	22.29	ND	--	638.31	638.31
MW-19	5/9/2012	10-25	658.37	20.47	20.41	0.06	637.9	637.95
MW-20	5/9/2012	10-30	659.38	21.13	ND	--	638.25	638.25
MW-21	5/9/2012	8-23	654.19	16.31	ND	--	637.88	637.88
MW-22	5/9/2012	10-25	654.07	16.46	ND	--	637.61	637.61
NMW-1	5/9/2012	10-25	662.30	23.93	23.72	0.21	638.37	638.53
NMW-2	5/9/2012	10-25	660.61	22.36	ND	--	638.25	638.25
NMW-3	5/9/2012	10-25	660.63	24.05	21.97	2.08	636.58	638.20
NMW-4	5/9/2012	10-25	660.99	22.91	ND	--	638.08	638.08
NMW-5	5/9/2012	10-25	660.45	22.26	ND	--	638.19	638.19

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - June 6, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	6/6/2012	10-40	657.29	18.49	ND	--	638.80	638.80
MW-2	6/6/2012	11-42	659.25	20.60	ND	--	638.65	638.65
MW-3	6/6/2012	10-48	657.34	19.08	18.55	0.53	638.26	638.67
MW-4	6/6/2012	10-44	660.21	21.27	ND	--	638.94	638.94
MW-5	6/6/2012	10.5-43	656.93	18.23	18.18	0.05	638.70	638.74
MW-6	6/6/2012	10-54.5	656.95	18.55	18.27	0.28	638.40	638.62
MW-7	6/6/2012	30-45	655.13	16.60	ND	--	638.53	638.53
MW-8	6/6/2012	30-45	654.42	16.25	ND	--	638.17	638.17
MW-9	6/6/2012	25-40	654.17	15.73	ND	--	638.44	638.44
MW-10	6/6/2012	23-38	653.57	15.25	ND	--	638.32	638.32
MW-11	6/6/2012	25-40	654.55	15.99	ND	--	638.56	638.56
MW-12	6/6/2012	10-25	659.90	20.61	ND	--	639.29	639.29
MW-13	6/6/2012	10-25	662.65	24.82	23.41	1.41	637.83	638.93
MW-14	6/6/2012	10-25	660.17	21.52	21.17	0.35	638.65	638.92
MW-15	6/6/2012	10-25	659.94	21.14	21.04	0.1	638.80	638.88
MW-16	6/6/2012	10-25	659.20	20.59	ND	--	638.61	638.61
MW-17	6/6/2012	10-25	659.23	20.65	ND	--	638.58	638.58
MW-18	6/6/2012	10-25	660.60	21.57	ND	--	639.03	639.03
MW-19	6/6/2012	10-25	658.37	19.88	19.74	0.14	638.49	638.60
MW-20	6/6/2012	10-30	659.38	20.60	ND	--	638.78	638.78
MW-21	6/6/2012	8-23	654.19	15.77	ND	--	638.42	638.42
MW-22	6/6/2012	10-25	654.07	15.95	ND	--	638.12	638.12
NMW-1	6/6/2012	10-25	662.30	23.19	23.05	0.14	639.11	639.22
NMW-2	6/6/2012	10-25	660.61	21.88	ND	--	638.73	638.73
NMW-3	6/6/2012	10-25	660.63	23.75	21.36	2.39	636.88	638.74
NMW-4	6/6/2012	10-25	660.99	22.00	ND	--	638.99	638.99
NMW-5	6/6/2012	10-25	660.45	21.55	ND	--	638.90	638.90

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - July 7, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	7/7/2012	10-40	657.29	19.91	ND	--	637.38	637.38
MW-2	7/7/2012	11-42	659.25	22.05	ND	--	637.20	637.20
MW-3	7/7/2012	10-48	657.34	23.25	19.27	3.98	634.09	637.19
MW-4	7/7/2012	10-44	660.21	22.72	ND	--	637.49	637.49
MW-5	7/7/2012	10.5-43	656.93	19.89	19.64	0.25	637.04	637.24
MW-6	7/7/2012	10-54.5	656.95	20.14	19.68	0.46	636.81	637.17
MW-7	7/7/2012	30-45	655.13	18.07	ND	--	637.06	637.06
MW-8	7/7/2012	30-45	654.42	17.50	ND	--	636.92	636.92
MW-9	7/7/2012	25-40	654.17	17.20	ND	--	636.97	636.97
MW-10	7/7/2012	23-38	653.57	16.74	ND	--	636.83	636.83
MW-11	7/7/2012	25-40	654.55	17.45	ND	--	637.10	637.10
MW-12	7/7/2012	10-25	659.90	22.55	22.54	0.01	637.35	637.36
MW-13	7/7/2012	10-25	662.65	26.12	24.59	1.53	636.53	637.72
MW-14	7/7/2012	10-25	660.17	23.03	22.6	0.43	637.14	637.48
MW-15	7/7/2012	10-25	659.94	22.67	22.37	0.3	637.27	637.50
MW-16	7/7/2012	10-25	659.20	22.05	ND	--	637.15	637.15
MW-17	7/7/2012	10-25	659.23	22.13	22.11	0.02	637.10	637.12
MW-18	7/7/2012	10-25	660.60	22.95	ND	--	637.65	637.65
MW-19	7/7/2012	10-25	658.37	21.60	21.06	0.54	636.77	637.19
MW-20	7/7/2012	10-30	659.38	22.02	ND	--	637.36	637.36
MW-21	7/7/2012	8-23	654.19	17.24	ND	--	636.95	636.95
MW-22	7/7/2012	10-25	654.07	17.43	ND	--	636.64	636.64
NMW-1	7/7/2012	10-25	662.30	24.07	23.89	0.18	638.23	638.37
NMW-2	7/7/2012	10-25	660.61	23.34	ND	--	637.27	637.27
NMW-3	7/7/2012	10-25	660.63	25.77	22.35	3.42	634.86	637.53
NMW-4	7/7/2012	10-25	660.99	23.31	ND	--	637.68	637.68
NMW-5	7/7/2012	10-25	660.45	22.99	ND	--	637.46	637.46

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - August 23, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	8/23/2012	10-40	657.29	20.52	ND	--	636.77	636.77
MW-2	8/23/2012	11-42	659.25	22.71	ND	--	636.54	636.54
MW-3	8/23/2012	10-48	657.34	22.37	20.36	2.01	634.97	636.54
MW-4	8/23/2012	10-44	660.21	23.38	ND	--	636.83	636.83
MW-5	8/23/2012	10.5-43	656.93	20.74	20.26	0.48	636.19	636.56
MW-6	8/23/2012	10-54.5	656.95	21.47	20.15	1.32	635.48	636.51
MW-7	8/23/2012	30-45	655.13	18.73	ND	--	636.40	636.40
MW-8	8/23/2012	30-45	654.42	18.60	ND	--	635.82	635.82
MW-9	8/23/2012	25-40	654.17	17.88	ND	--	636.29	636.29
MW-10	8/23/2012	23-38	653.57	17.40	ND	--	636.17	636.17
MW-11	8/23/2012	25-40	654.55	18.13	ND	--	636.42	636.42
MW-12	8/23/2012	10-25	659.90	22.72	22.39	0.33	637.18	637.44
MW-13	8/23/2012	10-25	662.65	26.53	25.59	0.94	636.12	636.85
MW-14	8/23/2012	10-25	660.17	24.07	23.19	0.88	636.10	636.79
MW-15	8/23/2012	10-25	659.94	27.00	22.76	4.24	632.94	636.25
MW-16	8/23/2012	10-25	659.20	22.43	ND	--	636.77	636.77
MW-17	8/23/2012	10-25	659.23	22.98	22.71	0.27	636.25	636.46
MW-18	8/23/2012	10-25	660.60	24.57	23.36	1.21	636.03	636.97
MW-19	8/23/2012	10-25	658.37	22.16	21.7	0.46	636.21	636.57
MW-20	8/23/2012	10-30	659.38	22.66	ND	--	636.72	636.72
MW-21	8/23/2012	8-23	654.19	17.92	ND	--	636.27	636.27
MW-22	8/23/2012	10-25	654.07	18.07	ND	--	636.00	636.00
NMW-1	8/23/2012	10-25	662.30	25.25	24.99	0.26	637.05	637.25
NMW-2	8/23/2012	10-25	660.61	24.02	ND	--	636.59	636.59
NMW-3	8/23/2012	10-25	660.63	25.13	23.41	1.72	635.50	636.84
NMW-4	8/23/2012	10-25	660.99	24.27	24.16	0.11	636.72	636.81
NMW-5	8/23/2012	10-25	660.45	23.66	ND	--	636.79	636.79

Notes:

1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. LNAPL was bailed from monitoring wells containing >0.5-feet of LNAPL.
3. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.

TABLE 5
MONITORING WELL GAUGING SUMMARY - September 26, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	9/26/2012	10-40	657.29	20.19	ND	--	637.10	637.10
MW-2	9/26/2012	11-42	659.25	22.31	ND	--	636.94	636.94
MW-3	9/26/2012	10-48	657.34	21.22	20.29	0.93	636.12	636.85
MW-4	9/26/2012	10-44	660.21	22.41	ND	--	637.80	637.80
MW-5	9/26/2012	10.5-43	656.93	20.31	20.02	0.29	636.62	636.85
MW-6	9/26/2012	10-54.5	656.95	21.01	19.96	1.05	635.94	636.76
MW-7	9/26/2012	30-45	655.13	18.28	ND	--	636.85	636.85
MW-8	9/26/2012	30-45	654.42	18.56	ND	--	635.86	635.86
MW-9	9/26/2012	25-40	654.17	17.41	ND	--	636.76	636.76
MW-10	9/26/2012	23-38	653.57	16.93	ND	--	636.64	636.64
MW-11	9/26/2012	25-40	654.55	17.68	ND	--	636.87	636.87
MW-12	9/26/2012	10-25	659.90	22.93	22.61	0.32	636.97	637.22
MW-13	9/26/2012	10-25	662.65	26.79	25.59	1.2	635.86	636.80
MW-14	9/26/2012	10-25	660.17	23.36	22.93	0.43	636.81	637.15
MW-15	9/26/2012	10-25	659.94	24.34	22.86	1.48	635.60	636.75
MW-16	9/26/2012	10-25	659.20	22.31	ND	--	636.89	636.89
MW-17	9/26/2012	10-25	659.23	22.59	22.42	0.17	636.64	636.77
MW-18	9/26/2012	10-25	660.60	23.47	23.42	0.05	637.13	637.17
MW-19	9/26/2012	10-25	658.37	21.83	21.41	0.42	636.54	636.87
MW-20	9/26/2012	10-30	659.38	22.29	ND	--	637.09	637.09
MW-21	9/26/2012	8-23	654.19	17.47	ND	--	636.72	636.72
MW-22	9/26/2012	10-25	654.07	17.62	ND	--	636.45	636.45
NMW-1	9/26/2012	10-25	662.30	25.39	25.12	0.27	636.91	637.12
NMW-2	9/26/2012	10-25	660.61	23.54	ND	--	637.07	637.07
NMW-3	9/26/2012	10-25	660.63	24.16	23.21	0.95	636.47	637.21
NMW-4	9/26/2012	10-25	660.99	24.04	23.96	0.08	636.95	637.01
NMW-5	9/26/2012	10-25	660.45	23.23	ND	--	637.22	637.22

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. LNAPL was bailed from monitoring wells containing >0.5-feet of LNAPL.
3. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
4. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - October 24, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	10/24/2012	10-40	657.29	19.22	ND	--	638.07	638.07
MW-2	10/24/2012	11-42	659.25	21.36	ND	--	637.89	637.89
MW-3	10/24/2012	10-48	657.34	20.07	19.26	0.81	637.27	637.90
MW-4	10/24/2012	10-44	660.21	22.01	ND	--	638.20	638.20
MW-5	10/24/2012	10.5-43	656.93	19.03	18.94	0.09	637.90	637.97
MW-6	10/24/2012	10-54.5	656.95	19.40	18.92	0.48	637.55	637.92
MW-7	10/24/2012	30-45	655.13	17.36	ND	--	637.77	637.77
MW-8	10/24/2012	30-45	654.42	17.81	ND	--	636.61	636.61
MW-9	10/24/2012	25-40	654.17	16.50	ND	--	637.67	637.67
MW-10	10/24/2012	23-38	653.57	16.03	ND	--	637.54	637.54
MW-11	10/24/2012	25-40	654.55	16.44	ND	--	638.11	638.11
MW-12	10/24/2012	10-25	659.90	21.50	21.36	0.14	638.40	638.51
MW-13	10/24/2012	10-25	662.65	25.85	24.36	1.49	636.80	637.96
MW-14	10/24/2012	10-25	660.17	22.40	21.91	0.49	637.77	638.15
MW-15	10/24/2012	10-25	659.94	22.08	21.49	0.59	637.86	638.32
MW-16	10/24/2012	10-25	659.20	21.36	ND	--	637.84	637.84
MW-17	10/24/2012	10-25	659.23	21.42	ND	--	637.81	637.81
MW-18	10/24/2012	10-25	660.60	22.33	ND	--	638.27	638.27
MW-19	10/24/2012	10-25	658.37	20.79	20.38	0.41	637.58	637.90
MW-20	10/24/2012	10-30	659.38	21.35	ND	--	638.03	638.03
MW-21	10/24/2012	8-23	654.19	16.54	ND	--	637.65	637.65
MW-22	10/24/2012	10-25	654.07	16.70	ND	--	637.37	637.37
NMW-1	10/24/2012	10-25	662.30	24.29	24.12	0.17	638.01	638.14
NMW-2	10/24/2012	10-25	660.61	22.61	ND	--	638.00	638.00
NMW-3	10/24/2012	10-25	660.63	22.62	22.38	0.24	638.01	638.20
NMW-4	10/24/2012	10-25	660.99	22.86	22.84	0.02	638.13	638.15
NMW-5	10/24/2012	10-25	660.45	22.28	ND	--	638.17	638.17

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. LNAPL was bailed from monitoring wells containing >0.5-feet of LNAPL.
3. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
4. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - November 27, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	11/27/2012	10-40	657.29	19.31	ND	--	637.98	637.98
MW-2	11/27/2012	11-42	659.25	21.39	ND	--	637.86	637.86
MW-3	11/27/2012	10-48	657.34	20.02	19.33	0.69	637.32	637.86
MW-4	11/27/2012	10-44	660.21	22.08	ND	--	638.13	638.13
MW-5	11/27/2012	10.5-43	656.93	19.17	18.97	0.2	637.76	637.92
MW-6	11/27/2012	10-54.5	656.95	19.67	19.01	0.66	637.28	637.79
MW-7	11/27/2012	30-45	655.13	17.32	ND	--	637.81	637.81
MW-8	11/27/2012	30-45	654.42	17.10	ND	--	637.32	637.32
MW-9	11/27/2012	25-40	654.17	16.52	ND	--	637.65	637.65
MW-10	11/27/2012	23-38	653.57	16.08	ND	--	637.49	637.49
MW-11	11/27/2012	25-40	654.55	16.18	ND	--	638.37	638.37
MW-12	11/27/2012	10-25	659.90	21.35	ND	--	638.55	638.55
MW-13	11/27/2012	10-25	662.65	25.10	24.36	0.74	637.55	638.13
MW-14	11/27/2012	10-25	660.17	22.54	22	0.54	637.63	638.05
MW-15	11/27/2012	10-25	659.94	22.45	21.89	0.56	637.49	637.93
MW-16	11/27/2012	10-25	659.20	21.40	ND	--	637.80	637.80
MW-17	11/27/2012	10-25	659.23	21.45	ND	--	637.78	637.78
MW-18	11/27/2012	10-25	660.60	22.55	ND	--	638.05	638.05
MW-19	11/27/2012	10-25	658.37	21.04	20.44	0.6	637.33	637.80
MW-20	11/27/2012	10-30	659.38	21.41	ND	--	637.97	637.97
MW-21	11/27/2012	8-23	654.19	16.56	ND	--	637.63	637.63
MW-22	11/27/2012	10-25	654.07	16.69	ND	--	637.38	637.38
NMW-1	11/27/2012	10-25	662.30	24.10	23.9	0.2	638.20	638.36
NMW-2	11/27/2012	10-25	660.61	22.66	ND	--	637.95	637.95
NMW-3	11/27/2012	10-25	660.63	23.84	22.19	1.65	636.79	638.08
NMW-4	11/27/2012	10-25	660.99	22.92	22.9	0.02	638.07	638.09
NMW-5	11/27/2012	10-25	660.45	22.41	ND	--	638.04	638.04

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. LNAPL was bailed from monitoring wells containing >0.5-feet of LNAPL.
3. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
4. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - December 11, 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	12/11/2012	10-40	657.29	19.37	ND	--	637.92	637.92
MW-2	12/11/2012	11-42	659.25	21.46	ND	--	637.79	637.79
MW-3	12/11/2012	10-48	657.34	20.07	19.45	0.62	637.27	637.75
MW-4	12/11/2012	10-44	660.21	22.13	ND	--	638.08	638.08
MW-5	12/11/2012	10.5-43	656.93	19.52	19.11	0.41	637.41	637.73
MW-6	12/11/2012	10-54.5	656.95	19.62	19.15	0.47	637.33	637.70
MW-7	12/11/2012	30-45	655.13	16.96	ND	--	638.17	638.17
MW-8	12/11/2012	30-45	654.42	16.71	ND	--	637.71	637.71
MW-9	12/11/2012	25-40	654.17	16.04	ND	--	638.13	638.13
MW-10	12/11/2012	23-38	653.57	15.96	ND	--	637.61	637.61
MW-11	12/11/2012	25-40	654.55	16.40	ND	--	638.15	638.15
MW-12	12/11/2012	10-25	659.90	20.86	ND	--	639.04	639.04
MW-13	12/11/2012	10-25	662.65	25.19	24.71	0.48	637.46	637.83
MW-14	12/11/2012	10-25	660.17	22.56	22.11	0.45	637.61	637.96
MW-15	12/11/2012	10-25	659.94	22.36	22.02	0.34	637.58	637.85
MW-16	12/11/2012	10-25	659.20	21.06	ND	--	638.14	638.14
MW-17	12/11/2012	10-25	659.23	21.10	ND	--	638.13	638.13
MW-18	12/11/2012	10-25	660.60	22.13	ND	--	638.47	638.47
MW-19	12/11/2012	10-25	658.37	21.26	20.52	0.74	637.11	637.69
MW-20	12/11/2012	10-30	659.38	21.07	ND	--	638.31	638.31
MW-21	12/11/2012	8-23	654.19	16.13	ND	--	638.06	638.06
MW-22	12/11/2012	10-25	654.07	16.26	ND	--	637.81	637.81
NMW-1	12/11/2012	10-25	662.30	24.19	24.01	0.18	638.11	638.25
NMW-2	12/11/2012	10-25	660.61	22.21	ND	--	638.40	638.40
NMW-3	12/11/2012	10-25	660.63	24.03	22.22	1.81	636.60	638.01
NMW-4	12/11/2012	10-25	660.99	22.70	22.67	0.03	638.29	638.31
NMW-5	12/11/2012	10-25	660.45	22.02	ND	--	638.43	638.43

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. LNAPL was bailed from monitoring wells containing >0.5-feet of LNAPL.
3. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
4. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - January 16, 2013
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	1/16/2013	10-40	657.29	18.74	ND	--	638.55	638.55
MW-2	1/16/2013	11-42	659.25	20.85	ND	--	638.40	638.40
MW-3	1/16/2013	10-48	657.34	19.72	18.71	1.01	637.62	638.41
MW-4	1/16/2013	10-44	660.21	20.04	ND	--	640.17	640.17
MW-5	1/16/2013	10.5-43	656.93	18.66	18.42	0.24	638.27	638.46
MW-6	1/16/2013	10-54.5	656.95	19.35	18.41	0.94	637.60	638.33
MW-7	1/16/2013	30-45	655.13	16.83	ND	--	638.30	638.30
MW-8	1/16/2013	30-45	654.42	16.32	ND	--	638.10	638.10
MW-9	1/16/2013	25-40	654.17	16.01	ND	--	638.16	638.16
MW-10	1/16/2013	23-38	653.57	15.49	ND	--	638.08	638.08
MW-11	1/16/2013	25-40	654.55	16.24	ND	--	638.31	638.31
MW-12	1/16/2013	10-25	659.90	21.14	ND	--	638.76	638.76
MW-13	1/16/2013	10-25	662.65	24.54	24.13	0.41	638.11	638.43
MW-14	1/16/2013	10-25	660.17	21.98	21.49	0.49	638.19	638.57
MW-15	1/16/2013	10-25	659.94	22.00	21.5	0.5	637.94	638.33
MW-16	1/16/2013	10-25	659.20	20.89	ND	--	638.31	638.31
MW-17	1/16/2013	10-25	659.23	20.94	ND	--	638.29	638.29
MW-18	1/16/2013	10-25	660.60	21.91	ND	--	638.69	638.69
MW-19	1/16/2013	10-25	658.37	20.55	19.87	0.68	637.82	638.35
MW-20	1/16/2013	10-30	659.38	20.86	ND	--	638.52	638.52
MW-21	1/16/2013	8-23	654.19	16.02	ND	--	638.17	638.17
MW-22	1/16/2013	10-25	654.07	16.18	ND	--	637.89	637.89
NMW-1	1/16/2013	10-25	662.30	23.91	23.74	0.17	638.39	638.52
NMW-2	1/16/2013	10-25	660.61	22.16	ND	--	638.45	638.45
NMW-3	1/16/2013	10-25	660.63	22.13	21.98	0.15	638.50	638.62
NMW-4	1/16/2013	10-25	660.99	22.45	ND	--	638.54	638.54
NMW-5	1/16/2013	10-25	660.45	21.83	ND	--	638.62	638.62

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. LNAPL was bailed from monitoring wells containing >0.5-feet of LNAPL.
3. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
4. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - February 20, 2013
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	2/20/2013	10-40	657.29	18.71	ND	--	638.58	638.58
MW-2	2/20/2013	11-42	659.25	20.78	ND	--	638.47	638.47
MW-3	2/20/2013	10-48	657.34	19.31	18.69	0.62	638.03	638.51
MW-4	2/20/2013	10-44	660.21	21.40	ND	--	638.81	638.81
MW-5	2/20/2013	10.5-43	656.93	18.66	18.3	0.36	638.27	638.55
MW-6	2/20/2013	10-54.5	656.95	19.15	18.31	0.84	637.80	638.46
MW-7	2/20/2013	30-45	655.13	16.83	ND	--	638.30	638.30
MW-8	2/20/2013	30-45	654.42	16.41	ND	--	638.01	638.01
MW-9	2/20/2013	25-40	654.17	15.87	ND	--	638.30	638.30
MW-10	2/20/2013	23-38	653.57	15.38	ND	--	638.19	638.19
MW-11	2/20/2013	25-40	654.55	16.13	ND	--	638.42	638.42
MW-12	2/20/2013	10-25	659.90	20.97	ND	--	638.93	638.93
MW-13	2/20/2013	10-25	662.65	24.55	24.08	0.47	638.10	638.47
MW-14	2/20/2013	10-25	660.17	21.87	21.34	0.53	638.30	638.71
MW-15	2/20/2013	10-25	659.94	21.54	21.26	0.28	638.40	638.62
MW-16	2/20/2013	10-25	659.20	20.72	ND	--	638.48	638.48
MW-17	2/20/2013	10-25	659.23	20.78	ND	--	638.45	638.45
MW-18	2/20/2013	10-25	660.60	21.76	ND	--	638.84	638.84
MW-19	2/20/2013	10-25	658.37	20.16	19.81	0.35	638.21	638.48
MW-20	2/20/2013	10-30	659.38	20.77	ND	--	638.61	638.61
MW-21	2/20/2013	8-23	654.19	15.90	ND	--	638.29	638.29
MW-22	2/20/2013	10-25	654.07	16.04	ND	--	638.03	638.03
NMW-1	2/20/2013	10-25	662.30	23.83	23.61	0.22	638.47	638.64
NMW-2	2/20/2013	10-25	660.61	22.01	ND	--	638.60	638.60
NMW-3	2/20/2013	10-25	660.63	22.43	21.69	0.74	638.20	638.78
NMW-4	2/20/2013	10-25	660.99	22.36	ND	--	638.63	638.63
NMW-5	2/20/2013	10-25	660.45	21.72	ND	--	638.73	638.73

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - April 21, 2014
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	4/21/2014	10-40	657.29	18.49	ND	--	638.80	638.80
MW-2	4/21/2014	11-42	659.25	20.59	ND	--	638.66	638.66
MW-3	4/21/2014	10-48	657.34	19.71	18.64	1.07	637.63	638.46
MW-4	4/21/2014	10-44	660.21	21.32	ND	--	638.89	638.89
MW-5	4/21/2014	10.5-43	656.93	18.72	18.31	0.41	638.21	638.53
MW-6	4/21/2014	10-54.5	656.95	18.81	18.46	0.35	638.14	638.41
MW-7	4/21/2014	30-45	655.13	16.67	ND	--	638.46	638.46
MW-8	4/21/2014	30-45	654.42	16.46	ND	--	637.96	637.96
MW-9	4/21/2014	25-40	654.17	15.74	ND	--	638.43	638.43
MW-10	4/21/2014	23-38	653.57	15.26	ND	--	638.31	638.31
MW-11	4/21/2014	25-40	654.55	16.02	ND	--	638.53	638.53
MW-12	4/21/2014	10-25	659.90	20.73	ND	--	639.17	639.17
MW-13	4/21/2014	10-25	662.65	24.43	23.86	0.57	638.22	638.66
MW-14	4/21/2014	10-25	660.17	21.97	21.34	0.63	638.20	638.69
MW-15	4/21/2014	10-25	659.94	22.19	21.16	1.03	637.75	638.55
MW-16	4/21/2014	10-25	659.20	20.61	ND	--	638.59	638.59
MW-17	4/21/2014	10-25	659.23	20.63	ND	--	638.60	638.60
MW-18	4/21/2014	10-25	660.60	21.64	ND	--	638.96	638.96
MW-19	4/21/2014	10-25	658.37	20.11	19.79	0.32	638.26	638.51
MW-20	4/21/2014	10-30	659.38	20.64	ND	--	638.74	638.74
MW-21	4/21/2014	8-23	654.19	15.79	ND	--	638.40	638.40
MW-22	4/21/2014	10-25	654.07	15.92	ND	--	638.15	638.15
NMW-1	4/21/2014	10-25	662.30	23.61	23.38	0.23	638.69	638.87
NMW-2	4/21/2014	10-25	660.61	21.86	ND	--	638.75	638.75
NMW-3	4/21/2014	10-25	660.63	22.96	21.57	1.39	637.67	638.75
NMW-4	4/21/2014	10-25	660.99	22.11	ND	--	638.88	638.88
NMW-5	4/21/2014	10-25	660.45	21.57	ND	--	638.88	638.88
SS052MW097	4/22/2014	25-30	660.36	21.46	ND	--	638.90	638.90
SS052MW125	4/22/2014	28.5-43.5	658.16	19.41	ND	--	638.75	638.75

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - December 18, 2014
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	12/18/2014	10-40	657.29	19.12	ND	--	638.17	638.17
MW-2	12/18/2014	11-42	659.25	21.09	ND	--	638.16	638.16
MW-3	12/18/2014	10-48	657.34	20.18	19.23	0.95	637.16	637.90
MW-4	12/18/2014	10-44	660.21	21.83	ND	--	638.38	638.38
MW-5	12/18/2014	10.5-43	656.93	19.12	18.76	0.36	637.81	638.09
MW-6	12/18/2014	10-54.5	656.95	19.24	18.97	0.27	637.71	637.92
MW-7	12/18/2014	30-45	655.13	17.70	ND	--	637.43	637.43
MW-8	12/18/2014	30-45	654.42	17.03	ND	--	637.39	637.39
MW-9	12/18/2014	25-40	654.17	16.28	ND	--	637.89	637.89
MW-10	12/18/2014	23-38	653.57	15.89	ND	--	637.68	637.68
MW-11	12/18/2014	25-40	654.55	16.63	ND	--	637.92	637.92
MW-12	12/18/2014	10-25	659.90	21.21	ND	--	638.69	638.69
MW-13	12/18/2014	10-25	662.65	24.97	24.39	0.58	637.68	638.13
MW-14	12/18/2014	10-25	660.17	22.47	21.81	0.66	637.70	638.21
MW-15	12/18/2014	10-25	659.94	22.75	21.99	0.76	637.19	637.78
MW-16	12/18/2014	10-25	659.20	21.28	ND	--	637.92	637.92
MW-17	12/18/2014	10-25	659.23	21.06	ND	--	638.17	638.17
MW-18	12/18/2014	10-25	660.60	22.16	ND	--	638.44	638.44
MW-19	12/18/2014	10-25	658.37	20.67	19.37	1.3	637.70	638.71
MW-20	12/18/2014	10-30	659.38	21.29	ND	--	638.09	638.09
MW-21	12/18/2014	8-23	654.19	16.39	ND	--	637.80	637.80
MW-22	12/18/2014	10-25	654.07	16.49	ND	--	637.58	637.58
NMW-1	12/18/2014	10-25	662.30	24.01	23.71	0.3	638.29	638.52
NMW-2	12/18/2014	10-25	660.61	22.29	ND	--	638.32	638.32
NMW-3	12/18/2014	10-25	660.63	23.51	22.06	1.45	637.12	638.25
NMW-4	12/18/2014	10-25	660.99	22.63	ND	--	638.36	638.36
NMW-5	12/18/2014	10-25	660.45	22.21	ND	--	638.24	638.24

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - May 4, 2015
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	5/4/2015	10-40	657.29	15.21	ND	--	642.08	642.08
MW-2	5/4/2015	11-42	659.25	17.27	ND	--	641.98	641.98
MW-3	5/4/2015	10-48	657.34	15.51	ND	--	641.83	641.83
MW-4	5/4/2015	10-44	660.21	15.07	ND	--	645.14	645.14
MW-5	5/4/2015	10.5-43	656.93	15.51	15.01	0.5	641.42	641.81
MW-6	5/4/2015	10-54.5	656.95	15.26	15.17	0.09	641.69	641.76
MW-7	5/4/2015	30-45	655.13	13.22	ND	--	641.91	641.91
MW-8	5/4/2015	30-45	654.42	12.85	ND	--	641.57	641.57
MW-9	5/4/2015	25-40	654.17	12.36	ND	--	641.81	641.81
MW-10	5/4/2015	23-38	653.57	11.86	ND	--	641.71	641.71
MW-11	5/4/2015	25-40	654.55	12.64	ND	--	641.91	641.91
MW-12	5/4/2015	10-25	659.90	17.46	ND	--	642.44	642.44
MW-13	5/4/2015	10-25	662.65	20.78	20.56	0.22	641.87	642.04
MW-14	5/4/2015	10-25	660.17	18.23	18.04	0.19	641.94	642.09
MW-15	5/4/2015	10-25	659.94	17.92	ND	--	642.02	642.02
MW-16	5/4/2015	10-25	659.20	17.24	ND	--	641.96	641.96
MW-17	5/4/2015	10-25	659.23	17.31	ND	--	641.92	641.92
MW-18	5/4/2015	10-25	660.60	18.32	ND	--	642.28	642.28
MW-19	5/4/2015	10-25	658.37	16.66	16.59	0.07	641.71	641.76
MW-20	5/4/2015	10-30	659.38	17.26	ND	--	642.12	642.12
MW-21	5/4/2015	8-23	654.19	12.39	ND	--	641.80	641.80
MW-22	5/4/2015	10-25	654.07	12.57	ND	--	641.50	641.50
MW-23	5/4/2015	10-25	662.62	20.63	ND	--	641.99	641.99
MW-24	5/4/2015	10-30	662.14	20.01	ND	--	642.13	642.13
MW-25	5/4/2015	10-25	656.88	14.53	ND	--	642.35	642.35
MW-26	5/4/2015	10-25	657.70	15.72	ND	--	641.98	641.98
MW-27	5/4/2015	10-30	658.39	16.19	ND	--	642.20	642.20
NMW-1	5/4/2015	10-25	662.30	20.39	ND	--	641.91	641.91
NMW-2	5/4/2015	10-25	660.61	18.52	ND	--	642.09	642.09
NMW-3	5/4/2015	10-25	660.63	18.54	ND	--	642.09	642.09
NMW-4	5/4/2015	10-25	660.99	18.74	ND	--	642.25	642.25
NMW-5	5/4/2015	10-25	660.45	18.21	ND	--	642.24	642.24

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 5
MONITORING WELL GAUGING SUMMARY - March 3, 2016
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Screen Interval (ft, BGS)	Measuring Point Elevation (ft, MSL)	Depth to Water (ft, BMP)	Depth to NAPL (ft, BMP)	NAPL Thickness (ft)	Water Level Elevation (ft, MSL)	Corrected Water Level Elevation (ft, MSL)
MW-1	3/3/2016	10-40	657.29	13.24	ND	--	644.05	644.05
MW-2	3/3/2016	11-42	659.25	15.29	ND	--	643.96	643.96
MW-3	3/3/2016	10-48	657.34	15.26	ND	--	642.08	642.08
MW-4	3/3/2016	10-44	660.21	14.79	ND	--	645.42	645.42
MW-5	3/3/2016	10.5-43	656.93	13.10	12.34	0.76	643.83	644.42
MW-6	3/3/2016	10-54.5	656.95	14.43	ND	--	642.52	642.52
MW-7	3/3/2016	30-45	655.13	11.37	ND	--	643.76	643.76
MW-8	3/3/2016	30-45	654.42	11.60	ND	--	642.82	642.82
MW-9	3/3/2016	25-40	654.17	10.34	ND	--	643.83	643.83
MW-10	3/3/2016	23-38	653.57	9.58	ND	--	643.99	643.99
MW-11	3/3/2016	25-40	654.55	10.66	ND	--	643.89	643.89
MW-12	3/3/2016	10-25	659.90	15.38	ND	--	644.52	644.52
MW-13	3/3/2016	10-25	662.65	18.39	ND	--	644.26	644.26
MW-14	3/3/2016	10-25	660.17	15.88	ND	--	644.29	644.29
MW-15	3/3/2016	10-25	659.94	15.66	ND	--	644.28	644.28
MW-16	3/3/2016	10-25	659.20	15.22	ND	--	643.98	643.98
MW-17	3/3/2016	10-25	659.23	15.26	ND	--	643.97	643.97
MW-18	3/3/2016	10-25	660.60	16.27	ND	--	644.33	644.33
MW-19	3/3/2016	10-25	658.37	14.43	ND	--	643.94	643.94
MW-20	3/3/2016	10-30	659.38	15.28	ND	--	644.10	644.10
MW-21	3/3/2016	8-23	654.19	10.42	ND	--	643.77	643.77
MW-22	3/3/2016	10-25	654.07	10.57	ND	--	643.50	643.50
MW-23	3/3/2016	10-25	662.62	18.28	ND	--	644.34	644.34
MW-24	3/3/2016	10-30	662.14	17.81	ND	--	644.33	644.33
MW-25	3/3/2016	10-25	656.88	12.45	ND	--	644.43	644.43
MW-26	3/3/2016	10-25	657.70	13.41	ND	--	644.29	644.29
MW-27	3/3/2016	10-30	658.39	NM	NM	--	--	--
MW-28	3/3/2016	10-30	658.08	NM	NM	--	--	--
MW-29	3/3/2016	10-25	655.08	11.20	ND	--	643.88	643.88
MW-30	3/3/2016	10-25	660.20	16.25	ND	--	643.95	643.95
NMW-1	3/3/2016	10-25	662.30	17.82	ND	--	644.48	644.48
NMW-2	3/3/2016	10-25	660.61	16.45	ND	--	644.16	644.16
NMW-3	3/3/2016	10-25	660.63	16.32	ND	--	644.31	644.31
NMW-4	3/3/2016	10-25	660.99	16.68	ND	--	644.31	644.31
NMW-5	3/3/2016	10-25	660.45	16.22	ND	--	644.23	644.23

Notes:
1. Water levels in wells containing LNAPL were corrected using an LNAPL specific gravity of 0.78 as determined from analysis of LNAPL collected at well NMW-3.
2. ND - Measurable LNAPL thickness not greater than 0.01 feet. MSL = Mean sea level.
3. BMP = Below measuring point. BGS = Below ground surface.

TABLE 6
AQUIFER TESTING RESULTS
R&H Oil/Tropicana Energy Site, San Antonio, Texas

July 2011 Testing - Manual data recordation

Well ID	Slug Test	Solution Method	Hydraulic Conductivity Test Result K, cm/sec	Average Hydraulic Conductivity K, cm/sec
MW-12	MW-12 Slug Out 1	Bouwer & Rice	8.3E-03	9.0E-03
MW-12	MW-12 Slug Out 2	Bouwer & Rice	9.7E-03	
MW-17	MW-17 Slug Out 1	Bouwer & Rice	7.4E-03	8.5E-03
MW-17	MW-17 Slug Out 2	Bouwer & Rice	9.6E-03	
MW-20	MW-20 Slug Out 1	Bouwer & Rice	2.1E-03	2.1E-03

December 2011 Testing - Pressure transducer/data logger

Well ID	Slug Test	Solution Method	Hydraulic Conductivity Test Result K, cm/sec	Average Hydraulic Conductivity K, cm/sec
MW-16	MW-16 Slug Out 1	Bouwer & Rice	6.9E-03	6.6E-03
MW-16	MW-16 Slug Out 2	Bouwer & Rice	6.6E-03	
MW-16	MW-16 Slug Out 3	Bouwer & Rice	6.4E-03	
MW-20	MW-20 Slug Out 1	Bouwer & Rice	7.5E-03	7.3E-03
MW-20	MW-20 Slug Out 2	Bouwer & Rice	7.1E-03	
NMW-5	NMW-5 Slug Out 1	Bouwer & Rice	4.2E-03	4.5E-03
NMW-5	NMW-5 Slug Out 2	Bouwer & Rice	4.8E-03	

NOTES:
1. Data analysis performed using AQTESOLV aquifer test analysis software (Duffield, 2007). Results provided in Appendix F.
2. Well hydraulic conductivity is the average of the individual slug tests performed at each well.

Well Yield Calculations

$$Q = \frac{57923 \cdot K \cdot b^2}{7.2 + \log(K \cdot b)}$$

Q = sustainable well yield in gallons per day
K = representative hyraulic conductivity in centimeters per second (above)
b = saturated thickness in feet based on water levels measured on date of test (see Table 5)

Max Q	Max K (MW-12) 0.009	b at Max K 5.7	$Q = \frac{57923 \cdot 0.009 \cdot 5.7^2}{7.2 + \log(0.009 \cdot 5.7)} =$	2866 gpd
Min Q	Min K (MW-20) 0.0021	b at Min K 10.4	$Q = \frac{57923 \cdot 0.0021 \cdot 10.4^2}{7.2 + \log(0.0021 \cdot 10.4)} =$	2375 gpd

Well yield equation from TCEQ RG-366/TRRP-8 for 4-in diameter well
TRRP well yield classification criteria - Q <150 gpd = Class 3, 150 gpd ≤ Q <144K gpd = Class 2.

TABLE 7
GROUNDWATER SAMPLING RESULTS: PHYSICAL PROPERTIES AND ATTENUATION PARAMETERS - FEBRUARY 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Temperature (C°)	pH	Dissolved Oxygen (mg/L)	Oxidation/ Reduction Potential (mV)	Conductivity (umhos/cm)	Turbidity (NTUs)	Ferrous Iron (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Sulfate (mg/L)
Off-site Wells											
MW-7	2/1/2011	20.6	6.89	0.99	-33	801	222	0.36	2.8	<0.05	37
MW-8	2/1/2011	20.3	6.74	1.17	-171	694	59	0.49	2.9	<0.05	31
MW-9	2/1/2011	19.8	6.82	1.42	-28	810	23	0.06	5.9	<0.05	34
MW-10	2/1/2011	19.8	6.86	1.22	-12	744	29	0.18	4.8	0.073J	32
MW-11	2/1/2011	20.7	6.86	1.26	-48	793	123	0.39	4.3	0.54	31

NOTES:
1. On-site wells were not sampled during the February 2011 sampling event.
2. All parameters measured using field equipment/test kits except for nitrate, nitrite and sulfate which were analyzed by a fixed laboratory.

TABLE 7
GROUNDWATER SAMPLING RESULTS: PHYSICAL PROPERTIES AND ATTENUATION PARAMETERS - JUNE 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Temperature (C°)	pH	Dissolved Oxygen (mg/L)	Oxidation/ Reduction Potential (mV)	Conductivity (umhos/cm)	Turbidity (NTUs)	Ferrous Iron (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Sulfate (mg/L)
On-site Wells											
MW-1	6/7/2011	26.4	6.51	0.79	-97	1030	4.8	3.3	<0.05	<0.05	2.6
MW-2	6/7/2011	27.1	6.44	0.71	-101	1420	15	3.3	<0.05	<0.05	0.75
MW-3	6/7/2011	30.1	6.29	0.37	-87	1620	8.21	1.67	<0.05	<0.05	10
MW-4	6/7/2011	26.9	6.54	0.62	-87	1010	8.2	1.05	<0.05	<0.05	0.92
MW-5	6/7/2011	30.1	6.38	0.49	-83	1030	9.3	2.17	<0.05	<0.05	0.78
MW-6	6/7/2011	28.2	6.34	0.53	-78	990	8.1	2.68	2	<0.05	18
MW-12	6/6/2011	29.7	6.42	0.53	-91	1180	5.9	2.16	<0.05	<0.05	2.1
MW-13	6/6/2011	29.5	6.22	0.88	36	2320	1.8	0.63	<0.05	<0.05	1000
MW-14	6/7/2011	24.6	6.56	0.75	-61	1490	3.7	1.93	<0.05	<0.05	7.7
MW-15	6/6/2011	29.4	6.57	0.55	-94	1910	8.4	2.11	<0.05	<0.05	4.6
MW-16	6/3/2011	28.7	6.56	0.5	-69	1080	6.7	2.67	<0.05	<0.05	3.5
MW-17	6/3/2011	25.7	6.63	0.74	-41	886	29	1.78	2.6	0.11J	31
MW-18	6/3/2011	24.5	6.71	0.6	-76	3430	6.9	0.79	0.075	<0.05	5.6
MW-19	6/3/2011	24.6	6.55	0.92	-44	960	5.6	1.31	1.1	0.25	27
MW-20	6/3/2011	25.4	6.78	1.25	-90	860	36	1.86	3.4	<0.05	41

NOTES:
1. Off-site wells were not sampled during the June 2011 sampling event.
2. All parameters measured using field equipment/test kits except for nitrate, nitrite and sulfate which were analyzed by a fixed laboratory.

TABLE 7
GROUNDWATER SAMPLING RESULTS: PHYSICAL PROPERTIES
AND ATTENUATION PARAMETERS - OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Temperature (C°)	pH	Dissolved Oxygen (mg/L)	Oxidation/ Reduction Potential (mV)	Conductivity (umhos/cm)	Turbidity (NTUs)	Ferrous Iron (mg/L)
On-site Wells								
MW-1	10/12/2011	25.4	6.84	1.4	-141	1270	29	3.3
MW-2	10/12/2011	25.1	6.73	0.92	-125	1630	24	2.81
MW-3	10/12/2011	25.5	6.86	1.25	-110	1680	7.9	2.08
MW-4	10/12/2011	25.7	6.97	1.36	-122	1350	9.1	1.51
MW-5	10/12/2011	25.4	6.85	0.93	-129	1510	22	3.13
MW-6	10/12/2011	26.5	6.75	1.34	-127	1240	8.9	1.97
MW-12	10/12/2011	25.4	6.85	0.95	-127	1450	53	2.56
MW-13	10/12/2011	25.7	6.77	1.12	-128	1350	9.3	3.3
MW-14	10/12/2011	25.3	6.88	1.16	-143	1780	9.6	3.18
MW-16	10/11/2011	27.4	6.52	1.02	-136	1480	33	2.61
MW-17	10/11/2011	25.4	6.64	1.16	-141	1170	32	2.39
MW-18	10/12/2011	24.9	6.84	0.95	-107	1390	12	2.96
MW-19	10/12/2011	25.7	6.85	0.96	-98	1150	8.3	2.42
MW-20	10/12/2011	25.5	6.86	1.18	-47	1270	23	1.17
Off-site Wells								
MW-7	10/13/2011	25.7	6.93	0.92	-52	960	24	0.66
MW-8	10/13/2011	26.1	6.87	0.93	-152	670	30	1.64
MW-9	10/13/2011	25.6	6.85	1.17	-117	1360	8.9	0.3
MW-10	10/13/2011	25.2	6.84	0.92	-110	1530	8.7	0.22
MW-11	10/13/2011	25.6	6.83	1.05	-110	1650	7.9	0.34

Notes:
1. Attenuation parameters (nitrate, nitrite, and sulfate) were not measured during the October 2011 sampling event.
2. All parameters measured using field equipment/test kits.

TABLE 7
GROUNDWATER SAMPLING RESULTS: PHYSICAL PROPERTIES
AND ATTENUATION PARAMETERS - MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Temperature (C°)	pH	Dissolved Oxygen (mg/L)	Oxidation/ Reduction Potential (mV)	Conductivity (umhos/cm)	Turbidity (NTUs)
On-site Wells							
MW-1	5/11/2012	23.7	7.17	0.75	-86	1269	17
MW-2	5/10/2012	24.1	7.14	0.48	-159	1172	11
MW-3	5/10/2012	25.2	6.94	0.68	-90	1073	7.1
MW-4	5/9/2012	23.7	7.04	0.15	-355	1158	16
MW-5	5/11/2012	24.2	6.89	0.95	-142	966	7.1
MW-6	5/11/2012	24.7	6.75	0.83	-107	1043	7.5
MW-12	5/10/2012	24.9	6.97	0.53	-113	983	7.1
MW-14	5/10/2012	22.9	6.91	1.06	-138	1806	51
MW-15	5/10/2012	24.7	7.08	0.32	-127	1169	11
MW-16	5/10/2012	24.3	7.03	0.3	-127	1662	77
MW-17	5/10/2012	23.4	6.9	0.91	-240	967	57
MW-18	5/9/2012	25.1	7.14	0.11	-184	5442	24
MW-19	5/10/2012	23.5	7.05	1.17	-230	936	37
MW-20	5/9/2012	25	7.17	0.59	-181	1028	36
Off-site Wells							
MW-7	5/11/2012	24.8	7.18	0.63	-177	939	9.6
MW-8	5/11/2012	24.7	6.91	0.37	-92	881	9.1
MW-9	5/9/2012	25.5	7.23	0.42	-128	902	16
MW-10	5/11/2012	23.7	7.19	0.86	-136	1137	7.7
MW-11	5/11/2012	23.9	7.17	0.88	-137	1038	8.7
MW-21	5/9/2012	25.2	7.26	1.22	-114	1226	15
MW-22	5/9/2012	25.2	7.14	1.44	-97	924	11

Notes:
1. Attenuation parameters (ferrous iron, nitrate, nitrite, and sulfate) were not measured during the May 2012 sampling event.
2. All parameters measured using field equipment/test kits.

TABLE 7
GROUNDWATER SAMPLING RESULTS: PHYSICAL PROPERTIES AND ATTENUATION PARAMETERS - APRIL 2014
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Temperature (C°)	pH	Dissolved Oxygen (mg/L)	Oxidation/ Reduction Potential (mV)	Conductivity (umhos/cm)	Ferrous Iron (mg/L)	Nitrate as N (mg/L)	Sulfate (mg/L)	Manganese (mg/L)	Methane (mg/L)
On-site Wells											
MW-1	4/22/2014	24.6	6.63	0.12	-117	1170	2.36	<0.32	1.2	0.29	1.4
MW-2	4/23/2014	23.8	6.6	0.14	-71	1470	nm	nm	nm	nm	nm
MW-3	4/24/2014	24.5	6.62	0.97	-137	550	1.99	<1.9	31	0.7	nm
MW-4	4/23/2014	23.6	6.68	0.16	-54	960	nm	nm	nm	nm	nm
MW-5	4/24/2014	24.1	6.41	0.23	-249	1350	nm	nm	nm	nm	nm
MW-6	4/24/2014	24.2	6.59	1.51	-228	850	1.05	4.2	32	0.16	nm
MW-12	4/23/2014	24.4	6.48	0.48	-53	1470	nm	nm	nm	nm	nm
MW-13*	4/24/2014	23.6	6.41	4.06	-77	1560	nm	nm	nm	nm	nm
MW-14*	4/24/2014	22.9	6.63	0.73	-7	1760	2.41	<0.31	<0.083	0.97	2.4
MW-15*	4/23/2014	23.8	6.77	0.43	-71	2190	nm	nm	nm	nm	nm
MW-16	4/23/2014	24.7	6.6	0.14	-99	1310	nm	nm	nm	nm	nm
MW-17	4/23/2014	24.8	6.54	0.21	-82	960	nm	nm	nm	nm	nm
MW-18	4/23/2014	23.1	6.74	0.21	-86	4550	nm	nm	nm	nm	nm
MW-19*	4/24/2014	23.4	6.64	0.51	-51	2680	2.13	0.5	23	1.2	2.7
MW-20	4/22/2014	25.6	6.65	0.46	-17	980	0.22	3	39	0.076	<0.00036
Off-site Wells											
MW-7	4/23/2014	25.3	6.67	0.33	-11	860	nm	nm	nm	nm	nm
MW-8	4/23/2014	27.1	6.75	0.56	-80	850	nm	nm	nm	nm	nm
MW-9	4/23/2014	25.5	6.68	1.69	-5.2	850	nm	nm	nm	nm	nm
MW-10	4/23/2014	24.8	6.91	1.76	-12	650	nm	nm	nm	nm	nm
MW-11	4/23/2014	25.6	6.67	3.12	-4.8	840	nm	nm	nm	nm	nm
MW-21	4/22/2014	25	6.57	0.1	-110	1210	1.52	0.52	19	0.41	0.37
MW-22	4/22/2014	25.7	6.56	0.45	-1.6	920	0.11	4.1	41	0.097	<0.00036
Kelly Air Force Base Wells											
SS052MW097	4/22/2014	24.8	6.42	0.28	-124	970	0.45	0.74	7.8	1.2	0.51
SS052MW125	4/22/2014	24.2	6.37	1.01	-22	810	0.22	6.1	40	0.0082 J	<0.00036

NOTES:
1. * = Well was pumped dry or attempted to be pumped dry to evacuate LNAPL from well prior to sampling.
   Wells pumped dry were sampled the following day by collecting a grab sample.
2. nm = Not measured.
3. All parameters measured using field equipment/test kits except for nitrate, sulfate, manganese, and methane which were analyzed at a fixed laboratory.

TABLE 7
GROUNDWATER SAMPLING RESULTS: PHYSICAL PROPERTIES
AND ATTENUATION PARAMETERS - MAY 2015
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	Date	Temperature (C°)	pH	Dissolved Oxygen (mg/L)	Oxidation/ Reduction Potential (mV)	Conductivity (umhos/cm)	Turbidity (NTUs)
On-site Wells							
MW-1	5/4/2015	24.2	6.89	0.71	-136	1590	6.7
MW-2	5/4/2015	24.3	6.9	1.04	-152	1690	14
MW-3	5/6/2015	24	6.91	0.44	-142	1160	8.5
MW-4	5/4/2015	25	6.87	0.62	-121	1150	9.6
MW-5	5/6/2015	26.3	6.83	0.56	-121	3070	12
MW-6	5/6/2015	25.4	6.8	0.51	-168	1190	37
MW-12	5/4/2015	25.9	6.67	0.58	-120	1720	14
MW-13	5/6/2015	25.2	6.69	0.41	-117	2080	52
MW-14	5/6/2015	25	6.84	1.62	-187	2740	46
MW-15	5/6/2015	23.8	7.02	0.5	-131	3090	34
MW-16	5/6/2015	22.6	7.03	0.8	-133	2040	29
MW-17	5/4/2015	26.5	6.74	0.57	-172	1520	6.9
MW-18	5/4/2015	24.9	7.02	0.59	-151	7070	7.9
MW-19	5/6/2015	26.1	6.91	0.33	-192	1730	12
MW-20	5/4/2015	25.4	6.86	0.81	-12	1740	8.4
MW-23	5/6/2015	25	6.83	0.47	-101	3110	77
MW-24	5/6/2015	23.5	7.11	0.66	-27	1470	141
Off-site Wells							
MW-7	5/5/2015	25.5	6.94	0.64	28	1210	5.1
MW-8	5/5/2015	25.6	7.04	4.64	-28	1160	36
MW-9	5/5/2015	24.7	7.02	1.46	31	1210	3.7
MW-10	5/5/2015	24.5	7.2	2.9	64	948	2.1
MW-11	5/5/2015	22.4	7.01	1.68	78	1210	2.7
MW-21	5/5/2015	24.1	6.97	0.54	-142	1770	1.2
MW-22	5/5/2015	25.2	7.08	1.22	51	1000	3.9
MW-25	5/5/2015	25.4	6.96	3.87	-56	1630	39
MW-26	5/5/2015	24.9	6.92	0.53	-54	1920	5.6
MW-27	5/4/2015	23.1	6.79	1.43	-37	1510	11
SS052MW097	5/5/2015	23	7.01	0.64	-101	1240	9.2
SS052MW125	5/5/2015	22.9	7.03	1.53	85	1190	1.6

Notes:
1. nm = Not measured.
2. Attenuation parameters (ferrous iron, nitrate, nitrite, and sulfate) were not measured during the May 2015 sampling event.
3. All parameters measured using field equipment/test kits.

TABLE 8
ON-SITE SOIL SAMPLING RESULTS: TOTAL PETROLEUM HYDROCARBONS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	**TRRP**	R&H Oil West Side								R&H Oil East Side								Tropicana				
Sample Location:	**PCL**	MW-12	MW-14	NMW-3	SB-1	SB-2	SB-3	SB-4	SB-5	NMW-1	NMW-1	NMW-2	MW-15	MW-13	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:		5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	2/20/2014	2/20/2014	5/23/2011	2/20/2014	5/24/2011	5/24/2011	5/24/2011	2/20/2014	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																						
Sample Interval (ft bgs):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	-	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
TX 1006 Analysis																						
>C10-C12 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.78	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C10-C12 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.53	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C12-C16 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	**19**	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C12-C16 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.7	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C16-C21 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	**66**	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C16-C21 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	**43**	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C21-C35 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	**260**	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C21-C35 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	**220**	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C6-C8 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.82	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C7-C8 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 1.1	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C8-C10 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.85	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
>C8-C10 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 2.2	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
nC6 Aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.86	NA	NA	NA	NS	NA	NA	NA	NA	NA	NA	NA
TX 1005 Analysis																						
C6-C12		<5	<4.7	<5	<4.5	<15	<13	4	4	<97	<4	<28	<49	<5.3	NS	<47	<4.7	<4.8	<4.7	<5.4	<5	<5.1
>C12-C28		**500**	<6.1	<6.4	**130**	**2,400**	**1,400**	**100**	**31**	**5,500**	**220**	**3,000**	**4,100**	**130**	NS	**5,500**	**330**	<6.2	<6.1	<7	<6.5	<6.7
>C28-C35		**870**	<9.6	<10	**380**	**2,400**	**1,700**	**190**	**130**	**6,500**	**350**	**2,600**	**3,900**	**87**	NS	**4,600**	**340**	<9.9	<9.7	<11	<10	<11
C6-C35 (Total)	2,270	**1,400**	<9.6	<10	**510**	**4,800**	**3,000**	**290**	**160**	**12,000**	**580**	**5,600 J**	**8,000 J**	**210 J**	NS	**10,000**	**680**	<9.9	<9.7	<11	<10	<11
Shallow Soil																						
Sample Interval (ft bgs):		4-5	3-5	3-4	-	-	-	3-4	3-4	3-4	-	2-3	2-3	3-4	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
TX 1006 Analysis																						
>C10-C12 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**1,600**	NA	NA	NA	NA	NA	NA	NA
>C10-C12 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	< 39	NA	NA	NA	NA	NA	NA	NA
>C12-C16 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**15,000**	NA	NA	NA	NA	NA	NA	NA
>C12-C16 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**2,000**	NA	NA	NA	NA	NA	NA	NA
>C16-C21 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**13,000**	NA	NA	NA	NA	NA	NA	NA
>C16-C21 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**6,900**	NA	NA	NA	NA	NA	NA	NA
>C21-C35 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**13,000**	NA	NA	NA	NA	NA	NA	NA
>C21-C35 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**16,000**	NA	NA	NA	NA	NA	NA	NA
>C6-C8 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	< 62	NA	NA	NA	NA	NA	NA	NA
>C7-C8 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	**110 J**	NA	NA	NA	NA	NA	NA	NA
>C8-C10 aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	< 64	NA	NA	NA	NA	NA	NA	NA
>C8-C10 aromatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	< 170	NA	NA	NA	NA	NA	NA	NA
nC6 Aliphatics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NA	NA	NA	< 65	NA	NA	NA	NA	NA	NA	NA
TX 1005 Analysis																						
C6-C12		<5.4	<6.3	<5.9	NS	NS	NS	< 710	< 4.5	<59	NS	<660	<64	<750	**2,300**	<61	<5.8	<5.4	<58	<5.3	<5.7	<5.3
>C12-C28		<7	<8.1	**640 J+**	NS	NS	NS	**110,000**	**280**	**4,000**	NS	**48,000 J**	**5,400**	**70,000**	**53,000**	**3,200**	<7.5	<7.1	**3,600**	**390**	<7.4	<6.9
>C28-C35		<11	<13	**580 J+**	NS	NS	NS	**57,000**	**280**	**3,500**	NS	**22,000 J**	**1,500**	**22,000**	**20,000**	<120	<12	<11	**1,800**	**170**	<12	<11
C6-C35 (Total)	2,270	<11	<13	**1,200 J**	NS	NS	NS	**170,000**	**560**	**7,500**	NS	**70,000 J**	**6,800 J**	**92,000**	**76,000**	**3,200**	<12	<11	**5,400 J**	**560 J**	<12	<11
Deep Soil																						
Sample Interval (ft bgs):		11-12	20-22	18-20	-	-	-	-	-	14-15	-	19-20	14-15	12-13	-	24-25	21-22	17-18	13-14	19-20	16-17	17-18
TX 1005 Analysis																						
C6-C12		**170**	**630**	**3,800**	NS	NS	NS	NS	NS	**1,100 J+**	NS	<5.4	**1,400**	**2,300**	NS	**41**	**460 J+**	**1,200**	**420**	**340**	**2,500**	**89**
>C12-C28		<6.9	**87**	<140	NS	NS	NS	NS	NS	**950 J+**	NS	**700 J+**	**2,200**	**630**	NS	**270**	**760 J+**	**980**	**210**	**1,900**	**1,300**	**120**
>C28-C35		<11	<12	<220	NS	NS	NS	NS	NS	**420 J+**	NS	**210 J+**	**500**	<110	NS	<11	**95 J+**	<54	<11	<55	<110	<11
C6-C35 (Total)	2,270	**170**	**720**	**3,800 J**	NS	NS	NS	NS	NS	**2,500 J+**	NS	**910**	**4,100**	**2,900 J**	NS	**310**	**1,300 J+**	**2,200**	**630 J**	**2,300 J**	**3,800**	**210**

NOTES:
1. All units are mg/kg.
2. Samples analyzed for TPH by Texas TPH Method TX1005, and aliphatic/aromatic fractionation by Method TX1006.
3. TRRP PCL calculated using TCEQ Tier 1 PCL Calculator. Highlighted values exceed the TRRP PCL.
4. Detected compounds are presented in **bold** type.
5. < = Compound not detected at the indicated laboratory detection limit. J = Estimated value. J+ = Estimated value with a potential high bias.
6. bgs = Below ground surface. NS =Not sampled.

TABLE 9
ON-SITE SOIL SAMPLING RESULTS: METALS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	Representative	R&H Oil West Side									R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	Background	MW-12	MW-14	NMW-3	SB-1	SB-2	SB-2[6]	SB-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value[3]	Value	5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	10/24/2012	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																						
Sample Interval (ft bgs):			0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Aluminum	64,000	30,000	**8,400**	**620**	**720**	**9600**	**9300**	**7700**	**8200**	**21,000**	**3,700**	**6,300**	**4,800**	**5,300**	**14,000**	**960**	**1,500**	**5,300**	**950**	**10,000**	**5,100**	**10,000**
Arsenic	0.68	6.3	**4.8**	**0.51**	**0.77**	**4.1**	**7.9**	**6.6**	**6**	**7.6**	**4**	**4.3**	**3.8**	**5.6**	**5.8**	**1.4**	**4.3**	**2.8**	**1.2**	**5.2**	**2.7**	**4.5**
Barium	220	300	**96**	**8.5**	**16**	**120**	**200**	**190**	**120**	**70**	**35**	**85**	**71**	**77**	**230**	**11**	**33**	**60**	**12**	**93**	**59**	**88**
Chromium	1,200	43.16	**16**	**2**	**1.9**	**13**	**17**	**13**	**12**	**16**	**12**	**9.6**	**15**	**11**	**12**	**2.7**	**6.7**	**6.6**	**1.8**	**13**	**8.7**	**20**
Cobalt	23	9.93	**6**	**0.51**	**0.87**	**4**	**3.7**	**3.0**	**3.7**	**6.7**	**3.4**	**4.2**	**4.8**	**5.5**	**5.1**	**6.5**	**1.5**	**2.9**	**1.1**	**4.3**	**2.3**	**4.5**
Copper	520	30.22	**18**	**2.1**	**1.5**	**49 J**	**35 J**	**30**	**21 J**	**12**	**8.9**	**12**	**14**	**22**	**8.9**	**9.9**	**8.2**	**8.3**	**2.8**	**14**	**11**	**24**
Lead	1.5	33.1	**83**	**2.9**	**3.1**	**69**	**430**	**360**	**160**	**17**	**35**	**52**	**49**	**110**	**69**	**18**	**55**	**31**	**2.9**	**100**	**36**	**44**
Manganese	580	506.5	**170**	**28**	**90**	**270**	**190**	**160**	**220**	**220**	**150**	**170**	**120**	**280**	**260**	**33**	**110**	**220**	**45**	**240**	**160**	**230**
Mercury	0.0039	0.04	**0.22**	**0.0035**	**0.0037**	**0.098**	**0.37**	**0.41 J**	**0.27**	**0.0091 J**	**0.044 J-**	**0.08**	**0.15**	**0.055**	**0.024**	**0.018**	**0.03**	**0.051**	**0.0091**	**0.094**	**0.097**	**0.17**
Nickel	79	22.68	**7.6**	**0.99**	**1.4**	**8.3**	**10**	**8.1**	**8.4**	**13**	**5.8**	**8.4**	**6.4**	**8.5**	**8.6**	**3.3**	**3.1**	**6.5**	**3.1**	**8.5**	**6**	**17**
Selenium	1.1	0.3	<0.28	<0.25	<0.27	<0.29	<0.34	<0.34	<0.28	< 0.26	< 0.27	<0.26	<0.29	<0.27	<0.28	<0.26	<0.25	<0.27	<0.25	<0.28	<0.27	<0.27
Thallium	0.78	0.51	<0.3	<0.27	<0.29	<0.31	<0.36	<0.36	<0.3	**1.3 J**	< 0.29	<0.28	<0.31	<0.29	<0.3	<0.28	<0.26	<0.29	<0.27	<0.3	<0.29	<0.29
Vanadium	75	56.91	**17**	**3.3**	**3.1**	**16**	**20**	**17**	**20**	**25**	**8.7 J**	**18**	**12**	**16**	**25**	**5.6**	**9.3**	**13**	**5.6**	**19**	**13**	**20**
Zinc	1,200	73	**130**	**5**	**3.9**	**190**	**360**	**300**	**190**	**54**	**41**	**52**	**88**	**98**	**45**	**110**	**60**	**42**	**6.6**	**61**	**65**	**68**
Shallow Soil																						
Sample Interval (ft bgs):			4-5	3-5	3-4	-	-	-	-	3-4	3-4	3-4	2-3	2-3	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
Aluminum	64,000	30,000	**14,000**	**13,000**	**16,000**	NS	NS	NS	NS	**7,300**	**25,000**	**16,000**	**14,000**	**16,000**	**2,200**	**13,000**	**17,000**	**12,000**	**17,000**	**16,000**	**16,000**	**12,000**
Arsenic	0.68	6.3	**3.6**	**3.8**	**4.3**	NS	NS	NS	NS	**3.8**	**4.2**	**4.4**	**3.1**	**5.3**	**5.4**	**3.5**	**5.1**	**4**	**4.2**	**2.7**	**3.4**	**4.8**
Barium	220	300	**130**	**100**	**92**	NS	NS	NS	NS	**53**	**95**	**110**	**130**	**68**	**170**	**110**	**110**	**90**	**100**	**90**	**100**	**91**
Chromium	1,200	43.16	**12**	**11**	**14**	NS	NS	NS	NS	**3.6**	**29**	**11**	**11**	**13**	**2**	**11**	**14**	**10**	**14**	**13**	**13**	**10**
Cobalt	23	9.93	**4.9**	**5.3**	**5.1**	NS	NS	NS	NS	**1**	**5.9**	**7.2**	**4.7**	**5.8**	**1.3**	**5.7**	**5.1**	**4.9**	**5.1**	**4.6**	**5.2**	**3.8**
Copper	520	30.22	**9.2**	**8.6**	**11**	NS	NS	NS	NS	**13**	**24**	**9.9**	**8.5**	**9.4**	**18**	**8.6**	**9.1**	**9.1**	**12**	**12**	**9.2**	**11**
Lead	1.5	33.1	**13**	**11**	**44**	NS	NS	NS	NS	**15**	**66**	**17**	**12**	**13**	**20**	**12**	**12**	**270**	**140**	**33**	**12**	**30**
Manganese	580	506.5	**320**	**390**	**250**	NS	NS	NS	NS	**14**	**240**	**190**	**230**	**210**	**27**	**280**	**230**	**350**	**220**	**190**	**330**	**180**
Mercury	0.0039	0.04	**0.0067**	**0.0068**	**0.2**	NS	NS	NS	NS	**0.0097 J**	**0.19 J-**	**0.013**	**0.0072**	**0.0083**	**0.017**	**0.0033**	**0.0061**	**0.0072**	**0.015**	**0.45**	**0.0026**	**0.031**
Nickel	79	22.68	**9**	**9.6**	**11**	NS	NS	NS	NS	**3.1**	**13**	**12**	**12**	**11**	**6.1**	**9.4**	**11**	**9.5**	**11**	**14**	**10**	**8.9**
Selenium	1.1	0.3	<0.29	<0.33	<0.32	NS	NS	NS	NS	< 0.31	< 0.3	<0.33	<0.36	<0.34	0.71	<0.33	<0.32	<0.3	<0.31	<0.29	<0.31	<0.28
Thallium	0.78	0.51	<0.31	<0.36	<0.34	NS	NS	NS	NS	< 0.33	< 0.32	<0.35	<0.38	<0.37	<0.43	<0.36	<0.34	<0.32	<0.33	<0.31	<0.33	<0.3
Vanadium	75	56.91	**23**	**16**	**21**	NS	NS	NS	NS	**8.9 J**	**24 J**	**18**	**24**	**26**	**4.2**	**17**	**24**	**36**	**21**	**23**	**25**	**31**
Zinc	1,200	73	**32**	**25**	**35**	NS	NS	NS	NS	**13**	**66**	**60**	**30**	**30**	**8.3**	**30**	**30**	**23**	**40**	**110**	**30**	**31**
Deep Soil																						
Sample Interval (ft bgs):			11-12	20-22	18-20	-	-	-	-	17-18	15-16	14-15	19-20	14-15	12-13	24-25	21-22	17-18	13-14	19-20	16-17	17-18
Aluminum	64,000	30,000	**8,300**	**8,100**	**7,400**	NS	NS	NS	NS	**12,000**	**11,000**	**7,200**	**11,000**	**7,100**	**10,000**	**5,400**	**9,300**	**6,700**	**9,800**	**7,800**	**6,800**	**8,300**
Arsenic	0.68	6.3	**4.6**	**5.3**	**5.5**	NS	NS	NS	NS	**5.6**	**4.8**	**2.7**	**15**	**4.9**	**3.1**	**3.3**	**2.6**	**2.4**	**4.3**	**5.5**	**6.7**	**4.7**
Barium	220	300	**43**	**41**	**50**	NS	NS	NS	NS	**42**	**38**	**71**	**71**	**43**	**48**	**40**	**65**	**52**	**120**	**52**	**41**	**56**
Chromium	1,200	43.16	**8.8**	**7.8**	**8.7**	NS	NS	NS	NS	**11**	**9.1**	**6.8**	**9.9**	**7.9**	**9.8**	**7.3**	**9**	**7.3**	**9.8**	**7.4**	**7.2**	**9.6**
Cobalt	23	9.93	**3.2**	**3.5**	**1.8**	NS	NS	NS	NS	**3.9**	**3.3**	**3**	**18**	**1.7**	**3**	**2**	**2.9**	**2**	**2.6**	**3.6**	**3**	**3.3**
Copper	520	30.22	**4.6**	**6.5**	**4.6**	NS	NS	NS	NS	**4.7**	**4.5**	**4.8**	**5.5**	**5.9**	**3.7**	**3.6**	**4.8**	**3.6**	**4.2**	**5.6**	**7.1**	**7.8**
Lead	1.5	33.1	**9.5**	**7.9**	**7.1**	NS	NS	NS	NS	**9.8**	**9.8**	**9.6**	**6.8**	**16**	**7.4**	**4.7**	**6.4**	**10**	**7.1**	**6.5**	**13**	**8.5**
Manganese	580	506.5	**150**	**190**	**180**	NS	NS	NS	NS	**180**	**250**	**210**	**180**	**140**	**190**	**140**	**220**	**160**	**260**	**200**	**120**	**220**
Mercury	0.0039	0.04	**0.0028**	<0.0018	<0.0018	NS	NS	NS	NS	<0.0039 J	<0.0038 J	<0.0017	<0.0018	<0.0018	<0.0019	<0.0018	<0.002	**0.0024**	<0.0019	**0.0028**	**0.0021**	**0.0064**
Nickel	79	22.68	**6**	**7.5**	**4.9**	NS	NS	NS	NS	**6.8**	**6.9**	**5.5**	**16**	**4.7**	**6.4**	**3.7**	**6.5**	**4.2**	**6.2**	**6.3**	**6.1**	**5.9**
Selenium	1.1	0.3	<0.29	<0.3	<0.29	NS	NS	NS	NS	<0.28	<0.28	<0.29	<0.29	<0.29	<0.29	<0.29	<0.31	<0.28	<0.29	<0.28	<0.3	<0.29
Thallium	0.78	0.51	<0.31	<0.32	<0.31	NS	NS	NS	NS	<0.3	<0.3	<0.31	<0.31	<0.31	<0.31	<0.31	<0.33	<0.3	<0.31	<0.3	<0.32	<0.31
Vanadium	75	56.91	**14**	**22**	**18**	NS	NS	NS	NS	**22**	**19 J**	**19**	**18**	**18**	**11**	**9.9**	**11**	**8.2**	**15**	**19**	**31**	**21**
Zinc	1,200	73	**17**	**17**	**16**	NS	NS	NS	NS	**24**	**22**	**14**	**19**	**15**	**17**	**11**	**21**	**13**	**17**	**17**	**16**	**19**

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value. Yellow shading indicates the EEV exceedance is less than the background value.
5. < = Compound not detected at the indicated laboratory detection limit. bgs = Below ground surface. NS = Not sampled.
6. Sample SB-2 collected on 10/24/2012 was re-analyzed to confirm originally reported concentrations.

TABLE 10
ON-SITE SOIL SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	R&H Oil West Side								R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	MW-12	MW-14	NMW-3	SB-1	SB-2	SB-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																				
Sample Interval (ft bgs):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
1,1,1,2-Tetrachloroethane	0.71	<0.0016	<0.0015	<0.0015 J	<0.0027	<0.0026	<0.0022	< 0.002	< 0.0022	<0.0026	<0.0014	<0.0016 J	<0.0023 J	<0.0023	<0.0017	<0.0028	<0.0016 J	<0.0018 J	<0.0021	<0.0014
1,1,1-Trichloroethane	0.81	<0.00086	<0.0008	<0.00079	<0.0014	<0.0014	<0.0012	< 0.0011	< 0.0012	<0.0014	<0.00073	<0.00084	<0.0012	<0.0012	<0.00088	<0.0015	<0.00084	<0.00094	<0.0011	<0.00072
1,1,2,2-Tetrachloroethane	0.012	0.001	<0.00094	<0.00093 J	<0.0017	<0.0016 J	<0.0014 J	< 0.0013	< 0.0014	<0.0016 J	<0.00085	<0.00098 J	<0.0014 J	<0.0014	<0.001 J	<0.0018	<0.00099 J	<0.0011 J	<0.0013	<0.00084
1,1,2-Trichloroethane	0.01	<0.00084	<0.00079	<0.00078 J	<0.0014	<0.0013	<0.0011	< 0.0011	< 0.0011	<0.0014	<0.00072	<0.00082 J	<0.0012 J	<0.0012	<0.00087	<0.0015	<0.00083 J	<0.00093 J	<0.0011	<0.00071
1,1-Dichloroethane	3.6	<0.001	<0.00094	<0.00093	<0.0017	<0.0016	<0.0014	< 0.0013	< 0.0014	<0.0016	<0.00085	<0.00098	<0.0014	<0.0014	<0.001	<0.0018	<0.00099	<0.0011	<0.0013	<0.00084
1,1-Dichloroethene	0.025	<0.0014	<0.0013	<0.0013	<0.0023	<0.0022	<0.0019	< 0.0018	< 0.0019	<0.0023	<0.0012	<0.0014	<0.002	<0.002	<0.0015	<0.0025	<0.0014	<0.0016	<0.0018	<0.0012
1,1-Dichloropropene	0.067	<0.00075	<0.0007	<0.00069 J	<0.0012	<0.0012	<0.001	< 0.00094	< 0.001	<0.0012	<0.00064 J	<0.00073 J	<0.0011 J	<0.0011	<0.00078	<0.0013	<0.00074 J	<0.00083 J	<0.00095	<0.00063
1,2,3-Trichloropropane	0.00027	<0.0015 J	<0.0014	<0.0014	<0.0025	<0.0024 J	<0.0021 J	< 0.0019	< 0.002	<0.0024 J	<0.0013	<0.0015	<0.0021	<0.0022	<0.0016 J	<0.0027	<0.0015	<0.0017	<0.0019	<0.0013
1,2,4-Trichlorobenzene	2.4	<0.0023 J	<0.0021	<0.0021 J	<0.0038 J	<0.0036 J	<0.0031 J	< 0.0029	< 0.0031	<0.0037 J	<0.0019 J	<0.0022 J	<0.0032 J	<0.0032	<0.0024 J	<0.004	<0.0022 J	<0.0025 J	<0.0029	<0.0019
1,2,4-Trimethylbenzene	24	<0.0013	<0.001	<0.00098 J	<0.0018	<0.0017 J	<0.0014 J	< 0.0013	< 0.0014	<0.0017 J	<0.0009	<0.001 J	<0.0015 J	<0.0015	**0.0011 J**	<0.0019	<0.001 J	<0.0012 J	<0.0014	<0.00089
1,2-Dibromo-3-Chloropropane	0.00087	<0.0028 J	<0.0026	<0.0026 J	<0.0046	<0.0045 J	<0.0038 J	< 0.0035	< 0.0038	<0.0045 J	<0.0024	<0.0028 J	<0.004 J	<0.004	<0.0029 J	<0.0049	<0.0028 J	<0.0031 J	<0.0036	<0.0024
1,2-Dibromoethane	0.0001	<0.0012	<0.0011	<0.0011	<0.0019	<0.0019	<0.0016	< 0.0015	< 0.0016	<0.0019 J	<0.001	<0.0012	<0.0017	<0.0017	<0.0012	<0.0021	<0.0012	<0.0013	<0.0015	<0.00099
1,2-Dichlorobenzene	8.9	<0.00093 J	<0.00087	<0.00085 J	<0.0015	<0.0015 J	<0.0013 J	< 0.0012	< 0.0012	<0.0015 J	<0.00078 J	<0.0009 J	<0.0013 J	<0.0013	<0.00096 J	<0.0016	<0.00091 J	<0.001 J	<0.0012	<0.00077
1,2-Dichloroethane	0.007	<0.001	<0.00098	<0.00096	<0.0017	<0.0016	<0.0014	< 0.0013	< 0.0014	<0.0017	<0.00088	<0.001	<0.0015	<0.0015	<0.0011	<0.0018	<0.001	<0.0011	<0.0013	<0.00087
1,2-Dichloropropane	0.011	<0.00082	<0.00077	<0.00076	<0.0014	<0.0013	<0.0011	< 0.001	< 0.0011	<0.0013	<0.0007	<0.0008	<0.0012	<0.0012	<0.00085	<0.0014	<0.00081	<0.0009	<0.001	<0.00069
1,3,5-Trimethylbenzene	27	<0.0019 J	<0.0017	<0.0017 J	<0.003	<0.0029 J	<0.0025 J	< 0.0023	< 0.0025	<0.003 J	<0.0016 J	<0.0018 J	<0.0026 J	<0.0026	<0.0019 J	<0.0032	<0.0018 J	<0.002 J	<0.0023	<0.0015
1,3-Dichlorobenzene	3.4	<0.00082 J	<0.00077	<0.00076 J	<0.0014	<0.0013 J	<0.0011 J	< 0.001	< 0.0011	<0.0013 J	<0.0007 J	<0.0008 J	<0.0012 J	<0.0012	<0.00085 J	<0.0014	<0.00081 J	<0.0009 J	<0.001	<0.00069
1,3-Dichloropropane	0.032	<0.00073	<0.00068	<0.00067	<0.0012	<0.0011	<0.00099	< 0.00092	< 0.00098	<0.0012	<0.00062	<0.00071	<0.001	<0.001	<0.00075	<0.0013	<0.00072	<0.0008	<0.00093	<0.00061
1,4-Dichlorobenzene	1.1	<0.00076 J	<0.00072	<0.0007 J	<0.0013	<0.0012 J	<0.001 J	< 0.00096	< 0.001	<0.0012 J	<0.00065 J	<0.00075 J	<0.0011 J	<0.0011	<0.00079 J	<0.0013	<0.00075 J	<0.00084 J	<0.00097	<0.00064
2,2-Dichloropropane	0.06	<0.0021	<0.002	<0.0019	<0.0035 J	<0.0033 J	<0.0029 J	< 0.0026	< 0.0028	<0.0034	<0.0018	<0.0021	<0.003	<0.003	<0.0022	<0.0037	<0.0021	<0.0023	<0.0027	<0.0018
2-Butanone (MEK)	15	<0.0022	<0.0021	<0.002	<0.0036	<0.0035	<0.003	**0.018**	< 0.003	<0.0035 J	<0.0019	<0.0021	<0.0031	<0.0031	<0.0023	<0.0039	<0.0022	<0.0024	<0.0028	<0.0018
2-Chlorotoluene	4.5	<0.00079 J	<0.00074	<0.00072 J	<0.0013	<0.0012 J	<0.0011 J	< 0.00099	< 0.0011	<0.0013 J	<0.00067 J	<0.00077 J	<0.0011 J	<0.0011	<0.00081 J	<0.0014	<0.00078 J	<0.00086 J	<0.001	<0.00066
2-Hexanone	0.16	<0.0012	<0.0011	<0.0011	<0.0019	<0.0018	<0.0016	< 0.0015	< 0.0016	<0.0019 J	<0.00099	<0.0011	<0.0017	<0.0017 J	<0.0012 J	<0.002	<0.0012	<0.0013	<0.0015 J	<0.00098
4-Chlorotoluene	5.4	<0.00096 J	<0.0009	<0.00088 J	<0.0016	<0.0015 J	<0.0013 J	< 0.0012	< 0.0013	<0.0015 J	<0.00081 J	<0.00094 J	<0.0014 J	<0.0014	<0.00099 J	<0.0017	<0.00095 J	<0.0011 J	<0.0012	<0.0008
4-Isopropyltoluene	120	<0.0012 J	<0.0011	<0.0011 J	<0.0019	<0.0019 J	<0.0016 J	< 0.0015	< 0.0016	<0.0019 J	<0.001 J	<0.0012 J	<0.0017 J	<0.0017	<0.0012 J	**0.0079 J**	<0.0012 J	<0.0013 J	<0.0015	**0.001 J**
4-Methyl-2-pentanone (MIBK)	2.5	<0.0017	<0.0016	<0.0016	<0.0028	<0.0027	<0.0023	< 0.0021	< 0.0023	**0.004 J**	<0.0014	<0.0017	<0.0024	<0.0024 J	<0.0018 J	<0.003	<0.0017	<0.0019	<0.0022 J	<0.0014
Acetone	21	**0.074 J+**	**0.017 J-**	<0.0018	**0.086 J-**	**0.098 J-**	**0.062 J-**	**0.18**	< 0.036	**0.14 J-**	**0.11**	**0.1**	**0.029**	<0.0027	**0.059**	**0.11 J-**	<0.0019	<0.0021	**0.19**	**0.034 J-**
Benzene	0.013	**0.0016 J**	<0.00068	<0.0012	**0.002 J**	**0.0015 J**	**0.0016 J**	< 0.00092	< 0.00098	**0.0021 J**	**0.00062 J**	<0.0022	<0.0025	**0.0019 J**	**0.0026 J**	**0.0019 J**	<0.0014	<0.0016	**0.0013 J**	**0.00081 J**
Bromobenzene	1.2	<0.0011 J	<0.0011	<0.0011 J	<0.0019	<0.0018 J	<0.0016 J	< 0.0014	< 0.0015	<0.0018 J	<0.00097 J	<0.0011 J	<0.0016 J	<0.0016	<0.0012 J	<0.002	<0.0011 J	<0.0013 J	<0.0015	<0.00096
Bromodichloromethane	0.033	<0.00076	<0.00072	<0.0007	<0.0013	<0.0012	<0.001	< 0.00096	< 0.001	<0.0012	<0.00065	<0.00075	<0.0011	<0.0011	<0.00079	<0.0013	<0.00075	<0.00084	<0.00097	<0.00064
Bromoform	0.32	<0.0016 J	<0.0015	<0.0015 J	<0.0026	<0.0025 J	<0.0022 J	< 0.002	< 0.0021	<0.0025 J	<0.0013 J	<0.0015 J	<0.0022 J	<0.0023	<0.0016 J	<0.0028	<0.0016 J	<0.0017 J	<0.002	<0.0013
Bromomethane	0.065	<0.00096	<0.0009	<0.00088	<0.0016 J	<0.0015 J	<0.0013 J	< 0.0012	< 0.0013	<0.0015	<0.00081	<0.00094	<0.0014	<0.0014	<0.00099	<0.0017	<0.00095	<0.0011	<0.0012	<0.0008
Carbon disulfide	6.8	<0.00064	<0.0006	<0.00059	<0.001 J	<0.001 J	<0.00086 J	**0.0016 J**	0.00086 J	<0.001	<0.00054	<0.00062	<0.0009	<0.00091	<0.00066	<0.0011	<0.00063	<0.0007	<0.00081	<0.00053
Carbon tetrachloride	0.031	<0.0013	<0.0012	<0.0012 J	<0.0022	<0.0021	<0.0018	< 0.0016	< 0.0018	<0.0021	<0.0011 J	<0.0013 J	<0.0019 J	<0.0019	<0.0013	<0.0023	<0.0013 J	<0.0014 J	<0.0017	<0.0011
Chlorobenzene	0.55	<0.0011	<0.001	<0.001 J	<0.0018	<0.0018	<0.0015	< 0.0014	< 0.0015	<0.0018	<0.00094	<0.0011 J	<0.0016 J	<0.0016	<0.0011	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00093
Chloroethane	15	<0.0016	<0.0015	<0.0015	<0.0027	<0.0026	<0.0022	< 0.002	< 0.0022	<0.0026	<0.0014	<0.0016	<0.0023	<0.0023	<0.0017	<0.0028	<0.0016	<0.0018	<0.0021	<0.0014
Chloroform	0.32	<0.00076	<0.00072	<0.0007	<0.002	<0.0019	<0.0018	< 0.00096	< 0.001	<0.0012	<0.00065	<0.00075	<0.0011	<0.0011	<0.00079	<0.0013	<0.00075	<0.00084	<0.00097	<0.00064
Chloromethane	0.2	<0.0019 J	<0.0018	<0.0018 J	<0.0032 J	<0.003 J	<0.0026 J	< 0.0024	< 0.0026	<0.0031 J	<0.0016 J	<0.0019 J	<0.0027 J	<0.0027 J	<0.002 J	<0.0034 J	<0.0019 J	<0.0021 J	<0.0024 J	<0.0016 J
cis-1,2-Dichloroethene	0.12	<0.00096	<0.0009	<0.00088	<0.0016	<0.0015	<0.0013	< 0.0012	< 0.0013	<0.0015	<0.00081	<0.00094	<0.0014	<0.0014	<0.00099	<0.0017	<0.00095	<0.0011	<0.0012	<0.0008
cis-1,3-Dichloropropene	0.0033	<0.00062	<0.00059	<0.00058	<0.001	<0.00099	<0.00085	< 0.00078	< 0.00084	<0.001	<0.00053	<0.00061	<0.00089	<0.00089	<0.00065	<0.0011	<0.00062	<0.00069	<0.00079	<0.00052
Dibromochloromethane	0.025	<0.0011	<0.001	<0.001 J	<0.0018	<0.0017	<0.0015	< 0.0014	< 0.0015	<0.0017	<0.00092	<0.0011 J	<0.0015 J	<0.0015	<0.0011	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00091
Dibromomethane	0.56	<0.00087	<0.00081	<0.0008	<0.0014	<0.0014	<0.0012	< 0.0011	< 0.0012	<0.0014	<0.00074	<0.00085	<0.0012	<0.0012	<0.0009	<0.0015	<0.00086	<0.00095	<0.0011	<0.00073
Dichlorodifluoromethane	87	<0.0018 J	<0.0017 J	<0.0016 J	<0.0029 J	<0.0028 J	<0.0024 J	< 0.0022	< 0.0024	<0.0029 J	<0.0015 J	<0.0017 J	<0.0025 J	<0.0025	<0.0018	<0.0031 J	<0.0018 J	<0.002 J	<0.0023	<0.0015 J
Ethylbenzene	3.8	**0.0016 J**	<0.0011	<0.0011 J	<0.0019	<0.0019	<0.0016	< 0.0015	< 0.0016	**0.0027 J**	<0.001	<0.0012 J	<0.0017 J	<0.0017	**0.002 J**	<0.0021	<0.0012 J	<0.0013 J	<0.0015	<0.00099
Hexachlorobutadiene	1.2	<0.0013 J	<0.0012	<0.0012 J	<0.0022 J	<0.0021 J	<0.0018 J	< 0.0016	< 0.0018	<0.0021 J	<0.0011 J	<0.0013 J	<0.0019 J	<0.0019	<0.0013 J	<0.0023	<0.0013 J	<0.0014 J	<0.0017	<0.0011
Iodomethane	0.057	<0.0029	<0.0027	<0.0027 J	<0.0048	<0.0046	<0.0039	< 0.0036 J	< 0.0039 J	<0.0046	<0.0025 J	<0.0028 J	<0.0041 J	<0.0041	<0.003	<0.0051	<0.0029 J	<0.0032 J	<0.0037	<0.0024
Isopropylbenzene	170	<0.0011 J	<0.001	<0.00098	<0.0018	<0.0017 J	<0.0014 J	< 0.0013	< 0.0014	<0.0017 J	<0.0009 J	<0.001	<0.0015	<0.0015	<0.0011 J	<0.0019	<0.001	<0.0012	<0.0014	<0.00089
Methyl tert-butyl ether	0.31	<0.0021	<0.002 J	<0.0019	<0.0035	<0.0033	<0.0029	< 0.0027	< 0.0029	<0.0034 J	<0.0018	<0.0021	<0.003	<0.003	<0.0022	<0.0037 J	<0.0021	<0.0023	<0.0027	<0.0018 J
Methylene Chloride	0.0065	<0.0025	<0.0024	<0.0023	<0.0042	<0.004	<0.0034	< 0.0032	< 0.0034	<0.0041	<0.0021	<0.0025	<0.0036	**0.029**	<0.0026	<0.0044	<0.0025	<0.0028	<0.0032	<0.0021
Naphthalene	3.8	<0.0027 J	<0.0026	<0.0025 J	<0.0045	<0.0043 J	<0.0037 J	< 0.0034	< 0.0037	<0.0044 J	<0.0023	<0.0027 J	<0.0039 J	<0.0039	**0.0033 J**	<0.0048	<0.0027 J	<0.003 J	<0.0035	<0.0023
n-Butylbenzene	76	<0.00067 J	<0.00063	<0.00062 J	<0.0011	<0.0011 J	<0.00091 J	< 0.00084	< 0.00091	<0.0011 J	<0.00057 J	<0.00065 J	<0.00095 J	<0.00096	<0.00069 J	<0.0012	<0.00066 J	<0.00074 J	<0.00085	<0.00056
N-Propylbenzene	22	<0.0011 J	<0.001	<0.001 J	<0.0018	<0.0017 J	<0.0015 J	< 0.0014	< 0.0015	<0.0018 J	<0.00093 J	<0.0011 J	<0.0016 J	<0.0016	<0.0011 J	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00092
sec-Butylbenzene	42	<0.00081 J	<0.00076	<0.00075 J	<0.0013	<0.0013 J	<0.0011 J	< 0.001	< 0.0011	<0.0013 J	<0.00069 J	<0.00079 J	<0.0011 J	<0.0012	<0.00084 J	<0.0014	<0.0008 J	<0.00089 J	<0.001	<0.00068
Styrene	1.6	<0.00082	<0.00077	<0.00076 J	<0.0014	<0.0013	<0.0011	< 0.001	< 0.0011	<0.0013	<0.0007	<0.0008 J	<0.0012 J	<0.0012	<0.00085	<0.0014	<0.00081 J	<0.0009 J	<0.001	<0.00069
tert-Butylbenzene	50	<0.0011 J	<0.001	<0.001 J	<0.0018	<0.0017 J	<0.0015 J	< 0.0014	< 0.0015	<0.0018 J	<0.00093 J	<0.0011 J	<0.0016 J	<0.0016	<0.0011 J	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00092
Tetrachloroethene	0.025	<0.00082	<0.00077	<0.00076 J	<0.0014	<0.0013	<0.0011	< 0.001 J	< 0.0011 J	<0.0013	<0.0007 J	<0.0008 J	<0.0012 J	<0.0012	<0.00085	<0.0014	<0.00081 J	<0.0009 J	<0.001	<0.00069
Toluene	4.1	**0.0026 J**	<0.0015	<0.0015	<0.0026	<0.0025	<0.0022	< 0.002	< 0.0022	**0.0032 J**	<0.0014	<0.0016	**0.0023 J**	<0.0023	**0.0026 J**	<0.0028	<0.0016	<0.0018	**0.002 J**	<0.0013
trans-1,2-Dichloroethene	0.25	<0.0013	<0.0012	<0.0012	<0.0022	<0.0021	<0.0018	< 0.0017	< 0.0018	<0.0021	<0.0011	<0.0013	<0.0019	<0.0019	<0.0014	<0.0023	<0.0013	<0.0014	<0.0017	<0.0011
trans-1,3-Dichloropropene	0.018	<0.00067	<0.00063	<0.00062	<0.0011	<0.0011	<0.00091	< 0.00084	< 0.00091	<0.0011	<0.00057	<0.00065	<0.00095	<0.00096	<0.00069	<0.0012	<0.00066	<0.00074	<0.00085	<0.00056
Trichloroethene	0.017	<0.0016	<0.0015	<0.0015	<0.0027	<0.0026	<0.0022	< 0.002	< 0.0022	<0.0026	<0.0014	<0.0016	<0.0023	<0.0023	<0.0017	<0.0028	<0.0016	<0.0018	<0.0021	<0.0014
Trichlorofluoromethane	64	<0.00076	<0.00072	<0.0007	<0.0013	<0.0012	<0.001	< 0.00096	< 0.001	<0.0012	<0.00065	<0.00075	<0.0011	<0.0011	<0.00079	<0.0013	<0.00075	<0.00084	<0.00097	<0.00064
Vinyl chloride	0.011	<0.001	<0.00098	<0.00096	<0.0017	<0.0016	<0.0014	< 0.0013	< 0.0014	<0.0017	<0.00088	<0.001	<0.0015	<0.0015	<0.0011	<0.0018	<0.001	<0.0011	<0.0013	<0.00087
Xylenes, Total	61	**0.0022 J**	<0.0012	<0.0012 J	<0.0022	<0.0021	<0.0018	< 0.0016	< 0.0018	<0.0021	<0.0011	<0.0013 J	<0.0019 J	<0.0019	<0.0013	<0.0023	<0.0013 J	<0.0014 J	<0.0017	<0.0011

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value (not applicable, no exceedances).
5. < = Compound not detected at the indicated laboratory detection limit. bgs = Below ground surface.
6. J = Estimated value. J+ = Estimated value with a potential high bias. J- = Estimated value with a potential low bias.

TABLE 10
ON-SITE SOIL SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	R&H Oil West Side					R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	MW-12	MW-14	NMW-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	5/23/2011	5/23/2011	5/24/2011	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Shallow Soil																	
Sample Interval (ft bgs):		4-5	3-5	3-4	3-4	3-4	3-4	2-3	2-3	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
1,1,1,2-Tetrachloroethane	0.71	<0.0014	<0.0017	<0.0017 J	< 0.0022	< 0.0045	<0.0032	<0.095	<0.0019 J	<0.13	<0.0015 J	<0.0016 J	<0.0022	<0.0017 J	<0.0014 J	<0.0016 J	<0.0016
1,1,1-Trichloroethane	0.81	<0.00073	<0.00091	<0.0009	< 0.0012	< 0.0024	<0.0017	<0.05	<0.001	<0.071	<0.00082	<0.00084	<0.0011	<0.00089	<0.00074	<0.00085	<0.00083
1,1,2,2-Tetrachloroethane	0.012	<0.00086	<0.0011	<0.0011 J	< 0.0014	< 0.0028	<0.002 J	<0.059	0.0012 R	<0.083	<0.00096 J	<0.00099 J	<0.0013	<0.001 J	<0.00087 J	<0.001 J	<0.00098
1,1,2-Trichloroethane	0.01	<0.00072	<0.00089	<0.00089 J	< 0.0011	< 0.0024	<0.0017	<0.049	<0.001 J	<0.07	<0.00081 J	<0.00083 J	<0.0011	<0.00088 J	<0.00073 J	<0.00084 J	<0.00082
1,1-Dichloroethane	3.6	<0.00086	<0.0011	<0.0011	< 0.0014	< 0.0028	<0.002	<0.059	<0.0012	<0.083	<0.00096	<0.00099	<0.0013	<0.001	<0.00087	<0.001	<0.00098
1,1-Dichloroethene	0.025	<0.0012	<0.0015	<0.0015	< 0.0019	< 0.004	<0.0028	<0.083	<0.0017	<0.12	<0.0013	<0.0014	<0.0019	<0.0015	<0.0012	<0.0014	<0.0014
1,1-Dichloropropene	0.067	<0.00064	<0.0008	<0.00079 J	< 0.001	< 0.0021	<0.0015	<0.044	<0.0009	<0.062	<0.00072 J	<0.00074 J	<0.001	<0.00078 J	<0.00065 J	<0.00075 J	<0.00073
1,2,3-Trichloropropane	0.00027	<0.0013	<0.0016	<0.0016	< 0.0021	< 0.0042	<0.003 J	<0.089	0.0018 R	<0.13	<0.0014	<0.0015	<0.002	<0.0016	<0.0013	<0.0015	<0.0015
1,2,4-Trichlorobenzene	2.4	<0.0019	<0.0024	<0.0024 J	< 0.0031	< 0.0064	<0.0045 J	<0.13	0.0027 R	<0.19	<0.0022 J	<0.0022 J	<0.0031	<0.0024 J	<0.002 J	<0.0023 J	<0.0022
1,2,4-Trimethylbenzene	24	<0.00091	**0.0034 J**	<0.0011 J	**0.0019 J**	**0.0084 J**	<0.0029	<0.062	**0.057 J**	**1.5**	<0.001 J	<0.001 J	<0.0015	<0.0011 J	<0.00092 J	<0.0011 J	<0.001
1,2-Dibromo-3-Chloropropane	0.00087	<0.0024	<0.003	<0.003 J	< 0.0038	< 0.0079	<0.0055 J	<0.17	0.0034 R	<0.23	<0.0027 J	<0.0028 J	<0.0038	<0.0029 J	<0.0024 J	<0.0028 J	<0.0027
1,2-Dibromoethane	0.0001	<0.001	<0.0012	<0.0012	< 0.0016	< 0.0033	<0.0023	<0.069	<0.0014 J	<0.098	<0.0011	<0.0012	<0.0016	<0.0012	<0.001	<0.0012	<0.0011
1,2-Dichlorobenzene	8.9	<0.00079	<0.00098	<0.00097 J	< 0.0013	< 0.0026	<0.0018 J	<0.054	0.0011 R	<0.077	<0.00088 J	<0.00091 J	<0.0012	<0.00096 J	<0.0008 J	<0.00092 J	<0.0009
1,2-Dichloroethane	0.007	<0.00089	<0.0011	<0.0011	< 0.0014	< 0.0029	<0.002	<0.061	<0.0012	<0.086	<0.00099	<0.001	<0.0014	<0.0011	<0.0009	<0.001	<0.001
1,2-Dichloropropane	0.011	<0.0007	<0.00087	<0.00086	< 0.0011	< 0.0023	<0.0016	<0.048	<0.00098	<0.068	<0.00078	<0.00081	<0.0011	<0.00086	<0.00071	<0.00082	<0.0008
1,3,5-Trimethylbenzene	27	<0.0016	<0.002	<0.0019 J	< 0.0025	< 0.0052	<0.0036 J	<0.11	0.0022 R	**0.65**	<0.0018 J	<0.0018 J	<0.0025	<0.0019 J	<0.0016 J	<0.0018 J	<0.0018
1,3-Dichlorobenzene	3.4	<0.0007	<0.00087	<0.00086 J	< 0.0011	< 0.0023	<0.0016 J	<0.048	0.00098 R	<0.068	<0.00078 J	<0.00081 J	<0.0011	<0.00086 J	<0.00071 J	<0.00082 J	<0.0008
1,3-Dichloropropane	0.032	<0.00062	<0.00077	<0.00077	< 0.00099	< 0.002	<0.0014	<0.043	<0.00087 J	<0.06	<0.0007	<0.00072	<0.00098	<0.00076	<0.00063	<0.00073	<0.00071
1,4-Dichlorobenzene	1.1	<0.00065	<0.00081	<0.0008 J	< 0.001	< 0.0021	<0.0015 J	<0.045	0.00091 R	<0.063	<0.00073 J	<0.00075 J	<0.001	<0.00079 J	<0.00066 J	<0.00076 J	<0.00074
2,2-Dichloropropane	0.06	<0.0018	<0.0022	<0.0022	< 0.0028	< 0.0059	<0.0041	<0.12	<0.0025 J	<0.17	<0.002	<0.0021	<0.0028	<0.0022	<0.0018	<0.0021	<0.002
2-Butanone (MEK)	15	<0.0019	<0.0023	<0.0023	< 0.003	< 0.0062	<0.0043	<0.13	**0.32**	**4**	**0.051**	<0.0022	<0.0029	<0.0023	<0.0019	<0.0022	<0.0021
2-Chlorotoluene	4.5	<0.00067	<0.00083	<0.00083 J	< 0.0011	< 0.0022	<0.0015 J	<0.046	0.00094 R	<0.065	<0.00075 J	<0.00078 J	<0.0011	<0.00082 J	<0.00068 J	<0.00078 J	<0.00076
2-Hexanone	0.16	<0.001	<0.0012	<0.0012	< 0.0016	< 0.0033	<0.0023	<0.068	**0.016 J**	<0.097	<0.0011	<0.0012	<0.0016	<0.0012	<0.001	<0.0012	<0.0011
4-Chlorotoluene	5.4	<0.00082	<0.001	<0.001 J	< 0.0013	< 0.0027	<0.0019 J	<0.056	0.0011 R	<0.079	<0.00092 J	<0.00095 J	<0.0013	<0.001 J	<0.00083 J	<0.00096 J	<0.00093
4-Isopropyltoluene	120	<0.001	<0.0012	<0.0012 J	< 0.0016	< 0.0033	<0.0023 J	<0.069	0.0014 R	**<0.26 J**	**0.0049 J**	<0.0012 J	<0.0016	<0.0012 J	<0.001 J	<0.0012 J	<0.0011
4-Methyl-2-pentanone (MIBK)	2.5	<0.0015	<0.0018	<0.0018	< 0.0023	< 0.0048	<0.0033	<0.1	<0.002 J	<0.14	<0.0016	<0.0017	<0.0023	<0.0018	<0.0015	<0.0017	<0.0016
Acetone	21	<0.0016 J	**0.25 J-**	**0.05**	< 0.0026	**0.09**	**0.091 J+**	**0.48 J**	**2.9 J**	**15**	<0.0018	**0.047**	**0.077 J+**	**0.053**	**0.053**	<0.0019	**0.027 J-**
Benzene	0.013	**0.0022 J**	**0.2**	<0.0022	< 0.00099	**0.0043 J**	<0.0014	**3.3 J**	**1.7**	<0.078 J	**0.012 J-**	<0.0029	**0.0051 J**	<0.0049	<0.0045	<0.0032	**0.0036 J**
Bromobenzene	1.2	<0.00098	<0.0012	<0.0012 J	< 0.0015	< 0.0032	<0.0022 J	<0.067	0.0014 R	<0.095	<0.0011 J	<0.0011 J	<0.0015	<0.0012 J	<0.00099 J	<0.0011 J	<0.0011
Bromodichloromethane	0.033	<0.00065	<0.00081	<0.0008	< 0.001	< 0.0021 J	<0.0015	<0.045	<0.00091 J	<0.063	<0.00073	<0.00075	<0.001	<0.00079	<0.00066	<0.00076	<0.00074
Bromoform	0.32	<0.0014	<0.0017	<0.0017 J	< 0.0021	< 0.0044	<0.0031 J	<0.093	0.0019 R	<0.13	<0.0015 J	<0.0016 J	<0.0021	<0.0017 J	<0.0014 J	<0.0016 J	<0.0015
Bromomethane	0.065	<0.00082	<0.001	<0.001	< 0.0013	< 0.0027	<0.0019	<0.056 J	<0.0011	<0.079 J	<0.00092	<0.00095	<0.0013	<0.001	<0.00083	<0.00096	<0.00093
Carbon disulfide	6.8	<0.00054	<0.00067	<0.00067	< 0.00086 J	< 0.0018	<0.0012	<0.037 J	**0.0096 J**	<0.053 J	<0.00061	<0.00063	<0.00085	<0.00066	<0.00055	<0.00063	<0.00062
Carbon tetrachloride	0.031	<0.0011	<0.0014	<0.0014 J	< 0.0018	< 0.0037	<0.0026	<0.077	<0.0016	<0.11	<0.0012 J	<0.0013 J	<0.0017	<0.0014 J	<0.0011 J	<0.0013 J	<0.0013
Chlorobenzene	0.55	<0.00095	<0.0012	<0.0012 J	< 0.0015	< 0.0031	<0.0022	<0.065	<0.0013 J	<0.092	<0.0011 J	<0.0011 J	<0.0015	<0.0012 J	<0.00096 J	<0.0011 J	<0.0011
Chloroethane	15	<0.0014	<0.0017	<0.0017	< 0.0022	< 0.0045	<0.0032	<0.095 J	<0.0019	<0.13 J	<0.0015	<0.0016	<0.0022	<0.0017	<0.0014	<0.0016	<0.0016
Chloroform	0.32	<0.00065	<0.00081	<0.0008	< 0.001	< 0.0021	<0.0015	<0.045	<0.00091	<0.063	<0.00073	<0.00075	<0.001	<0.00079	<0.00066	<0.00076	<0.00074
Chloromethane	0.2	<0.0016	<0.002	<0.002 J	< 0.0026	< 0.0054	<0.0038 J	<0.11 J	<0.0023 J	<0.16 J	<0.0018 J	<0.0019 J	<0.0026 J	<0.002 J	<0.0017 J	<0.0019 J	<0.0019 J
cis-1,2-Dichloroethene	0.12	<0.00082	<0.001	<0.001	< 0.0013	< 0.0027	<0.0019	<0.056	<0.0011	<0.079	<0.00092	<0.00095	<0.0013	<0.001	<0.00083	<0.00096	<0.00093
cis-1,3-Dichloropropene	0.0033	<0.00053	<0.00066	<0.00066	< 0.00085	< 0.0017	<0.0012	<0.037	<0.00075 J	<0.052	<0.0006	<0.00062	<0.00084	<0.00065	<0.00054	<0.00062	<0.00061
Dibromochloromethane	0.025	<0.00093	<0.0012	<0.0011 J	< 0.0015	< 0.003	<0.0021	<0.064	<0.0013 J	<0.09	<0.001 J	<0.0011 J	<0.0015	<0.0011 J	<0.00094 J	<0.0011 J	<0.0011
Dibromomethane	0.56	<0.00074	<0.00092	<0.00091	< 0.0012	< 0.0024	<0.0017	<0.051	<0.001	<0.072	<0.00083	<0.00086	<0.0012	<0.0009	<0.00075	<0.00087	<0.00084
Dichlorodifluoromethane	87	<0.0015 J	<0.0019 J	<0.0019 J	< 0.0024	< 0.005 J	<0.0035 J	<0.1 J	<0.0021	<0.15 J	<0.0017 J	<0.0018 J	<0.0024 J	<0.0019 J	<0.0015 J	<0.0018 J	<0.0017 J
Ethylbenzene	3.8	<0.001	**0.0088**	<0.0012 J	< 0.0016	< 0.0033	<0.0023	<0.069	**0.069 J**	**<0.17 J**	<0.0011 J	<0.0012 J	**0.0017 J**	<0.0012 J	<0.001 J	<0.0012 J	<0.0011
Hexachlorobutadiene	1.2	<0.0011	<0.0014	<0.0014 J	< 0.0018	< 0.0037	<0.0026 J	<0.077 J	0.0016 R	<0.11 J	<0.0012 J	<0.0013 J	<0.0017	<0.0014 J	<0.0011 J	<0.0013 J	<0.0013
Iodomethane	0.057	<0.0025	<0.0031	<0.003 J	< 0.0039 J	< 0.0081	<0.0057	<0.17 J	<0.0035	<0.24 J	<0.0028 J	<0.0029 J	<0.0039	<0.003 J	<0.0025 J	<0.0029 J	<0.0028
Isopropylbenzene	170	<0.00091	**0.14**	<0.0011	< 0.0014	< 0.003	<0.0021 J	<0.062	**0.025 J**	<0.088	<0.001	<0.001	<0.0014	<0.0011	<0.00092	<0.0011	<0.001
Methyl tert-butyl ether	0.31	<0.0018 J	<0.0022 J	<0.0022	< 0.0029	< 0.0059	<0.0041	<0.12	<0.0025	<0.18	<0.002	<0.0021	<0.0028	<0.0022	<0.0018	<0.0021	<0.0021 J
Methylene Chloride	0.0065	<0.0022	<0.0027	<0.0027	< 0.0034	< 0.0071	<0.005	<0.2	<0.003	<0.36	<0.0024	<0.0025	<0.0034	<0.0026	<0.0022	<0.0025	<0.0025
Naphthalene	3.8	<0.0023	**0.0037 J**	<0.0029 J	< 0.0037	**0.011 J**	**0.0059 J**	**0.95 J**	0.0033 R	**<0.77 J**	<0.0026 J	<0.0027 J	<0.0037	<0.0029 J	<0.0024 J	<0.0027 J	<0.0027
n-Butylbenzene	76	<0.00057	**0.0051 J**	<0.00071 J	< 0.00091	< 0.0019	<0.0013 J	<0.039	0.0008 R	<0.056	<0.00064 J	<0.00066 J	<0.0009	<0.0007 J	<0.00058 J	<0.00067 J	<0.00065
N-Propylbenzene	22	<0.00094	**0.23**	<0.0012 J	< 0.0015	< 0.0031	<0.0022 J	<0.064	**0.035 J**	<0.091	**0.0026 J**	<0.0011 J	<0.0015	<0.0011 J	<0.00095 J	<0.0011 J	<0.0011
sec-Butylbenzene	42	<0.00069	**0.03**	<0.00085 J	< 0.0011	< 0.0023	<0.0016 J	<0.047	**0.014 J**	<0.067	**0.0063 J-**	<0.0008 J	<0.0011	<0.00084 J	<0.0007 J	<0.00081 J	<0.00078
Styrene	1.6	<0.0007	<0.00087	<0.00086 J	< 0.0011	< 0.0023	<0.0016	<0.048	<0.00098 J	<0.068	<0.00078 J	<0.00081 J	<0.0011	<0.00086 J	<0.00071 J	<0.00082 J	<0.0008
tert-Butylbenzene	50	<0.00094	**0.0041 J**	<0.0012 J	< 0.0015	< 0.0031	<0.0022 J	<0.064	0.0013 R	**<0.21 J**	<0.001 J	<0.0011 J	<0.0015	<0.0011 J	<0.00095 J	<0.0011 J	<0.0011
Tetrachloroethene	0.025	<0.0007	<0.00087	<0.00086 J	< 0.0011 J	< 0.0023	<0.0016	<0.048	<0.00098 J	<0.068	<0.00078 J	<0.00081 J	<0.0011	<0.00086 J	<0.00071 J	<0.00082 J	<0.0008
Toluene	4.1	**0.0021 J**	**0.0091**	<0.0017	< 0.0022	**0.006 J**	<0.0031	**0.27 J**	**0.11 J**	**0.5**	**0.0024 J**	**0.0021 J**	**0.0052 J**	<0.0017	**0.0034 J**	**0.0021 J**	**0.0031 J**
trans-1,2-Dichloroethene	0.25	<0.0011	<0.0014	<0.0014	< 0.0018	< 0.0037	<0.0026	<0.077	<0.0016	<0.11	<0.0013	<0.0013	<0.0018	<0.0014	<0.0011	<0.0013	<0.0013
trans-1,3-Dichloropropene	0.018	<0.00057	<0.00071	<0.00071	< 0.00091	< 0.0019	<0.0013	<0.039	<0.0008 J	<0.056	<0.00064	<0.00066	<0.0009	<0.0007	<0.00058	<0.00067	<0.00065
Trichloroethene	0.017	<0.0014	<0.0017	<0.0017	< 0.0022	< 0.0045	<0.0032	<0.095	<0.0019	<0.13	<0.0015	<0.0016	<0.0022	<0.0017	<0.0014	<0.0016	<0.0016
Trichlorofluoromethane	64	<0.00065	<0.00081	<0.0008	< 0.001	< 0.0021	<0.0015	<0.045 J	<0.00091	<0.063 J	<0.00073	<0.00075	<0.001	<0.00079	<0.00066	<0.00076	<0.00074
Vinyl chloride	0.011	<0.00089	<0.0011	<0.0011	< 0.0014	< 0.0029	<0.002	<0.061 J	<0.0012 J	<0.086 J	<0.00099	<0.001	<0.0014	<0.0011	<0.0009	<0.001	<0.001
Xylenes, Total	61	<0.0011	**0.02**	<0.0014 J	< 0.0018	**0.0069 J**	**0.005 J**	**0.23 J**	**0.11 J**	**2.4**	<0.0012 J	<0.0013 J	**0.0029 J**	<0.0014 J	**0.0016 J**	<0.0013 J	<0.0013

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value (not applicable, no exceedances).
5. < = Compound not detected at the indicated laboratory detection limit. bgs = Below ground surface.
6. J = Estimated value. J+ = Estimated value with a potential high bias. J- = Estimated value with a potential low bias. R = Result was rejected.

TABLE 10
ON-SITE SOIL SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	R&H Oil West Side					R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	MW-12	MW-14	NMW-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	5/23/2011	5/23/2011	5/24/2011	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
		Deep Soil															
Sample Interval (ft bgs):		11-12	20-22	18-20	17-18	15-16	14-15	19-20	14-15	12-13	24-25	21-22	17-18	13-14	19-20	16-17	17-18
1,1,1,2-Tetrachloroethane	0.71	<0.07 J	<1.1	<0.063	<0.63	<0.43	<0.081	<0.1	<0.063 J	<0.069	<0.063	<0.059	<0.69	<0.076	<0.067	<0.059 J	<0.0015
1,1,1-Trichloroethane	0.81	<0.037 J	<0.56	<0.033	<0.33	<0.23	<0.043	<0.054	<0.033 J	<0.037	<0.033	<0.031	<0.36	<0.04	<0.035	<0.031 J	<0.00078
1,1,2,2-Tetrachloroethane	0.012	<0.044 J	<0.65	<0.039	<0.39	<0.27	<0.051	<0.063	<0.039 J	<0.043	<0.039	<0.037	<0.43	<0.047	<0.042	<0.037 J	<0.00092
1,1,2-Trichloroethane	0.01	<0.037 J	<0.55	<0.033	<0.33	<0.23	<0.042	<0.053	<0.033 J	<0.036	<0.033	<0.031	<0.36	<0.04	<0.035	<0.031 J	<0.00077
1,1-Dichloroethane	3.6	<0.044 J	<0.65	<0.039	<0.39	<0.27	<0.051	<0.063	<0.039 J	<0.043	<0.039	<0.037	<0.43	<0.047	<0.042	<0.037 J	<0.00092
1,1-Dichloroethene	0.025	<0.061 J	<0.92	<0.055	<0.55	<0.38	<0.071	<0.088	<0.055 J	<0.061	<0.055	<0.051	<0.6	<0.066	<0.058	<0.051 J	<0.0013
1,1-Dichloropropene	0.067	<0.033 J	<0.49	<0.029	<0.29	<0.2	<0.038	<0.047	<0.029 J	<0.032	<0.029	<0.027	<0.32	<0.035	<0.031	<0.027 J	<0.00069
1,2,3-Trichloropropane	0.00027	<0.066 J	<0.98	<0.059	<0.59	<0.41	<0.076	<0.095	<0.059 J	<0.065	<0.059	<0.055	<0.64	<0.071	<0.063	<0.055 J	<0.0014
1,2,4-Trichlorobenzene	2.4	<0.099 J	<1.5	<0.088	<0.89 J	<0.61 J	<0.11	<0.14	<0.089 J	<0.098	<0.089	<0.083	<0.97	<0.11	<0.094	<0.083 J	<0.0021
1,2,4-Trimethylbenzene	24	**150**	**160**	**44**	**22**	**11**	**100**	**0.25 J**	**96**	**52**	**0.12 J**	**26**	**60**	**19**	**0.1 J**	**74**	**0.005 J**
1,2-Dibromo-3-Chloropropane	0.00087	<0.12 J	<1.8	<0.11	<1.1 J	<0.76 J	<0.14	<0.18	<0.11 J	<0.12	<0.11	<0.1	<1.2	<0.13	<0.12	<0.1 J	<0.0026
1,2-Dibromoethane	0.0001	<0.051 J	<0.77	<0.046	<0.46	<0.32	<0.059	<0.074	<0.046 J	<0.051	<0.046	<0.043	<0.5	<0.056	<0.049	<0.043 J	<0.0011
1,2-Dichlorobenzene	8.9	<0.04 J	<0.6	<0.036	<0.36	<0.25	<0.047	<0.058	<0.036 J	<0.04	<0.036	<0.034	<0.39	<0.044	<0.038	<0.034 J	<0.00084
1,2-Dichloroethane	0.007	<0.045 J	<0.68	<0.04	<0.41	<0.28	<0.052	<0.065	<0.041 J	<0.045	<0.041	<0.038	<0.44	<0.049	<0.043	<0.038 J	<0.00095
1,2-Dichloropropane	0.011	<0.036 J	<0.53	<0.032	<0.32	<0.22	<0.041	<0.051	<0.032 J	<0.035	<0.032	<0.03	<0.35	<0.039	<0.034	<0.03 J	<0.00075
1,3,5-Trimethylbenzene	27	**68**	**91**	**22**	**10**	**4.9**	**41**	<0.12	**42**	**22**	**0.098 J**	**2.6**	**21**	**8.9**	<0.076	**30**	<0.0017
1,3-Dichlorobenzene	3.4	<0.036 J	<0.53	<0.032	<0.32	<0.22	<0.041	<0.051	<0.032 J	<0.035	<0.032	<0.03	<0.35	<0.039	<0.034	<0.03 J	<0.00075
1,3-Dichloropropane	0.032	<0.032 J	<0.47	<0.028	<0.28	<0.2	<0.037	<0.046	<0.028 J	<0.031	<0.028	<0.026	<0.31	<0.034	<0.03	<0.027 J	<0.00066
1,4-Dichlorobenzene	1.1	<0.033 J	<0.5	<0.03	<0.3	<0.2	<0.038	<0.048	<0.03 J	<0.033	<0.03	<0.028	<0.32	<0.036	<0.032	<0.028 J	<0.0007
2,2-Dichloropropane	0.06	<0.091 J	<1.4	<0.082	<0.82	<0.56	<0.11	<0.13	<0.082 J	<0.09	<0.082	<0.076	<0.89	<0.099	<0.087	<0.077 J	<0.0019
2-Butanone (MEK)	15	<0.095 J	<1.4	<0.085	<0.86	<0.59	<0.11	<0.14	<0.086 J	<0.094	<0.086	<0.08	<0.93	<0.1	<0.091	<0.08 J	<0.002
2-Chlorotoluene	4.5	<0.034 J	<0.51	<0.03	<0.31	<0.21	<0.04	<0.049	<0.031 J	<0.034	<0.031	<0.029	<0.33	<0.037	<0.032	<0.029 J	<0.00072
2-Hexanone	0.16	<0.051 J	<0.76	<0.045	<0.45	<0.31	<0.059	<0.073	<0.046 J	<0.05	<0.046	<0.042	<0.49	<0.055	<0.048	<0.043 J	<0.0011
4-Chlorotoluene	5.4	<0.042 J	<0.62	<0.037	<0.37	<0.26	**5.3**	<0.06	<0.037 J	<0.041	<0.037	<0.035	<0.41	<0.045	<0.04	<0.035 J	<0.00088
4-Isopropyltoluene	120	**5.5 J**	**5.6**	**1.6**	**3.7 J-**	**2.6 J-**	**3.3**	**0.074 J**	**2.5 J**	**1**	**0.049 J**	**0.69**	**2.7**	**0.66**	<0.049	**2.2 J**	<0.0011
4-Methyl-2-pentanone (MIBK)	2.5	<0.074 J	<1.1	<0.066	<0.66	<0.46	<0.086	<0.11	<0.066 J	<0.073	<0.066	<0.062	<0.72	<0.08	<0.07	<0.062 J	<0.0016
Acetone	21	<0.083 J	**84**	**7.2**	**36**	<0.51	<0.097	<0.12	**18 J**	**5.5**	**2**	**3.6**	<0.81	**1.5**	**6.4**	**16**	<0.0018 J
Benzene	0.013	**47**	**130**	**29**	**14**	**6**	**83**	**7.9**	**64**	**31**	**4.7**	**18**	**46**	**9.8**	**4.6**	**54**	<0.00066
Bromobenzene	1.2	<0.05 J	<0.74	<0.044	<0.45	<0.31	<0.058	<0.072	<0.045 J	<0.049	<0.045	<0.042	<0.49	<0.054	<0.047	<0.042 J	<0.001
Bromodichloromethane	0.033	<0.033 J	<0.5	<0.03	<0.3	<0.2	<0.038	<0.048	<0.03 J	<0.033	<0.03	<0.028	<0.32	<0.036	<0.032	<0.028 J	<0.0007
Bromoform	0.32	<0.069 J	<1.	<0.061	<0.62	<0.42	<0.08	<0.099	<0.062 J	<0.068	<0.062	<0.058	<0.67	<0.075	<0.065	<0.058 J	<0.0014
Bromomethane	0.065	<0.042 J	<0.62 J	<0.037 J	<0.37	<0.26	<0.048 J	<0.06 J	<0.037 J	<0.041 J	<0.037 J	<0.035	<0.41 J	<0.045 J	<0.04 J	<0.035 J	<0.00088
Carbon disulfide	6.8	<0.028 J	<0.41 J	<0.025 J	<0.25	<0.17	<0.032 J	<0.04 J	<0.025 J	<0.027 J	<0.025 J	<0.023	<0.27 J	<0.03 J	<0.026 J	<0.023 J	<0.00058
Carbon tetrachloride	0.031	<0.057 J	<0.85	<0.051	<0.51	<0.35	<0.066	<0.082	<0.051 J	<0.056	<0.051	<0.047	<0.55	<0.062	<0.054	<0.048 J	<0.0012
Chlorobenzene	0.55	<0.048 J	<0.72	<0.043	<0.43	<0.3	<0.056	<0.07	<0.043 J	<0.048	<0.043	<0.04	<0.47	<0.052	<0.046	<0.04 J	<0.001
Chloroethane	15	<0.07 J	<1.1 J	<0.063 J	<0.63	<0.43	<0.081 J	<0.1 J	<0.063 J	<0.069 J	<0.063 J	<0.059	<0.69 J	<0.076 J	<0.067 J	<0.059 J	<0.0015
Chloroform	0.32	<0.033 J	<0.5	<0.03	<0.3	<0.2	<0.038	**2**	<0.03 J	<0.033	**0.32**	**2**	<0.32	<0.036	<0.032	<0.028 J	<0.0007
Chloromethane	0.2	<0.083 J	<1.2 J	<0.074 J	<0.75	<0.51	<0.097 J	<0.12 J	<0.075 J	<0.082 J	<0.075 J	<0.07	<0.81 J	<0.09 J	<0.079 J	<0.07 J	<0.0018 J
cis-1,2-Dichloroethene	0.12	<0.042 J	<0.62	<0.037	<0.37	<0.26	<0.048	<0.06	<0.037 J	<0.041	<0.037	<0.035	<0.41	<0.045	<0.04	<0.035 J	<0.00088
cis-1,3-Dichloropropene	0.0033	<0.027 J	<0.41	<0.024	<0.24	<0.17	<0.031	<0.039	<0.024 J	<0.027	<0.024	<0.023	<0.26	<0.029	<0.026	<0.023 J	<0.00057
Dibromochloromethane	0.025	<0.047 J	<0.71	<0.042	<0.42	<0.29	<0.055	<0.068	<0.042 J	<0.047	<0.042	<0.04	<0.46	<0.051	<0.045	<0.04 J	<0.00099
Dibromomethane	0.56	<0.038 J	<0.56	<0.034	<0.34	<0.23	<0.044	<0.054	<0.034 J	<0.037	<0.034	<0.032	<0.37	<0.041	<0.036	<0.032 J	<0.00079
Dichlorodifluoromethane	87	<0.077 J	<1.2 J	<0.069 J	<0.69 J	<0.48 J	<0.09 J	<0.11 J	<0.07 J	<0.076 J	<0.07 J	<0.065	<0.75 J	<0.084 J	<0.074 J	<0.065 J	<0.0016 J
Ethylbenzene	3.8	**77**	**100**	**19**	**10**	**5.1**	**51**	**0.12 J**	**52**	**29**	**0.13 J**	**18**	**43**	**9.4**	**0.11 J**	**45**	**0.0012 J**
Hexachlorobutadiene	1.2	<0.057 J	<0.85	<0.051 J	<0.51 J	<0.35 J	<0.066	<0.082 J	<0.051 J	<0.056 J	<0.051 J	<0.047	<0.55	<0.062 J	<0.054 J	<0.048 J	<0.0012
Iodomethane	0.057	<0.13 J	<1.9 J	<0.11 J	<1.1	<0.78	<0.15 J	<0.18 J	<0.11 J	<0.12 J	<0.11 J	<0.11	<1.2 J	<0.14 J	<0.12 J	<0.11 J	<0.0026
Isopropylbenzene	170	**11 J**	**15**	**3.8**	**1.2 J**	**0.81 J**	**7.5**	**0.3 J**	**6.4 J**	**2.8**	**0.94**	**2.1**	**7.4**	**1.7**	**1.7**	**5.5 J**	**0.77**
Methyl tert-butyl ether	0.31	<0.092 J	<1.4	<0.082	<0.82	**1.5 J**	<0.11	<0.13	<0.083 J	<0.091	<0.083	<0.077	<0.9	<0.1	<0.087	<0.077 J	<0.0019 J
Methylene Chloride	0.0065	<0.11 J	<1.6	<0.15	<3.2	<2.2	<0.13	<0.21	<0.11	<0.14	<0.16	<0.11	<1.1	<0.17	<0.13	<0.13	<0.0023
Naphthalene	3.8	**34 J**	**32**	**7.1**	**2.7 J**	**1.9 J**	**31 J**	**0.21 J**	**15**	**5.6**	**0.62**	**4.5**	**14**	**3.7**	**0.58**	**16**	**0.0027 J**
n-Butylbenzene	76	**10 J**	**16**	**3.7**	**4 J-**	**2.7 J-**	**7.7 J**	**0.49**	**7.4 J**	**3.6**	**0.42**	**2.4**	**6**	**1.4**	**1.3**	**8.1 J**	**0.051**
N-Propylbenzene	22	**19 J**	**28**	**6.3**	**2.9**	**1.6**	**13 J**	**0.94**	**13**	**6.8**	**1.5**	**5.1**	**11**	**2.7**	**2.4**	**12**	**1.2**
sec-Butylbenzene	42	**4.6 J**	**4.9**	**1.3**	**0.49 J**	**0.33 J**	**2.9**	**0.16 J**	**2.3 J**	**0.91**	**0.26**	**0.76**	**3**	**0.54**	**1.3**	**2.4 J**	**0.068**
Styrene	1.6	<0.036 J	<0.53	<0.032	<0.32	<0.22	<0.041	<0.051	<0.032 J	<0.035	<0.032	<0.03	<0.35	<0.039	<0.034	<0.03 J	<0.00075
tert-Butylbenzene	50	**0.55 J**	**2 J**	**0.2 J**	<0.43	<0.29	**0.39**	**0.16 J**	**0.28 J**	**0.18 J**	**0.12 J**	**0.15 J**	**1.3 J**	**0.17 J**	**0.22 J**	**0.31 J**	**0.011**
Tetrachloroethene	0.025	<0.036 J	<0.53	<0.032	<0.32	<0.22	<0.041	<0.051	<0.032 J	<0.035	<0.032	<0.03	<0.35	<0.039	<0.034	<0.03 J	<0.00075
Toluene	4.1	**2 J**	**510**	**1.1**	<0.62	<0.43	**600**	<0.1	**0.063 J**	**220**	<0.062	**0.15 J**	**1.1 J**	**0.088 J**	<0.066	**1.3 J**	<0.0015
trans-1,2-Dichloroethene	0.25	<0.057 J	<0.86	<0.051	<0.51	<0.35	<0.066	<0.083	<0.052 J	<0.057	<0.051	<0.048	<0.56	<0.062	<0.054	<0.048 J	<0.0012
trans-1,3-Dichloropropene	0.018	<0.029 J	<0.44	<0.026	<0.26	<0.18	<0.034	<0.042	<0.026 J	<0.029	<0.026	<0.024	<0.28	<0.032	<0.028	<0.024 J	<0.00061
Trichloroethene	0.017	<0.07 J	<1.1	<0.063	<0.63	<0.43	<0.081	<0.1	<0.063 J	<0.069	<0.063	<0.059	<0.69	<0.076	<0.067	<0.059 J	<0.0015
Trichlorofluoromethane	64	<0.033 J	<0.5 J	<0.03 J	<0.3	<0.2	<0.038 J	<0.048 J	<0.03 J	<0.033 J	<0.03 J	<0.028	<0.32 J	<0.036 J	<0.032 J	<0.028 J	<0.0007
Vinyl chloride	0.011	<0.045 J	<0.68	<0.04 J	<0.41	<0.28	<0.052	<0.065 J	<0.041 J	<0.045 J	<0.041 J	<0.038	<0.44	<0.049 J	<0.043 J	<0.038 J	<0.00095
Xylenes, Total	61	**590**	**640**	**170**	**65**	**20**	**350**	**0.31 J**	**300**	**190**	**0.071 J**	**8.6**	**92**	**47**	**0.16 J**	**140**	<0.0012

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection limit. J = Estimated value. bgs = Below ground surface.

TABLE 11
ON-SITE SOIL SAMPLING RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	R&H Oil West Side								R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	MW-12	MW-14	NMW-3	SB-1	SB-2	SB-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																				
Sample Interval (ft bgs):		0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
2,4,5-Trichlorophenol	17	<1.1	<0.01	<0.011	<0.59 J	<0.67 J	<0.58 J	< 0.055	< 0.053	<1	<0.59	<1	<0.057	<1	<0.05	<0.1	<0.01	<0.23	<0.11	<0.055
2,4,6-Trichlorophenol	0.087	<0.29	<0.0027	<0.0029	<0.16 J	<0.18 J	<0.15 J	< 0.015	< 0.014	<0.28	<0.16	<0.28	<0.015	<0.27	<0.013	<0.028	<0.0027	<0.062	<0.029	<0.015
2,4-Dichlorophenol	0.18	<0.41	<0.0039	<0.0041	<0.23 J	<0.26 J	<0.22 J	< 0.021	< 0.021	<0.4	<0.23	<0.4	<0.022	<0.39	<0.019	<0.04	<0.0039	<0.089	<0.041	<0.021
2,4-Dimethylphenol	1.6	<0.92 J	<0.0086	<0.0091	<0.51 J	<0.58 J	<0.49 J	< 0.047	< 0.046	<0.9 J	<0.51 J	<0.9 J	<0.048	<0.87 J	<0.043 J	<0.088	<0.0087	<0.2	<0.092	<0.047
2,4-Dinitrophenol	0.047	<0.5 J	<0.0047	<0.005	<0.28 J	<0.32 J	<0.27 J	< 0.026 J	< 0.025 J	<0.49 J	<0.28 J	<0.49 J	<0.027	<0.48 J	<0.024 J	<0.049	<0.0048	<0.11	<0.051	<0.026
2,4-Dinitrotoluene	0.0027	<0.39 J	<0.0036	<0.0038	<0.21 J	<0.24 J	<0.21 J	< 0.02	< 0.019	<0.38 J	<0.21 J	<0.38 J	<0.02	<0.37 J	<0.018 J	<0.037	<0.0036	<0.083	<0.039	<0.02
2,6-Dinitrotoluene	0.0024	<0.32 J	<0.003	<0.0031	<0.17 J	<0.2 J	<0.17 J	< 0.016	< 0.016	<0.31 J	<0.17 J	<0.31 J	<0.017	<0.3 J	<0.015 J	<0.03	<0.003	<0.068	<0.032	<0.016
2-Chloronaphthalene	330	<0.13	<0.0012	<0.0013	<0.072	<0.081	<0.07	< 0.0066	< 0.0065	<0.13	<0.071	<0.13	<0.0068	<0.12	<0.0061	<0.012	<0.0012	<0.028	<0.013	<0.0066
2-Chlorophenol	0.82	<0.21	<0.002	<0.0021	<0.12 J	<0.13 J	<0.11 J	< 0.011	< 0.011	<0.21	<0.12	<0.21	<0.011	<0.2	<0.0099	<0.02	<0.002	<0.045	<0.021	<0.011
2-Methylnaphthalene	8.5	<0.29 J	**0.0077 J**	<0.0029	<0.16 J	<0.18 J	<0.16 J	< 0.015	**0.04 J**	<0.29 J	<0.16 J	<0.29 J	**0.049 J**	<0.28 J	<0.014 J	<0.028	**0.016 J**	<0.063	<0.029	**0.081 J**
2-Nitroaniline	0.011	<0.52	<0.0049	<0.0052	<0.29 J	<0.33 J	<0.28 J	< 0.027	< 0.026	<0.51	<0.29	<0.51	<0.028	<0.5	<0.025	<0.05	<0.0049	<0.11	<0.052	<0.027
2-Nitrophenol	0.067	<0.42	<0.0039	<0.0041	<0.23 J	<0.26 J	<0.22 J	< 0.021	< 0.021	<0.41	<0.23	<0.41	<0.022	<0.4	<0.019	<0.04	<0.0039	<0.09	<0.042	<0.021
3 & 4 Methylphenol	0.32	<0.3	<0.0028	<0.003	<0.16	<0.19	<0.16	< 0.015	< 0.015	<0.29	<0.16	<0.29	<0.016	<0.28	<0.014	<0.029	<0.0028	<0.064	<0.03	<0.015
3,3'-Dichlorobenzidine	0.031	<1.1	<0.01	<0.011	<0.6 J	<0.68 J	<0.59 J	< 0.055	< 0.054	<1.1	<0.6	<1.1	<0.057	<1	<0.051	<0.1	<0.01	<0.23	<0.11	<0.056
3-Nitroaniline	0.013	<0.76 J	<0.0072	<0.0076	<0.42 J	<0.48 J	<0.41 J	< 0.039	< 0.038	<0.75 J	<0.42 J	<0.75 J	<0.04	<0.73 J	<0.036 J	<0.074	<0.0072	<0.16	<0.077	<0.039
4,6-Dinitro-2-methylphenol	0.0023	<0.53 J	<0.005	<0.0053 J	<0.29 J	<0.33 J	<0.29 J	< 0.027 J	< 0.027 J	<0.52 J	<0.29 J	<0.52 J	<0.028	<0.51 J	<0.025 J	<0.051	<0.005 J	<0.11 J	<0.053 J	<0.027
4-Bromophenyl phenyl ether	0.18	<0.3	<0.0028	<0.003	<0.17	<0.19	<0.16	< 0.015	< 0.015	<0.3	<0.17	<0.3	<0.016	<0.29	<0.014	<0.029	<0.0029	<0.066	<0.03	<0.016
4-Chloro-3-methylphenol	2.3	<1.7	<0.016	<0.017	<0.92 J	<1 J	<0.9 J	< 0.085	< 0.083	<1.6	<0.92	<1.6	<0.088	<1.6	<0.078	<0.16	<0.016	<0.36	<0.17	<0.086
4-Chloroaniline	0.01	<0.62	<0.0058	<0.0062	<0.34 J	<0.39 J	<0.34 J	< 0.032	< 0.031	<0.61	<0.34	<0.61	<0.033	<0.59	<0.029	<0.06	<0.0059	<0.13	<0.062	<0.032
4-Chlorophenyl phenyl ether	0.016	<0.19	<0.0018	<0.0019	<0.11 J	<0.12 J	<0.1 J	< 0.0098	< 0.0096	<0.19	<0.11	<0.19	<0.01	<0.18	<0.009	<0.019	<0.0018	<0.042	<0.019	<0.0099
4-Nitroaniline	0.054	<1.2 J	<0.011	<0.012 J	<0.66 J	<0.75 J	<0.64 J	< 0.061	< 0.06	<1.2 J	<0.66 J	<1.2 J	<0.063 J	<1.1 J	<0.056 J	<0.11	<0.011 J	<0.26 J	<0.12	<0.061
4-Nitrophenol	0.05	<0.54 J	<0.0051	<0.0054	<0.3 J	<0.34 J	<0.29 J	< 0.028	< 0.027	<0.53 J	<0.3 J	<0.53 J	<0.029	<0.52 J	<0.025 J	<0.052	<0.0051	<0.12	<0.054	<0.028
Acenaphthene	120	<0.15	<0.0014	<0.0015	<0.085 J	<0.097 J	<0.083 J	< 0.0078	< 0.0077	<0.15	<0.085	<0.15	<0.0081	<0.15	<0.0072	**0.088 J**	**0.011 J**	**0.2 J**	<0.015	<0.0079
Acenaphthylene	200	<0.11	<0.001	<0.0011	<0.059 J	<0.067 J	<0.058 J	< 0.0054	< 0.0053	<0.1	<0.059	<0.1	<0.0056	<0.1	<0.005	**0.098 J**	<0.001	<0.023	<0.011	<0.0055
Aniline	0.18	<0.32 J	<0.003 J	<0.0032 J	<0.18 J	<0.2 J	<0.17 J	< 0.016	< 0.016	<0.31 J	<0.18 J	<0.31 J	<0.017 J	<0.3 J	<0.015 J	<0.031 J	<0.003 J	<0.069 J	<0.032 J	<0.016 J
Anthracene	3,400	<0.14	<0.0013	<0.0014	**0.24 J**	**0.25 J**	<0.074 J	< 0.007	**0.027 J**	<0.13	<0.076	<0.13	<0.0072	<0.13	<0.0064	<0.013	**0.025**	**0.83**	**0.17 J**	<0.007
Benzo[a]anthracene	0.16	<0.15	<0.0014	<0.0015	**0.22 J**	**0.13 J**	**0.087 J**	< 0.0075	**0.13**	<0.14	<0.081	<0.14	<0.0078	<0.14	<0.0069	**0.49**	**0.032**	**4.1**	**0.14 J**	**0.25**
Benzo[a]pyrene	0.016	<0.17	<0.0016	<0.0017	**0.21 J**	<0.11	<0.093	< 0.0088	**0.26**	<0.17	<0.095	<0.17	<0.0091	<0.16	<0.0081	**0.58**	**0.031**	**3.4**	**0.16 J**	**0.3**
Benzo[b]fluoranthene	0.16	<0.18	<0.0017	<0.0018	**0.47 J**	**0.16 J**	<0.099	< 0.0094	**0.3**	<0.18	<0.1	<0.18	<0.0097	<0.17	<0.0086	**0.53**	**0.031**	**4.3**	**0.13 J**	**0.36**
Benzo[g,h,i]perylene	1,800	<0.54	<0.0051	<0.0054	<0.3 J	<0.34 J	<0.29 J	< 0.028	**0.13**	<0.53	<0.3	<0.53	<0.029	<0.52	<0.025	**0.45**	**0.025**	**1.5**	**0.16 J**	**0.18**
Benzo[k]fluoranthene	1.6	<0.16	<0.0015	<0.0016	<0.088 J	<0.1 J	<0.086 J	< 0.0081	**0.079 J**	<0.16	<0.088	<0.16	<0.0084	<0.15	<0.0075	**0.55**	**0.026 J**	**2.8**	**0.15 J**	**0.27**
Benzyl alcohol	2.9	<0.62	<0.0058	<0.0062	<0.34 J	<0.39 J	<0.34 J	< 0.032	< 0.031	<0.61	<0.34	<0.61	<0.033	<0.59	<0.029	<0.06	<0.0059	<0.13	<0.062	<0.032
Bis(2-chloroethoxy)methane	0.006	<0.15	<0.0014	<0.0015	<0.084	<0.095	<0.082	< 0.0077	< 0.0076	<0.15	<0.084	<0.15	<0.008	<0.14	<0.0071	<0.015	<0.0014	<0.033	<0.015	<0.0078
Bis(2-chloroethyl)ether	0.001	<0.18	<0.0017	<0.0018	<0.098 J	<0.11 J	<0.095 J	< 0.009	< 0.0088	<0.17	<0.097	<0.17	<0.0093	<0.17	<0.0083	<0.017	<0.0017	<0.038	<0.018	<0.0091
Bis(2-chloroisopropyl) ether	0.095	<0.95	<0.0089	<0.0094	<0.52 J	<0.59 J	<0.51 J	< 0.048	< 0.047	<0.92	<0.52	<0.92	<0.05	<0.9	<0.044	<0.091	<0.0089	<0.2	<0.095	<0.049
Bis(2-ethylhexyl) phthalate	39	<0.57	<0.0054	<0.0057	<0.32	<0.36	<0.31	< 0.029	**0.31 J**	<0.56	<0.32	<0.56	<0.03	<0.55	<0.027	<0.055	<0.0054	<0.12	<0.058	<0.03
Butyl benzyl phthalate	130	<0.66	<0.0062	<0.0066	<0.37	<0.41	<0.36	**0.13 J**	< 0.033	<0.65	<0.37	<0.65	<0.035	<0.63	<0.031	<0.064	<0.0062	<0.14	<0.066	<0.034
Chrysene	16	<0.11	<0.001	<0.0011	**0.27 J**	**0.099 J**	<0.059	< 0.0056	**0.14**	<0.11	<0.06	<0.11	<0.0058	<0.1	<0.0051	**0.52**	**0.031**	**4.4**	**0.13 J**	**0.27**
Dibenz(a,h)anthracene	0.016	<0.39	<0.0036	<0.0039	<0.21 J	<0.24 J	<0.21 J	< 0.02	< 0.019	<0.38	<0.21	<0.38	<0.021	<0.37	<0.018	<0.037	<0.0037	**0.6**	<0.039	<0.02
Dibenzofuran	17	<0.19	<0.0018	<0.0019	<0.11	<0.12	<0.1	< 0.0097	< 0.0095	<0.19	<0.11	<0.19	<0.01	<0.18	<0.0089	**0.061 J**	**0.0084 J**	**0.37 J**	<0.019	**0.09 J**
Diethyl phthalate	78	<0.9	<0.0084	<0.009	<0.5 J	<0.57 J	<0.49 J	< 0.046	< 0.045	<0.88	<0.5	<0.88	<0.048	<0.86	<0.042	<0.087	<0.0085	<0.19	<0.09	<0.046
Dimethyl phthalate	31	<0.52 J	<0.0049	<0.0052	<0.29 J	<0.33 J	<0.28 J	< 0.027	< 0.026	<0.51 J	<0.29 J	<0.51 J	<0.028	<0.5 J	<0.025 J	<0.05	<0.0049	<0.11	<0.052	<0.027
Di-n-butyl phthalate	1,700	<0.28	<0.0026	<0.0028	**1.3 J**	<0.17 J	<0.15 J	< 0.014	< 0.014	<0.27	<0.15	<0.27	<0.015	<0.26	<0.013	<0.027	<0.0026	<0.06	<0.028	<0.014
Di-n-octyl phthalate	630	<0.2 J	<0.0019	<0.002	<0.11	<0.13	<0.11	< 0.01	< 0.01	<0.2 J	<0.11 J	<0.2 J	<0.011	<0.19 J	<0.0095 J	<0.02	<0.0019	<0.044	<0.02	<0.01
Fluoranthene	960	<0.33	<0.0031	<0.0033	**0.49 J**	**0.44 J**	**0.35 J**	< 0.017	**0.2**	<0.32	<0.18	<0.32	<0.018	<0.32	<0.016	**1**	**0.076**	**12**	**0.35**	**0.39**
Fluorene	150	<0.25	<0.0024	<0.0025	<0.14	<0.16	<0.14	< 0.013	< 0.013	<0.25	<0.14	<0.25	<0.013	<0.24	<0.012	<0.024	**0.012 J**	<0.054	<0.025	<0.013
Hexachlorobenzene	0.21	<0.16	<0.0015	<0.0016	<0.09 J	<0.1 J	<0.088 J	< 0.0083	< 0.0081	<0.16	<0.09	<0.16	<0.0086	<0.15	<0.0076	<0.016	<0.0015	<0.035	<0.016	<0.0084
Hexachlorocyclopentadiene	1.8	<0.49 J	<0.0046	<0.0049 J	<0.27 J	<0.31 J	<0.27 J	< 0.025 J	< 0.025	<0.48 J	<0.27 J	<0.48 J	<0.026 J	<0.47 J	<0.023 J	<0.047	<0.0047 J	<0.11 J	<0.049 J	<0.025
Hexachloroethane	0.64	<0.25 J	<0.0023	<0.0025	<0.14 J	<0.15 J	<0.13 J	< 0.013	< 0.012 J	<0.24 J	<0.14 J	<0.24 J	<0.013	<0.23 J	<0.012 J	<0.024	<0.0023	<0.053	<0.025	<0.013
Indeno[1,2,3-cd]pyrene	0.16	<0.37	<0.0035	<0.0037	**0.23 J**	<0.23	<0.2	< 0.019 J	**0.45 J-**	<0.37	<0.21	<0.37	<0.02	<0.36	<0.018	**0.44**	**0.023 J**	**1.5**	**0.15 J**	**0.16**
Isophorone	1.5	<0.11	<0.001	<0.0011	<0.059 J	<0.067 J	<0.058 J	< 0.0054	< 0.0053	<0.1	<0.059	<0.1	<0.0056	<0.1	<0.005	<0.01	<0.001	<0.023	<0.011	<0.0055
Nitrobenzene	0.18	<0.32 J	<0.003	<0.0031	<0.18	<0.2	<0.17	< 0.016	< 0.016	<0.31 J	<0.17 J	<0.31 J	<0.017	<0.3 J	<0.015 J	<0.03	<0.003	<0.068	<0.032	<0.016
N-Nitrosodi-n-propylamine	0.00018	<0.24 J	<0.0022	<0.0024	<0.13	<0.15	<0.13	< 0.012	< 0.012	<0.23 J	<0.13 J	<0.23 J	<0.013	<0.23 J	<0.011 J	<0.023	<0.0022	<0.051	<0.024	<0.012
Pentachlorophenol	0.0092	<0.43 J	<0.004	<0.0043	<0.24 J	<0.27 J	<0.23 J	< 0.022	< 0.021	<0.42 J	<0.24 J	<0.42 J	<0.023	<0.41 J	<0.02 J	<0.041	<0.004	<0.092	<0.043	<0.022
Phenanthrene	210	<0.53	<0.005	<0.0053	**0.9 J**	**0.99 J**	<0.29 J	< 0.027	**0.072 J**	<0.52	<0.29	<0.52	<0.028	<0.5	<0.025	**0.53**	**0.071**	**2.3**	**0.17 J**	**0.21**
Phenol	10	<0.45	<0.0042	<0.0045	<0.25 J	<0.28 J	<0.24 J	< 0.023	< 0.023	<0.44	<0.25	<0.44	<0.024	<0.43	<0.021	<0.044	<0.0043	<0.098	<0.045	<0.023
Pyrene	560	<0.2	<0.0018	<0.0019	<0.11	<0.12	<0.11	< 0.01	**0.16**	<0.19	<0.11	<0.19	<0.01	<0.19	**0.055 J**	**0.82**	**0.061**	**8.4**	**0.25**	**0.36**

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection limit. J = Estimated value. bgs = Below ground surface.

TABLE 11
ON-SITE SOIL SAMPLING RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	R&H Oil West Side					R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	MW-12	MW-14	NMW-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	5/23/2011	5/23/2011	5/24/2011	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
		Shallow Soil															
Sample Interval (ft bgs):		4-5	3-5	3-4	3-4	3-4	3-4	2-3	2-3	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
2,4,5-Trichlorophenol	17	<0.012	<0.013	<0.51	< 3.8	< 0.059	<1.3	<3.5	<0.55	<8.1	<0.65	<0.012	<0.12	<0.5	<0.45	<0.012	<0.057
2,4,6-Trichlorophenol	0.087	<0.0031	<0.0036	<0.14	< 1	< 0.016	<0.34	<0.95	<0.15	<2.2	<0.17	<0.0033	<0.031	<0.13	<0.12	<0.0033	<0.015
2,4-Dichlorophenol	0.18	<0.0045	<0.0052	<0.2	< 1.5	< 0.023	<0.49	<1.4	<0.21	<3.1	<0.25	<0.0048	<0.045	<0.19	<0.18	<0.0047	<0.022
2,4-Dimethylphenol	1.6	<0.01	<0.012	<0.43 J	< 3.2	< 0.051	<1.1 J	<3. J	<0.47 J	<6.9 J	<0.56 J	<0.011	<0.1	<0.43 J	<0.39 J	<0.011	<0.049
2,4-Dinitrophenol	0.047	<0.0055	<0.0063	<0.24 J	< 1.8 J	< 0.028 J	<0.6 J	<1.7 J	<0.26 J	<3.8 J	<0.31 J	<0.0058	<0.055	<0.23 J	<0.21 J	<0.0058	<0.027
2,4-Dinitrotoluene	0.0027	<0.0042	<0.0049	<0.18 J	< 1.4	< 0.021	<0.46 J	<1.3 J	<0.2 J	<2.9 J	<0.23 J	<0.0045	<0.042	<0.18 J	<0.16 J	<0.0044	<0.021
2,6-Dinitrotoluene	0.0024	<0.0034	<0.004	<0.15 J	< 1.1	< 0.018	<0.38 J	<1. J	<0.16 J	<2.4 J	<0.19 J	<0.0037	<0.034	<0.15 J	<0.13 J	<0.0036	<0.017
2-Chloronaphthalene	330	<0.0014	<0.0016	<0.061	< 0.45	< 0.0072	<0.15	<0.43	<0.066	<0.97	<0.079	<0.0015	<0.014	<0.06	<0.055	<0.0015	<0.0069
2-Chlorophenol	0.82	<0.0023	<0.0027	<0.1	< 0.74	< 0.012	<0.25	<0.7	<0.11	<1.6	<0.13	<0.0024	<0.023	<0.098	<0.089	<0.0024	<0.011
2-Methylnaphthalene	8.5	**0.0082 J**	<0.0037	<0.14 J	< 1	**0.029 J**	<0.35 J	<0.97 J	<0.15 J	<2.2 J	<0.18 J	<0.0034	<0.032	<0.14 J	**0.39 J**	<0.0034	<0.016
2-Nitroaniline	0.011	<0.0057	<0.0066	<0.25	< 1.8	< 0.029	<0.62	<1.7	<0.27	<3.9	<0.32	<0.0061	<0.057	<0.24	<0.22	<0.006	<0.028
2-Nitrophenol	0.067	<0.0045	<0.0052	<0.2	< 1.5	< 0.023	<0.5	<1.4	<0.21	<3.1	<0.25	<0.0048	<0.045	<0.19	<0.18	<0.0048	<0.022
3 & 4 Methylphenol	0.32	<0.0032	<0.0038	<0.14	< 1	< 0.017	<0.36	<0.99	<0.15	<2.2	<0.18	<0.0035	<0.032	<0.14	<0.13	<0.0034	<0.016
3,3'-Dichlorobenzidine	0.031	<0.012	<0.014	<0.51	< 3.8	< 0.06	<1.3	<3.6	<0.56	<8.2	<0.66	<0.013	<0.12	<0.5	<0.46	<0.012	<0.058
3-Nitroaniline	0.013	<0.0083	<0.0096	<0.36 J	< 2.7	< 0.042	<0.91 J	<2.5 J	<0.39 J	<5.8 J	<0.46 J	<0.0089	<0.083	<0.35 J	<0.32 J	<0.0088	<0.041
4,6-Dinitro-2-methylphenol	0.0023	<0.0058	<0.0067	<0.25 J	< 1.9 J	< 0.03 J	<0.63 J	<1.8 J	<0.27 J	<4. J	<0.32 J	<0.0062 J	<0.058	<0.25 J	<0.23 J	<0.0061 J	<0.028
4-Bromophenyl phenyl ether	0.18	<0.0033	<0.0038	<0.14	< 1.1	< 0.017	<0.36	<1	<0.16	<2.3	<0.18	<0.0035	<0.033	<0.14	<0.13	<0.0035	<0.016
4-Chloro-3-methylphenol	2.3	<0.018	<0.021	<0.79	< 5.8	< 0.093	<2	<5.5	<0.85	<13	<1	<0.019	<0.18	<0.77	<0.7	<0.019	<0.089
4-Chloroaniline	0.01	<0.0068	<0.0078	<0.29	< 2.2	< 0.035	<0.74	<2.1	<0.32	<4.7	<0.38	<0.0072	<0.068	<0.29	<0.26	<0.0071	<0.033
4-Chlorophenyl phenyl ether	0.016	<0.0021	<0.0024	<0.091	< 0.67	< 0.011	<0.23	<0.64	<0.099	<1.5	<0.12	<0.0022	<0.021	<0.089	<0.081	<0.0022	<0.01
4-Nitroaniline	0.054	<0.013	<0.015	<0.56 J	< 4.2	< 0.066	<1.4 J	<4. J	<0.61 J	<9. J	<0.72 J	<0.014	<0.13	<0.55 J	<0.5 J	<0.014	<0.064
4-Nitrophenol	0.05	<0.0059	<0.0068	<0.26 J	< 1.9	< 0.03	<0.65 J	<1.8 J	<0.28 J	<4.1 J	<0.33 J	<0.0063	<0.059	<0.25 J	<0.23 J	<0.0062	<0.029
Acenaphthene	120	<0.0017	<0.0019	<0.073	< 0.54	< 0.0086	<0.18	<0.51	<0.079	<1.2	<0.093	<0.0018	<0.017	<0.071	<0.065	<0.0018	<0.0082
Acenaphthylene	200	<0.0012	<0.0013	<0.051	< 0.37	< 0.0059	<0.13	<0.35	<0.055	<0.81	<0.065	<0.0012	**0.19 J**	<0.05	<0.045	<0.0012	<0.0057
Aniline	0.18	<0.0035 J	<0.004 J	<0.15 J	< 1.1	< 0.018	<0.38 J	<1.1 J	<0.16 J	<2.4 J	<0.19 J	<0.0037 J	<0.035 J	<0.15 J	<0.13 J	<0.0037 J	<0.017 J
Anthracene	3,400	<0.0015	<0.0017	<0.065	< 0.48	< 0.0076	<0.16	<0.45	<0.07	<1	<0.083	<0.0016	<0.015	<0.063	<0.058	<0.0016	<0.0073
Benzo[a]anthracene	0.16	<0.0016	<0.0019	<0.07	< 0.52	< 0.0082	<0.18	<0.49	<0.076	<1.1	<0.09	<0.0017	<0.016	<0.068	<0.062	<0.0017	<0.0079
Benzo[a]pyrene	0.016	<0.0019	<0.0022	<0.081	< 0.6	< 0.0096	<0.21	<0.57	<0.088	<1.3	<0.1	<0.002	<0.019	<0.08	<0.073	<0.002	<0.0092
Benzo[b]fluoranthene	0.16	<0.002	<0.0023	<0.087	< 0.64	< 0.01	<0.22	<0.61	<0.094	<1.4	<0.11	<0.0021	<0.02	<0.085	<0.078	<0.0021	<0.0098
Benzo[g,h,i]perylene	1,800	<0.0059	<0.0068	<0.26	< 1.9	< 0.03	<0.65	<1.8	<0.28	<4.1	<0.33	<0.0063	<0.059	<0.25	<0.23	<0.0062	<0.029
Benzo[k]fluoranthene	1.6	<0.0017	<0.002	<0.075	< 0.56	< 0.0089	<0.19	<0.53	<0.082	<1.2	<0.097	<0.0018	<0.017	<0.074	<0.067	<0.0018	<0.0085
Benzyl alcohol	2.9	<0.0068	<0.0078	<0.29	< 2.2	< 0.035	<0.74	<2.1	<0.32	<4.7	<0.38	<0.0072	<0.068	<0.29	<0.26	<0.0072	<0.033
Bis(2-chloroethoxy)methane	0.006	<0.0016	<0.0019	<0.072	< 0.53	< 0.0084	<0.18	<0.5	<0.078	<1.1	<0.092	<0.0018	<0.017	<0.07	<0.064	<0.0017	<0.0081
Bis(2-chloroethyl)ether	0.001	<0.0019	<0.0022	<0.083	< 0.62	< 0.0098	<0.21	<0.58	<0.09	<1.3	<0.11	<0.002	<0.019	<0.082	<0.075	<0.002	<0.0094
Bis(2-chloroisopropyl) ether	0.095	<0.01	<0.012	<0.45	< 3.3	< 0.053	<1.1	<3.1	<0.48	<7.1	<0.57	<0.011	<0.1	<0.44	<0.4	<0.011	<0.051
Bis(2-ethylhexyl) phthalate	39	<0.0062	<0.0072	<0.27	< 2	< 0.032	<0.68	<1.9	<0.29	<4.3	<0.35	<0.0067	<0.063	<0.27	<0.24	<0.0066	<0.031
Butyl benzyl phthalate	130	<0.0072	<0.0083	<0.31	< 2.3	< 0.037	<0.79	<2.2	<0.34	<5	<0.4	<0.0077	<0.072	<0.31	<0.28	<0.0076	<0.035
Chrysene	16	<0.0012	<0.0014	<0.052	< 0.38	< 0.0061	<0.13	<0.36	<0.056	<0.82	<0.066	<0.0013	<0.012	<0.051	<0.046	<0.0013	<0.0058
Dibenz(a,h)anthracene	0.016	<0.0042	<0.0049	<0.18	< 1.4	< 0.022	<0.46	<1.3	<0.2	<2.9	<0.24	<0.0045	<0.042	<0.18	<0.16	<0.0045	<0.021
Dibenzofuran	17	<0.0021	<0.0024	<0.09	< 0.67	< 0.011	<0.23	<0.63	<0.097	<1.4	<0.12	<0.0022	<0.021	<0.088	<0.08	<0.0022	<0.01
Diethyl phthalate	78	<0.0098	<0.011	<0.43	< 3.2	< 0.05	<1.1	<3	<0.46	<6.8	<0.55	**0.012 J**	<0.098	<0.42	<0.38	<0.01	<0.048
Dimethyl phthalate	31	<0.0057	<0.0066	<0.25 J	< 1.8	< 0.029	<0.62 J	<1.7 J	<0.27 J	<3.9 J	<0.32 J	<0.0061	<0.057	<0.24 J	<0.22 J	<0.006	<0.028
Di-n-butyl phthalate	1,700	<0.003	<0.0035	<0.13	< 0.97	< 0.015	<0.33	<0.92	<0.14	<2.1	<0.17	<0.0032	<0.03	<0.13	<0.12	<0.0032	<0.015
Di-n-octyl phthalate	630	<0.0022	<0.0026	<0.096 J	< 0.71	< 0.011	<0.24 J	<0.67 J	<0.1 J	<1.5 J	<0.12 J	<0.0024	<0.022	<0.094 J	<0.086 J	<0.0023	<0.011
Fluoranthene	960	<0.0036	<0.0042	<0.16	< 1.2	< 0.018	<0.4	<1.1	<0.17	<2.5	<0.2	<0.0039	<0.036	<0.15	<0.14	<0.0038	<0.018
Fluorene	150	<0.0027	<0.0032	<0.12	< 0.88	< 0.014	<0.3	<0.84	<0.13	<1.9	<0.15	<0.0029	<0.027	<0.12	<0.11	<0.0029	<0.013
Hexachlorobenzene	0.21	<0.0018	<0.002	<0.077	< 0.57	< 0.009	<0.19	<0.54	<0.083	<1.2	<0.099	<0.0019	<0.018	<0.075	<0.069	<0.0019	<0.0087
Hexachlorocyclopentadiene	1.8	<0.0053	<0.0062	<0.23 J	< 1.7 J	< 0.027 J	<0.59 J	<1.6 J	<0.25 J	<3.7 J	<0.3 J	<0.0057 J	<0.054	<0.23 J	<0.21 J	<0.0057 J	<0.026
Hexachloroethane	0.64	<0.0027	<0.0031	<0.12 J	< 0.87	< 0.014	<0.29 J	<0.82 J	<0.13 J	<1.9 J	<0.15 J	<0.0029	<0.027	<0.11 J	<0.1 J	<0.0028	<0.013
Indeno[1,2,3-cd]pyrene	0.16	<0.0041	<0.0047	<0.18	< 1.3 J	< 0.021 J	<0.45	<1.2	<0.19	<2.8	<0.23	<0.0043	<0.041	<0.17	<0.16	<0.0043	<0.02
Isophorone	1.5	<0.0012	<0.0013	<0.051	< 0.37	< 0.0059	<0.13	<0.35	<0.055	<0.81	<0.065	<0.0012	<0.012	<0.05	<0.045	<0.0012	<0.0057
Nitrobenzene	0.18	<0.0034	<0.004	<0.15 J	< 1.1	< 0.018	<0.38 J	<1. J	<0.16 J	<2.4 J	<0.19 J	<0.0037	<0.034	<0.15 J	<0.13 J	<0.0036	<0.017
N-Nitrosodi-n-propylamine	0.00018	<0.0026	<0.003	<0.11 J	< 0.83	< 0.013	<0.28 J	<0.79 J	<0.12 J	<1.8 J	<0.14 J	<0.0027	<0.026	<0.11 J	<0.1 J	<0.0027	<0.013
Pentachlorophenol	0.0092	<0.0046	<0.0054	<0.2 J	< 1.5	< 0.024	<0.51 J	<1.4 J	<0.22 J	<3.2 J	<0.26 J	<0.005	<0.047	<0.2 J	<0.18 J	<0.0049	<0.023
Phenanthrene	210	<0.0057	<0.0067	<0.25	< 1.9	< 0.029	<0.63	<1.8	<0.27	<4	<0.32	<0.0061	<0.058	<0.25	<0.22	<0.0061	<0.028
Phenol	10	<0.0049	<0.0057	<0.21	< 1.6	< 0.025	<0.54	<1.5	<0.23	<3.4	<0.28	<0.0053	<0.049	<0.21	<0.19	<0.0052	<0.024
Pyrene	560	<0.0021	<0.0025	<0.093	< 0.69	< 0.011	<0.23	<0.65	<0.1	<1.5	<0.12	<0.0023	<0.021	<0.091	<0.083	<0.0022	<0.01

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value (not applicable, no exceedances).
5. < = Compound not detected at the indicated laboratory detection limit. J = Estimated value. bgs = Below ground surface.

TABLE 11
ON-SITE SOIL SAMPLING RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	R&H Oil West Side					R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	MW-12	MW-14	NMW-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	5/23/2011	5/23/2011	5/24/2011	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
		Deep Soil															
Sample Interval (ft bgs):		11-12	20-22	18-20	17-18	15-16	14-15	19-20	14-15	12-13	24-25	21-22	17-18	13-14	19-20	16-17	17-18
2,4,5-Trichlorophenol	17	<0.011	<0.61	<0.58	<0.057	<0.011	<0.12	<0.059	<0.58	<0.6	<0.57	<0.24	<0.11	<0.12	<0.57	<1.2	<0.011
2,4,6-Trichlorophenol	0.087	<0.0031	<0.16	<0.15	<0.015	<0.003	<0.031	<0.016	<0.15	<0.16	<0.15	<0.064	<0.03	<0.031	<0.15	<0.31	<0.003
2,4-Dichlorophenol	0.18	<0.0044	<0.23	<0.22	<0.022	<0.0044	<0.045	<0.023	<0.22	<0.23	<0.22	<0.093	<0.043	<0.045	<0.22	<0.45	<0.0044
2,4-Dimethylphenol	1.6	<0.0098	<0.52 J	<0.49 J	<0.049	<0.0097	<0.1	<0.05	<0.49 J	<0.51 J	<0.49 J	<0.21 J	<0.096	<0.1	<0.49 J	<1. J	<0.0097
2,4-Dinitrophenol	0.047	<0.0054	<0.29 J	<0.27 J	<0.027	<0.0054 J	<0.055	<0.028	<0.27 J	<0.28 J	<0.27 J	<0.11 J	<0.053	<0.055 J	<0.27 J	<0.55 J	<0.0053
2,4-Dinitrotoluene	0.0027	<0.0041	<0.22 J	<0.21 J	<0.02	<0.0041	<0.042	<0.021	<0.21 J	<0.21 J	<0.2 J	<0.086 J	<0.041	<0.042	<0.21 J	<0.42 J	<0.0041
2,6-Dinitrotoluene	0.0024	<0.0034	<0.18 J	<0.17 J	<0.017	<0.0033	<0.034	<0.017	<0.17 J	<0.18 J	<0.17 J	<0.071 J	<0.033	<0.034	<0.17 J	<0.35 J	<0.0033
2-Chloronaphthalene	330	<0.0014	<0.073	<0.07	<0.0068	<0.0014	<0.014	<0.0071	<0.07	<0.072	<0.069	<0.029	<0.014	<0.014	<0.069	<0.14	<0.0014
2-Chlorophenol	0.82	<0.0023	<0.12	<0.11	<0.011	<0.0022	<0.023	<0.012	<0.11	<0.12	<0.11	<0.047	<0.022	<0.023	<0.11	<0.23	<0.0022
2-Methylnaphthalene	8.5	**3.3**	**5.8 J**	**19 J**	**5.7**	**7.7**	**11**	<0.016	**7.0 J**	**5.3 J**	<0.16 J	**2.9 J**	**12**	**3.8**	**29 J**	**15 J**	**1.6**
2-Nitroaniline	0.011	<0.0056	<0.3	<0.28	<0.028	<0.0056	<0.057	<0.029	<0.28	<0.29	<0.28	<0.12	<0.055	<0.057	<0.28	<0.57	<0.0055
2-Nitrophenol	0.067	<0.0045	<0.24	<0.22	<0.022	<0.0044	<0.045	<0.023	<0.22	<0.23	<0.22	<0.093	<0.044	<0.045	<0.22	<0.46	<0.0044
3 & 4 Methylphenol	0.32	<0.0032	<0.17	<0.16	<0.016	<0.0032	**0.58**	<0.016	<0.16	**0.55 J**	<0.16	<0.067	<0.031	<0.032	<0.16	<0.33	<0.0032
3,3'-Dichlorobenzidine	0.031	<0.012	<0.62	<0.59	<0.057	<0.012 J	<0.12	<0.059	<0.58	<0.6	<0.58	<0.24	<0.11	<0.12	<0.58	<1.2	<0.012
3-Nitroaniline	0.013	<0.0082	<0.43 J	<0.41 J	<0.04	<0.0081	<0.083	<0.042	<0.41 J	<0.43 J	<0.41 J	<0.17 J	<0.08	<0.083	<0.41 J	<0.84 J	<0.0081
4,6-Dinitro-2-methylphenol	0.0023	<0.0057	<0.3 J	<0.29 J	<0.028 J	<0.0057 J	<0.058	<0.029 J	<0.29 J	<0.3 J	<0.28 J	<0.12 J	<0.056	<0.058 J	<0.28 J	<0.58 J	<0.0056
4-Bromophenyl phenyl ether	0.18	<0.0033	<0.17	<0.16	<0.016	<0.0032	<0.033	<0.017	<0.16	<0.17	<0.16	<0.068	<0.032	<0.033	<0.16	<0.33	<0.0032
4-Chloro-3-methylphenol	2.3	<0.018	<0.94	<0.9	<0.088	<0.018	<0.18	<0.091	<0.9	<0.93	<0.88	<0.37	<0.17	<0.18	<0.89	<1.8	<0.018
4-Chloroaniline	0.01	<0.0067	<0.35	<0.34	<0.033	<0.0066	<0.068	<0.034	<0.33	<0.35	<0.33	<0.14	<0.065	<0.068	<0.33	<0.68	<0.0066
4-Chlorophenyl phenyl ether	0.016	<0.0021	<0.11	<0.1	<0.01	<0.002	<0.021	<0.011	<0.1	<0.11	<0.1	<0.043	<0.02	<0.021	<0.1	<0.21	<0.002
4-Nitroaniline	0.054	<0.013	<0.68 J	<0.64 J	<0.063	<0.013	<0.13	<0.065 J	<0.64 J	<0.66 J	<0.63 J	<0.27 J	<0.13	<0.13 J	<0.64 J	<1.3 J	<0.013
4-Nitrophenol	0.05	<0.0058	<0.31 J	<0.29 J	<0.029	<0.0058	<0.059	<0.03	<0.29 J	<0.3 J	<0.29 J	<0.12 J	<0.057	<0.059	<0.29 J	<0.6 J	<0.0058
Acenaphthene	120	<0.0017	<0.087	<0.083	<0.0081	<0.0016	<0.017	<0.0084	<0.083	<0.086	<0.082	<0.034	<0.016	<0.017	<0.082	<0.17	<0.0016
Acenaphthylene	200	<0.0011	<0.061	<0.058	<0.0057	<0.0011	<0.012	<0.0058	<0.058	<0.06	<0.057	<0.024	<0.011	<0.012	<0.057	<0.12	<0.0011
Aniline	0.18	<0.0034 J	<0.18 J	<0.17 J	<0.017	<0.0034	<0.035 J	<0.017 J	<0.17 J	<0.18 J	<0.17 J	<0.071 J	<0.033 J	<0.035 J	<0.17 J	<0.35 J	<0.0034 J
Anthracene	3,400	<0.0015	<0.078	<0.074	<0.0072	<0.0015	<0.015	<0.0075	<0.074	<0.076	<0.073	<0.031	<0.014	<0.015	<0.073	<0.15	<0.0015
Benzo[a]anthracene	0.16	<0.0016	<0.084	<0.08	<0.0078	<0.0016	<0.016	<0.0081	<0.079	<0.082	<0.078	<0.033	<0.015	<0.016	<0.079	<0.16	<0.0016
Benzo[a]pyrene	0.016	<0.0018	<0.098	<0.093	<0.0091	<0.0018	<0.019	<0.0094	<0.093	<0.096	<0.091	<0.039	<0.018	<0.019	<0.092	<0.19	<0.0018
Benzo[b]fluoranthene	0.16	<0.002	<0.1	<0.099	<0.0097	<0.002	<0.02	<0.01	<0.099	<0.1	<0.098	<0.041	<0.019	<0.02	<0.098	<0.2	<0.0019
Benzo[g,h,i]perylene	1,800	<0.0058	<0.31	<0.29	<0.029	<0.0058	<0.059	<0.03	<0.29	<0.3	<0.29	<0.12	<0.057	<0.059	<0.29	<0.59	<0.0057
Benzo[k]fluoranthene	1.6	<0.0017	<0.09	<0.086	<0.0084	<0.0017	<0.017	<0.0087	<0.086	<0.089	<0.085	<0.036	<0.017	<0.017	<0.085	<0.17	<0.0017
Benzyl alcohol	2.9	<0.0067	<0.35	<0.34	<0.033	<0.0066	<0.068	<0.034	<0.34	<0.35	<0.33	<0.14	<0.065	<0.068	<0.33	<0.68	<0.0066
Bis(2-chloroethoxy)methane	0.006	<0.0016	<0.086	<0.082	<0.008	<0.0016	<0.017	<0.0083	<0.082	<0.085	<0.081	<0.034	<0.016	<0.017	<0.081	<0.17	<0.0016
Bis(2-chloroethyl)ether	0.001	<0.0019	<0.1	<0.095	<0.0093	<0.0019	<0.019	<0.0096	<0.095	<0.098	<0.094	<0.039	<0.019	<0.019	<0.094	<0.19	<0.0019
Bis(2-chloroisopropyl) ether	0.095	<0.01	<0.54	<0.51	<0.05	<0.01	<0.1	<0.052	<0.51	<0.53	<0.5	<0.21	<0.099	<0.1	<0.5	<1	<0.01
Bis(2-ethylhexyl) phthalate	39	<0.0062	<0.33	<0.31	<0.03	<0.0061	<0.063	<0.031	<0.31	<0.32	<0.3	<0.13	<0.06	<0.062	<0.31	<0.63	<0.0061
Butyl benzyl phthalate	130	<0.0071	<0.38	<0.36	<0.035	<0.007	<0.072	<0.036	<0.36	<0.37	<0.35	<0.15	<0.069	<0.072	<0.35	<0.73	<0.007
Chrysene	16	<0.0012	<0.062	<0.059	<0.0058	<0.0012	<0.012	<0.006	<0.059	<0.061	<0.058	<0.024	<0.011	<0.012	<0.058	<0.12	<0.0012
Dibenz(a,h)anthracene	0.016	<0.0042	<0.22	<0.21	<0.021	<0.0041	<0.042	<0.021	<0.21	<0.22	<0.21	<0.087	<0.041	<0.042	<0.21	<0.43	<0.0041
Dibenzofuran	17	<0.002	<0.11	<0.1	**0.046 J**	**0.087**	<0.021	<0.01	<0.1	<0.11	<0.1	<0.043	<0.02	<0.021	<0.1	<0.21	<0.002
Diethyl phthalate	78	<0.0097	<0.51	<0.49	<0.048	<0.0096	<0.098	<0.049	<0.49	<0.5	<0.48	<0.2	<0.095	<0.098	<0.48	<0.99	<0.0096
Dimethyl phthalate	31	<0.0056	<0.3 J	<0.28 J	<0.028	<0.0056	<0.057	<0.029	<0.28 J	<0.29 J	<0.28 J	<0.12 J	<0.055	<0.057	<0.28 J	<0.57 J	<0.0055
Di-n-butyl phthalate	1,700	<0.003	<0.16	<0.15	<0.015	<0.0029	<0.03	<0.015	<0.15	<0.15	<0.15	<0.062	<0.029	<0.03	<0.15	<0.3	<0.0029
Di-n-octyl phthalate	630	<0.0022	<0.12 J	<0.11 J	<0.011	<0.0022	<0.022	<0.011	<0.11 J	<0.11 J	<0.11 J	<0.045 J	<0.021	<0.022	<0.11 J	<0.22 J	<0.0022
Fluoranthene	960	<0.0036	<0.19	<0.18	<0.018	<0.0035	<0.036	<0.018	<0.18	<0.19	<0.18	<0.074	<0.035	<0.036	<0.18	<0.36	<0.0035
Fluorene	150	**0.059**	<0.14	<0.14	**0.16**	**0.28**	<0.028	<0.014	<0.14	<0.14	<0.13	<0.056	**0.45**	<0.027	**2**	<0.28	**0.31**
Hexachlorobenzene	0.21	<0.0017	<0.092	<0.088	<0.0086	<0.0017	<0.018	<0.0089	<0.087	<0.09	<0.086	<0.036	<0.017	<0.018	<0.087	<0.18	<0.0017
Hexachlorocyclopentadiene	1.8	<0.0053	<0.28 J	<0.27 J	<0.026 J	<0.0052 J	<0.054	<0.027 J	<0.27 J	<0.27 J	<0.26 J	<0.11 J	<0.052	<0.054 J	<0.26 J	<0.54 J	<0.0052
Hexachloroethane	0.64	<0.0026	<0.14 J	<0.13 J	<0.013	<0.0026	<0.027	<0.014	<0.13 J	<0.14 J	<0.13 J	<0.055 J	<0.026	<0.027	<0.13 J	<0.27 J	<0.0026
Indeno[1,2,3-cd]pyrene	0.16	<0.004	<0.21	<0.2	<0.02 J	<0.004	<0.041	<0.02	<0.2	<0.21	<0.2	<0.084	<0.039	<0.041	<0.2	<0.41	<0.004
Isophorone	1.5	<0.0011	<0.061	<0.058	<0.0057	<0.0011	<0.012	<0.0058	<0.058	<0.06	<0.057	<0.024	<0.011	<0.012	<0.057	<0.12	<0.0011
Nitrobenzene	0.18	<0.0034	<0.18 J	<0.17 J	<0.017	<0.0034	<0.035	<0.017	<0.17 J	<0.18 J	<0.17 J	<0.071 J	<0.033	<0.034	<0.17 J	<0.35 J	<0.0034
N-Nitrosodi-n-propylamine	0.00018	<0.0025	<0.13 J	<0.13 J	<0.013	<0.0025	<0.026	<0.013	<0.13 J	<0.13 J	<0.13 J	<0.053 J	<0.025	<0.026	<0.13 J	<0.26 J	<0.0025
Pentachlorophenol	0.0092	<0.0046	<0.24 J	<0.23 J	<0.023	<0.0045	<0.047	<0.023	<0.23 J	<0.24 J	<0.23 J	<0.096 J	<0.045	<0.047	<0.23 J	<0.47 J	<0.0045
Phenanthrene	210	**0.029**	<0.3	<0.29	<0.028	**0.21**	<0.058	<0.029	<0.28	<0.29	<0.28	<0.12	**0.27**	**0.075 J**	**1.7**	**1.4 J**	**0.21**
Phenol	10	<0.0049	<0.26	<0.24	<0.024	<0.0048	**0.39**	<0.025	<0.24	<0.25	<0.24	<0.1	<0.048	**0.22 J**	<0.24	<0.5	<0.0048
Pyrene	560	<0.0021	<0.11	<0.11	<0.01	**0.036**	<0.021	**0.077 J**	<0.11	<0.11	<0.1	<0.044	<0.021	<0.021	**0.28 J**	<0.21	<0.0021

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection limit. J = Estimated value. bgs = Below ground surface.

TABLE 12
ON-SITE SOIL SAMPLING RESULTS: EXTENT EVALUATION VALUE EXCEEDANCES
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Surface Soil

Sample Area:	Extent	Representative	R&H Oil West Side						R&H Oil East Side						Tropicana				
Sample Location:	Evaluation	Background	MW-12	SB-1	SB-2	SB-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	Value	5/23/2011	10/24/2012	10/24/2012	10/24/2012	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Sample Interval (ft bgs):			0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
C6-C35 (Total)	2,270	NA	**1,400**	**510**	**4,800**	**3,000**	**290**	**160**	**12,000**	**5,600 J**	**8,000 J**	**210 J**	**10,000**	**680**	<9.9	<9.7	<11	<10	<11
Arsenic	0.68	6.3	**4.8**	**4.1**	**7.9**	**6**	**7.6**	**4**	**4.3**	**3.8**	**5.6**	**5.8**	**1.4**	**4.3**	**2.8**	**1.2**	**5.2**	**2.7**	**4.5**
Barium	220	300	**96**	**120**	**200**	**120**	**70**	**35**	**85**	**71**	**77**	**230**	**11**	**33**	**60**	**12**	**93**	**59**	**88**
Lead	1.5	33	**83**	**69**	**430**	**160**	**17**	**35**	**52**	**49**	**110**	**69**	**18**	**55**	**31**	**2.9**	**100**	**36**	**44**
Mercury	0.0039	0.04	**0.22**	**0.098**	**0.37**	**0.27**	**0.0091 J**	**0.044 J-**	**0.08**	**0.15**	**0.055**	**0.024**	**0.018**	**0.03**	**0.051**	**0.0091**	**0.094**	**0.097**	**0.17**
Thallium	0.78	0.51	<0.3	<0.31	<0.36	<0.3	**1.3 J**	< 0.29	<0.28	<0.31	<0.29	<0.3	<0.28	<0.26	<0.29	<0.27	<0.3	<0.29	<0.29
Methylene Chloride	0.0065	NA	<0.0025	<0.0042	<0.004	<0.0034	< 0.0032	< 0.0034	<0.0041	<0.0021	<0.0025	<0.0036	**0.029**	<0.0026	<0.0044	<0.0025	<0.0028	<0.0032	<0.0021
Benzo[a]anthracene	0.16	NA	<0.15	**0.22 J**	**0.13 J**	**0.087 J**	< 0.0075	**0.13**	<0.14	<0.081	<0.14	<0.0078	<0.14	<0.0069	**0.49**	**0.032**	**4.1**	**0.14 J**	**0.25**
Benzo[a]pyrene	0.016	NA	<0.17	**0.21 J**	<0.11	<0.093	< 0.0088	**0.26**	<0.17	<0.095	<0.17	<0.0091	<0.16	<0.0081	**0.58**	**0.031**	**3.4**	**0.16 J**	**0.3**
Benzo[b]fluoranthene	0.16	NA	<0.18	**0.47 J**	**0.16 J**	<0.099	< 0.0094	**0.3**	<0.18	<0.1	<0.18	<0.0097	<0.17	<0.0086	**0.53**	**0.031**	**4.3**	**0.13 J**	**0.36**
Benzo[k]fluoranthene	1.6	NA	<0.16	<0.088 J	<0.1 J	<0.086 J	< 0.0081	**0.079 J**	<0.16	<0.088	<0.16	<0.0084	<0.15	<0.0075	**0.55**	**0.026 J**	**2.8**	**0.15 J**	**0.27**
Chrysene	16	NA	<0.11	**0.27 J**	**0.099 J**	<0.059	< 0.0056	**0.14**	<0.11	<0.06	<0.11	<0.0058	<0.1	<0.0051	**0.52**	**0.031**	**4.4**	**0.13 J**	**0.27**
Dibenz(a,h)anthracene	0.016	NA	<0.39	<0.21 J	<0.24 J	<0.21 J	< 0.02	< 0.019	<0.38	<0.21	<0.38	<0.021	<0.37	<0.018	<0.037	<0.0037	**0.6**	<0.039	<0.02
Indeno[1,2,3-cd]pyrene	0.16	NA	<0.37	**0.23 J**	<0.23	<0.2	< 0.019 J	**0.45 J-**	<0.37	<0.21	<0.37	<0.02	<0.36	<0.018	**0.44**	**0.023 J**	**1.5**	**0.15 J**	**0.16**
Phenanthrene	210	NA	<0.53	**0.9 J**	**0.99 J**	<0.29 J	< 0.027	**0.072 J**	<0.52	<0.29	<0.52	<0.028	<0.5	<0.025	**0.53**	**0.071**	**2.3**	**0.17 J**	**0.21**

Shallow Soil

Sample Area:	Extent	Representative	R&H Oil West Side				R&H Oil East Side							Tropicana				
Sample Location:	Evaluation	Background	MW-14	NMW-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	Value	Value	5/23/2011	5/24/2011	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	2/20/2014	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Sample Interval (ft bgs):			3-5	3-4	3-4	3-4	3-4	2-3	2-3	3-4	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
C6-C35 (Total)	2,270	NA	<13	**1,200 J**	**170,000**	**560**	**7,500**	**70,000 J**	**6,800 J**	**92,000**	**76,000**	**3,200**	<12	<11	**5,400 J**	**560 J**	<12	<11
Lead	1.5	33	**11**	**44**	**15**	**66**	**17**	**12**	**13**	**20**	NS	**12**	**12**	**270**	**140**	**33**	**12**	**30**
Mercury	0.0039	0.04	**0.0068**	**0.2**	**0.0097 J**	**0.19 J -**	**0.013**	**0.0072**	**0.0083**	**0.017**	NS	**0.0033**	**0.0061**	**0.0072**	**0.015**	**0.45**	**0.0026**	**0.031**
Benzene	0.013	NA	**0.2**	<0.0022	< 0.00099	**0.0043 J**	<0.0014	**3.3 J**	**1.7**	<0.078 J	NS	**0.012 J-**	<0.0029	**0.0051 J**	<0.0049	<0.0045	<0.0032	**0.0036 J**

Deep Soil

Sample Area:	Extent	Representative	R&H Oil West Side					R&H Oil East Side						Tropicana			
Sample Location:	Evaluation	Background	MW-12	MW-14	NMW-3	SB-4	SB-5	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19
Sample Date:	Value	Value	5/23/2011	5/23/2011	5/24/2011	2/20/2014	2/20/2014	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011
Sample Interval (ft bgs):			11-12	20-22	18-20	17-18	15-16	14-15	19-20	14-15	12-13	24-25	21-22	17-18	13-14	19-20	16-17
C6-C35 (Total)	2,270	NA	**170**	**720**	**3,800 J**	NS	NS	**2,500 J+**	**910**	**4,100**	**2,900 J**	**310**	**1,300 J+**	**2,200**	**630 J**	**2,300 J**	**3,800**
Arsenic	0.68	6.3	**4.6**	**5.3**	**5.5**	**5.6**	**4.8**	**2.7**	**15**	**4.9**	**3.1**	**3.3**	**2.6**	**2.4**	**4.3**	**5.5**	**6.7**
Lead	1.5	33	**9.5**	**7.9**	**7.1**	**9.8**	**9.8**	**9.6**	**6.8**	**16**	**7.4**	**4.7**	**6.4**	**10**	**7.1**	**6.5**	**13**
1,2,4-Trimethylbenzene	24	NA	**150**	**160**	**44**	**22**	**11**	**100**	**0.25 J**	**96**	**52**	**0.12 J**	**26**	**60**	**19**	**0.1 J**	**74**
1,3,5-Trimethylbenzene	27	NA	**68**	**91**	**22**	**10**	**4.9**	**41**	<0.12	**42**	**22**	**0.098 J**	**2.6**	**21**	**8.9**	<0.076	**30**
Acetone	21	NA	<0.083 J	**84**	**7.2**	**36**	<0.51	<0.097	<0.12	**18 J**	**5.5**	**2**	**3.6**	<0.81	**1.5**	**6.4**	**16**
Benzene	0.013	NA	**47**	**130**	**29**	**14**	**6**	**83**	**7.9**	**64**	**31**	**4.7**	**18**	**46**	**9.8**	**4.6**	**54**
Chloroform	0.32	NA	<0.033 J	<0.5	<0.03	<0.3	<0.2	<0.038	**2**	<0.03 J	<0.033	**0.32**	**2**	<0.32	<0.036	<0.032	<0.028 J
Ethylbenzene	3.8	NA	**77**	**100**	**19**	**10**	**5.1**	**51**	**0.12 J**	**52**	**29**	**0.13 J**	**18**	**43**	**9.4**	**0.11 J**	**45**
Methyl tert-butyl ether	0.31	NA	<0.092 J	<1.4	<0.082	<0.82	**1.5 J**	<0.11	<0.13	<0.083 J	<0.091	<0.083	<0.077	<0.9	<0.1	<0.087	<0.077 J
Naphthalene	3.8	NA	**34 J**	**32**	**7.1**	**2.7 J**	**1.9 J**	**31 J**	**0.21 J**	**15**	**5.6**	**0.62**	**4.5**	**14**	**3.7**	**0.58**	**16**
N-Propylbenzene	22	NA	**19 J**	**28**	**6.3**	**2.9**	**1.6**	**13 J**	**0.94**	**13**	**6.8**	**1.5**	**5.1**	**11**	**2.7**	**2.4**	**12**
Toluene	4.1	NA	**2 J**	**510**	**1.1**	<0.62	<0.43	**600**	<0.1	**0.063 J**	**220**	<0.062	**0.15 J**	**1.1 J**	**0.088 J**	<0.066	**1.3 J**
Xylenes, Total	61	NA	**590**	**640**	**170**	**65**	**20**	**350**	**0.31 J**	**300**	**190**	**0.071 J**	**8.6**	**92**	**47**	**0.16 J**	**140**
2-Methylnaphthalene	8.5	NA	**3.3**	**5.8 J**	**19 J**	**5.7**	**7.7**	**11**	<0.016	**7.0 J**	**5.3 J**	<0.16 J	**2.9 J**	**12**	**3.8**	**29 J**	**15 J**
3 & 4 Methylphenol	0.32	NA	<0.0032	<0.17	<0.16	<0.016	<0.0032	**0.58**	<0.016	<0.16	**0.55 J**	<0.16	<0.067	<0.031	<0.032	<0.16	<0.33

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value. Yellow shading indicates the EEV exceedance is less than the background value.
5. < = Compound not detected at the indicated laboratory detection limit. bgs = Below ground surface. NS = Not sampled.

TABLE 13
OFF-SITE SOIL SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Location:	Extent	Representative	MW-21	MW-21	MW-21	MW-22	MW-22	MW-22
Sample Interval (ft bgs):	Evaluation	Background	6-7	11-12	14-15	8-10	12-14	18-20
Sample Date:	Value[3]	Value	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012
Total Petroleum Hydrocarbons by TCEQ Method TX1005								
C6-C12	NA	NA	<4.9	**71**	**110**	<4.5	<4.2	<4.5
>C12-C28	NA	NA	**46**	**250**	**330**	<4.8	<4.5	<4.8
>C28-C35	NA	NA	<5.2	**13**	**16**	<4.8	<4.5	<4.8
C6-C35 (Total)	2,270	NA	**46**	**340**	**460**	<8.9	<8.3	<8.8
Metals by US EPA Method 6010B/7471B								
Aluminum	64,000	30,000	**15,000**	**7,200**	**5,300**	**15,000**	**4,900**	**6,700**
Arsenic	0.68	6.3	**4**	**3.9**	**6.3**	**2.7**	**4.4**	**4.5**
Barium	220	300	**190**	**71**	**29**	**52**	**23**	**58**
Chromium	1200	43.16	**13**	**9.3**	**6.3**	**12**	**5.8**	**7.3**
Cobalt	23	9.93	**4.3**	**1.6**	**2.3**	**4.9**	**2.6**	**3.6**
Copper	520	30.22	**8.6**	**4.7**	**4.9**	**7.1**	**4**	**4.6**
Lead	1.5	33.1	**12**	**5.8**	**6**	**10**	**5.6 J**	**5.4**
Manganese	580	506.5	**270**	**180**	**130**	**240**	**140**	**190**
Mercury	0.0039	0.04	**0.0066 J**	<0.0017	**0.0062 J**	<0.002	<0.0017	<0.0018
Nickel	79	22.68	**9.8**	**5.3**	**5.7**	**9.8**	**4.4**	**6.4**
Selenium	1.1	0.3	<0.32	<0.28	<0.28	<0.31	<0.28	<0.31
Thallium	0.78	0.51	<0.34	<0.3	<0.3	<0.33	<0.29	<0.33
Vanadium	75	56.91	**18**	**12**	**16**	**14**	**17**	**18**
Zinc	1,200	73	**28**	**14**	**13**	**29**	**11**	**15**
Volatile Organic Compounds (VOCs) by US EPA Method 8260B								
1,1,1,2-Tetrachloroethane	0.71	NA	<0.0019	<0.0014	<0.062	<0.0018	<0.0016	<0.0013
1,1,1-Trichloroethane	0.81	NA	<0.00098	<0.00074	<0.033	<0.00096	<0.00086	<0.0007
1,1,2,2-Tetrachloroethane	0.012	NA	<0.0012	<0.00087	<0.039	<0.0011	<0.001	<0.00082
1,1,2-Trichloroethane	0.01	NA	<0.00097	<0.00073	<0.032	<0.00095	<0.00085	<0.00069
1,1-Dichloroethane	3.6	NA	<0.0012	<0.00087	<0.039	<0.0011	<0.001	<0.00082
1,1-Dichloroethene	0.025	NA	<0.0016	<0.0012	<0.054	<0.0016	<0.0014	<0.0011
1,1-Dichloropropene	0.067	NA	<0.00086	**0.0054**	<0.029	<0.00085	<0.00075	<0.00061
1,2,3-Trichloropropane	0.00027	NA	<0.0017	<0.0013	<0.058	<0.0017	<0.0015	<0.0012
1,2,4-Trichlorobenzene	2.4	NA	<0.0026	<0.002	<0.087	<0.0026	<0.0023	<0.0019
1,2,4-Trimethylbenzene	24	NA	**0.0027 J**	**0.018**	<0.041	<0.0012	<0.0011	**0.001 J**
1,2-Dibromo-3-Chloropropane	0.00087	NA	<0.0032 J	<0.0024 J	<0.11	<0.0032 J	<0.0028 J	<0.0023 J
1,2-Dibromoethane	0.0001	NA	<0.0013	<0.001	<0.045	<0.0013	<0.0012	<0.00096
1,2-Dichlorobenzene	8.9	NA	<0.0011	<0.0008	<0.035	<0.001	<0.00093	<0.00075
1,2-Dichloroethane	0.007	NA	<0.0012	<0.0009	<0.04	<0.0012	<0.001	<0.00085
1,2-Dichloropropane	0.011	NA	<0.00094	<0.00071	<0.031	<0.00092	<0.00082	<0.00067
1,3,5-Trimethylbenzene	27	NA	<0.0021	<0.0016	<0.071	<0.0021	<0.0019	<0.0015
1,3-Dichlorobenzene	3.4	NA	<0.00094	<0.00071	<0.031	<0.00092	<0.00082	<0.00067
1,3-Dichloropropane	0.032	NA	<0.00083	<0.00063	<0.028	<0.00082	<0.00073	<0.00059
1,4-Dichlorobenzene	1.1	NA	<0.00087	<0.00066	<0.029	<0.00086	<0.00077	<0.00062
2,2-Dichloropropane	0.06	NA	<0.0024	<0.0018	<0.081	<0.0024	<0.0021	<0.0017
2-Butanone (MEK)	15	NA	**0.0035 J**	<0.0019	<0.084	<0.0025	<0.0022	<0.0018
2-Chlorotoluene	4.5	NA	<0.0009	<0.00068	<0.03	<0.00088	<0.00079	<0.00064
2-Hexanone	0.16	NA	<0.0013	<0.001	<0.045	<0.0013	<0.0012	<0.00095
4-Chlorotoluene	5.4	NA	<0.0011	<0.00083	<0.037	<0.0011	<0.00096	<0.00078
4-Isopropyltoluene	120	NA	<0.0013	<0.001	<0.045	<0.0013	<0.0012	<0.00096
4-Methyl-2-pentanone (MIBK)	2.5	NA	<0.0019	<0.0015	<0.065	<0.0019	<0.0017	<0.0014
Acetone	21	NA	**0.055 J-**	**0.033 J-**	<0.074	<0.0022 J	<0.0019 J	<0.0016 J
Benzene	0.013	NA	<0.00083	<0.00063	<0.028	<0.00082	<0.00073	**0.00086 J**
Bromobenzene	1.2	NA	<0.0013	<0.00099	<0.044	<0.0013	<0.0011	<0.00093
Bromodichloromethane	0.033	NA	<0.00087	<0.00066	<0.029	<0.00086	<0.00077	<0.00062
Bromoform	0.32	NA	<0.0018	<0.0014	<0.061	<0.0018	<0.0016	<0.0013
Bromomethane	0.065	NA	<0.0011	<0.00083	<0.037	<0.0011	<0.00096	<0.00078
Carbon disulfide	6.8	NA	<0.00073	<0.00055	<0.024	<0.00072	<0.00064	<0.00052
Carbon tetrachloride	0.031	NA	<0.0015	<0.0011	<0.05	<0.0015	<0.0013	<0.0011
Chlorobenzene	0.55	NA	<0.0013	<0.00096	<0.043	<0.0012	<0.0011	<0.0009

TABLE 13
OFF-SITE SOIL SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Location:	Extent	Representative	MW-21	MW-21	MW-21	MW-22	MW-22	MW-22
Sample Interval (ft bgs):	Evaluation	Background	6-7	11-12	14-15	8-10	12-14	18-20
Sample Date:	Value[3]	Value	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012
Volatile Organic Compounds (VOCs) by US EPA Method 8260B Continued								
Chloroethane	15	NA	<0.0019	<0.0014	<0.062	<0.0018	<0.0016	<0.0013
Chloroform	0.32	NA	<0.00087	<0.00066	<0.029	<0.00086	<0.00077	<0.00062
Chloromethane	0.2	NA	<0.0022	<0.0017	<0.074	<0.0022	<0.0019	<0.0016
cis-1,2-Dichloroethene	0.12	NA	<0.0011	<0.00083	<0.037	<0.0011	<0.00096	<0.00078
cis-1,3-Dichloropropene	0.0033	NA	<0.00071	<0.00054	<0.024	<0.0007	<0.00063	<0.00051
Dibromochloromethane	0.025	NA	<0.0012	<0.00094	<0.042	<0.0012	<0.0011	<0.00088
Dibromomethane	0.56	NA	<0.00099	<0.00075	<0.033	<0.00098	<0.00087	<0.0007
Dichlorodifluoromethane	87	NA	<0.002 J	<0.0015 J	<0.068 J	<0.002 J	<0.0018 J	<0.0014 J
Ethylbenzene	3.8	NA	<0.0013	**0.003 J**	**7.3**	<0.0013	<0.0012	<0.00096
Hexachlorobutadiene	1.2	NA	<0.0015	<0.0011	<0.05	<0.0015	<0.0013	<0.0011
Iodomethane	0.057	NA	<0.0033	<0.0025	<0.11	<0.0033	<0.0029	<0.0023
Isopropylbenzene	170	NA	**0.0053 J**	**0.17**	**1.6**	<0.0012	<0.0011	**0.025**
Methyl tert-butyl ether	0.31	NA	<0.0024	<0.0018	<0.081	<0.0024	<0.0021	<0.0017
Methylene Chloride	0.0065	NA	<0.0029	<0.0022	<0.097	<0.0028	<0.0025	<0.0021
Naphthalene	3.8	NA	**0.04**	**2.6**	**3.4**	<0.0031	<0.0028	<0.0022
n-Butylbenzene	76	NA	**0.0024 J**	**0.077**	**0.95**	<0.00075	<0.00067	**0.0043 J**
N-Propylbenzene	22	NA	**0.01**	**2.1**	**3.5**	<0.0012	<0.0011	**0.035**
sec-Butylbenzene	42	NA	**0.0018 J**	**0.05**	**0.57**	<0.00091	<0.00081	**0.007**
Styrene	1.6	NA	<0.00094	**0.0057**	<0.031	<0.00092	<0.00082	<0.00067
tert-Butylbenzene	50	NA	<0.0013	<0.00095	**0.076 J**	<0.0012	<0.0011	**0.0012 J**
Tetrachloroethene	0.025	NA	<0.00094	<0.00071	<0.031	<0.00092	<0.00082	<0.00067
Toluene	4.1	NA	<0.0018	<0.0014	<0.061	<0.0018	<0.0016	**0.0013 J**
trans-1,2-Dichloroethene	0.25	NA	<0.0015	<0.0011	<0.05	<0.0015	<0.0013	<0.0011
trans-1,3-Dichloropropene	0.018	NA	<0.00077	<0.00058	<0.026	<0.00075	<0.00067	<0.00055
Trichloroethene	0.017	NA	<0.0019	<0.0014	<0.062	<0.0018	<0.0016	<0.0013
Trichlorofluoromethane	64	NA	<0.00087	<0.00066	<0.029	<0.00086	<0.00077	<0.00062
Vinyl chloride	0.011	NA	<0.0012	<0.0009	<0.04 J	<0.0012	<0.001	<0.00085
Xylenes, Total	61	NA	<0.0015	<0.0011	<0.05	<0.0015	<0.0013	<0.0011
Semivolatile Organic Compounds (SVOCs) by US EPA Method 8270C								
2,4,5-Trichlorophenol	17	NA	<0.013	<0.011	<0.011	<0.012	<0.011	<0.012
2,4,6-Trichlorophenol	0.087	NA	<0.0034	<0.003	<0.003	<0.0032	<0.003	<0.0032
2,4-Dichlorophenol	0.18	NA	<0.005	<0.0043	<0.0044	<0.0046	<0.0043	<0.0046
2,4-Dimethylphenol	1.6	NA	<0.011	<0.0096	<0.0097	<0.01	<0.0095	<0.01
2,4-Dinitrophenol	0.047	NA	<0.0061 J	<0.0053 J	<0.0053 J	<0.0056 J	<0.0052 J	<0.0056 J
2,4-Dinitrotoluene	0.0027	NA	<0.0046	<0.004	<0.0041	<0.0043	<0.004	<0.0043
2,6-Dinitrotoluene	0.0024	NA	<0.0038	<0.0033	<0.0033	<0.0035	<0.0033	<0.0035
2-Chloronaphthalene	330	NA	<0.0016	<0.0014	<0.0014	<0.0014	<0.0013	<0.0014
2-Chlorophenol	0.82	NA	<0.0025	<0.0022	<0.0022	<0.0023	<0.0022	<0.0023
2-Methylnaphthalene	8.5	NA	**0.011 J**	**0.38**	**0.82**	<0.0033	<0.003	<0.0033
2-Nitroaniline	0.011	NA	<0.0063	<0.0055	<0.0055	<0.0058	<0.0054	<0.0058
2-Nitrophenol	0.067	NA	<0.005	<0.0043	<0.0044	<0.0046	<0.0043	<0.0046
3 & 4 Methylphenol	0.32	NA	<0.0036	<0.0031	<0.0031	<0.0033	<0.0031	<0.0033
3,3'-Dichlorobenzidine	0.031	NA	<0.013	<0.011	<0.011	<0.012	<0.011	<0.012
3-Nitroaniline*	0.013	NA	<0.0092	<0.008	<0.008	<0.0085	<0.0079	<0.0085
4,6-Dinitro-2-methylphenol	0.0023	NA	<0.0064	<0.0056	<0.0056	<0.0059	<0.0055	<0.0059
4-Bromophenyl phenyl ether	0.18	NA	<0.0036	<0.0032	<0.0032	<0.0034	<0.0031	<0.0034
4-Chloro-3-methylphenol	2.3	NA	<0.02	<0.017	<0.018	<0.019	<0.017	<0.019
4-Chloroaniline	0.01	NA	<0.0075	<0.0065	<0.0065	<0.0069	<0.0064	<0.0069
4-Chlorophenyl phenyl ether	0.016	NA	<0.0023	<0.002	<0.002	<0.0021	<0.002	<0.0021
4-Nitroaniline	0.054	NA	<0.014	<0.012	<0.013	<0.013	<0.012	<0.013
4-Nitrophenol	0.05	NA	<0.0065	<0.0057	<0.0057	<0.006	<0.0056	<0.006
Acenaphthene	120	NA	<0.0018	<0.0016	<0.0016	<0.0017	<0.0016	<0.0017
Acenaphthylene	200	NA	<0.0013	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012
Aniline	0.18	NA	<0.0038	<0.0033	<0.0034	<0.0035	<0.0033	<0.0035
Anthracene	3,400	NA	<0.0016	<0.0014	<0.0014	<0.0015	<0.0014	<0.0015
Benzo[a]anthracene	0.16	NA	<0.0018	<0.0015	<0.0016	<0.0016	<0.0015	<0.0016
Benzo[a]pyrene	0.016	NA	<0.0021	<0.0018	<0.0018	<0.0019	<0.0018	<0.0019
Benzo[b]fluoranthene	0.16	NA	<0.0022	<0.0019	<0.0019	<0.002	<0.0019	<0.002
Benzo[g,h,i]perylene	1,800	NA	<0.0065	<0.0057	<0.0057	<0.006	<0.0056	<0.006

TABLE 13
OFF-SITE SOIL SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Location:	Extent	Representative	MW-21	MW-21	MW-21	MW-22	MW-22	MW-22
Sample Interval (ft bgs):	Evaluation	Background	6-7	11-12	14-15	8-10	12-14	18-20
Sample Date:	Value[3]	Value	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012	5/7/2012
Semivolatile Organic Compounds (SVOCs) by US EPA Method 8270C								
Benzo[k]fluoranthene	1.6	NA	<0.0019	<0.0017	<0.0017	<0.0018	<0.0016	<0.0018
Benzyl alcohol	2.9	NA	<0.0075	<0.0065	<0.0066	<0.0069	<0.0064	<0.0069
Bis(2-chloroethoxy)methane	0.006	NA	<0.0018	<0.0016	<0.0016	<0.0017	<0.0016	<0.0017
Bis(2-chloroethyl)ether	0.001	NA	<0.0021	<0.0018	<0.0019	<0.002	<0.0018	<0.002
Bis(2-chloroisopropyl) ether	0.095	NA	<0.011	<0.0099	<0.0099	<0.011	<0.0098	<0.011
Bis(2-ethylhexyl) phthalate	39	NA	<0.0069	<0.006	<0.006	<0.0064	<0.0059	<0.0064
Butyl benzyl phthalate	130	NA	<0.0079	<0.0069	<0.007	<0.0074	<0.0068	<0.0074
Chrysene	16	NA	<0.0013	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012
Dibenz(a,h)anthracene	0.016	NA	<0.0047	<0.0041	<0.0041	<0.0043	<0.004	<0.0043
Dibenzofuran	17	NA	<0.0023	**0.05**	**0.085**	<0.0021	<0.002	<0.0021
Diethyl phthalate	78	NA	<0.016	<0.0094	<0.0095	<0.01	<0.011	<0.014
Dimethyl phthalate	31	NA	<0.0063	<0.0055	<0.0055	<0.0058	<0.0054	<0.0058
Di-n-butyl phthalate	1,700	NA	<0.0033	<0.0029	<0.0029	<0.0031	<0.0029	<0.0031
Di-n-octyl phthalate	630	NA	<0.0024	<0.0021	<0.0021	<0.0023	<0.0021	<0.0023
Fluoranthene	960	NA	<0.004	**0.0094 J**	**0.011 J**	<0.0037	<0.0034	<0.0037
Fluorene	150	NA	**0.026**	**0.16**	**0.2**	<0.0028	<0.0026	<0.0028
Hexachlorobenzene	0.21	NA	<0.002	<0.0017	<0.0017	<0.0018	<0.0017	<0.0018
Hexachlorocyclopentadiene	1.8	NA	<0.0059 J	<0.0052 J	<0.0052 J	<0.0055 J	<0.0051 J	<0.0055 J
Hexachloroethane	0.64	NA	<0.003	<0.0026	<0.0026	<0.0027	<0.0025	<0.0027
Indeno[1,2,3-cd]pyrene	0.16	NA	<0.0045	<0.0039	<0.0039	<0.0042	<0.0039	<0.0042
Isophorone	1.5	NA	<0.0013	<0.0011	<0.0011	<0.0012	<0.0011	<0.0012
Nitrobenzene	0.18	NA	<0.0038	<0.0033	<0.0033	<0.0035	<0.0033	<0.0035
N-Nitrosodi-n-propylamine	0.00018	NA	<0.0028	<0.0025	<0.0025	<0.0026	<0.0024	<0.0026
Pentachlorophenol	0.0092	NA	<0.0051	<0.0045	<0.0045	<0.0048	<0.0044	<0.0048
Phenanthrene	210	NA	**0.025**	**0.14**	**0.2**	<0.0059	<0.0055	<0.0059
Phenol	10	NA	<0.0054	<0.0047	<0.0048	<0.005	<0.0047	<0.005
Pyrene	560	NA	<0.0023	**0.011 J**	**0.016 J**	<0.0022	<0.002	<0.0022

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 2.
4. Shading = Detected compound exceeds the Extent Evaluation Value. Yellow shading indicates the EEV exceedance is less than the background value.
5. < = Compound not detected at the indicated laboratory detection lmit. J = Estimated value. bgs = Below ground surface.

TABLE 14
EXTENT EVALUATION VALUE EXCEEDANCES IN GROUNDWATER
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

			Metals by US EPA Method 6010B/7471A			*Volatile Organic Compounds (VOCs) by US EPA Method 8260B*											*Semivolatile Organic Compounds (SVOCs) by US EPA Method 8270C*		
Sample Location	**Sample Date**	**TPH** Total	Arsenic	Lead	Manganese	1,2,4-Trimethylbenzene	1,2-Dichloropropane	1,3,5-Trimethylbenzene	Benzene	Ethylbenzene	Methyl tert-butyl ether	Methylene Chloride	Naphthalene	Toluene	Vinyl chloride	Xylenes, Total	2,4-Dimethylphenol	2-Methylnaphthalene	3 & 4 Methylphenol
Extent Evaluation Value (mg/L)		0.98	0.01	0.015	1.1	1.2	0.005	1.2	0.005	0.70	0.24	0.005	0.49	1.0	0.002	10	0.49	0.098	0.12
MW-12	6/6/2011	**8.2**	**0.31**	**0.0042 J**	**0.76**	**1.1**	<0.008	**0.39**	**28**	**1.8**	<0.006	**0.019 J**	**0.41 J**	**0.18**	<0.0055	**8.4**	**0.085**	**0.058 J-**	**0.058 J-**
MW-12*	10/12/2011	**510**	**0.18**	**0.0081 J**	**0.79**	**1.6**	<0.016	**0.65**	**27**	**2.1**	<0.012	<0.015J	**0.78**	**0.11**	<0.011	**9**	<0.0031	**0.29**	<0.002J
MW-12	5/10/2012	**17**	**0.21**	**0.0038 J**	**0.89**	**1.2**	**0.023 J**	**0.4**	**26**	**1.7**	<0.006	<0.0075	**0.51**	**0.1**	<0.0055	**8**	**0.06**	**0.076**	**0.047**
MW-12	4/23/2014		NA	NA	NA	**0.88**	<0.008	**0.47**	**22**	**1.3**	<0.006 J	<0.0075 J	**0.37**	**0.058**	<0.0055	**6.2**	NA	NA	NA
MW-12	5/24/2015		NA	NA	NA	**0.69**	<0.035	**0.31 J**	**17**	**1**	<0.04	<0.4	**0.39 J**	<0.099	<0.06	**4.7**	NA	NA	NA
MW-13	6/6/2011	**4 J**	**0.035**	**0.0073**	**2.5**	**0.21**	0.00016	**0.064**	**11**	**0.68**	<0.00012	<0.00015	**0.092**	**4.3**	0.00011	**1**	**0.0088**	**0.063**	**0.063**
MW-13	10/13/2011	**6.4**	**0.062**	<0.0029	**2.9**	**0.25**	0.016	**0.083**	**14**	**0.81**	0.012	<0.015J	**0.25**	**2.9**	0.011	**1.3**	**0.026**	**0.0088**	**0.025**
MW-13	4/24/2014		NA	NA	NA	**0.58**	<0.008	**0.11**	**11**	**0.95**	<0.006 J	<0.0075 J	**0.11 J-**	**0.17**	<0.0055	**1.3**	NA	NA	NA
MW-13	5/6/2015		NA	NA	NA	**0.34**	<0.017	**0.072 J**	**15**	**0.7**	<0.02	<0.2	**0.083 J**	**0.3**	<0.03	**0.93**	NA	NA	NA
MW-14	6/7/2011	**17 J**	**0.28**	**0.01**	**1.6**	**0.71**	<0.008	**0.26**	**29**	**1.3**	<0.006	**0.0085 J**	**0.29 J**	**22**	<0.0055	**8.9**	**0.044**	**0.22 J-**	**0.22 J-**
MW-14	10/12/2011	**110**	**0.077**	**0.01**	**0.73**	**1**	<0.016	**0.41**	**30**	**1.7**	<0.012	<0.015J	**0.66**	**30**	<0.011	**11**	**0.59**	**0.11**	**0.14 J-**
MW-14	5/10/2012	**41**	**0.33**	**0.0077 J**	**1**	**1.1**	<0.032	**0.44**	**31**	**1.4**	<0.024	<0.03	**0.35**	**28**	<0.022	**13**	**0.64**	**0.058 J**	**0.086**
MW-14	4/24/2014		NA	NA	NA	**0.73**	<0.032	**0.28**	**24**	**1.2**	<0.024 J	<0.03 J	**0.22 J**	**29**	<0.022	**10**	NA	NA	NA
MW-14	5/6/2015		NA	NA	NA	**0.87**	<0.035	**0.35 J**	**27**	**1.3**	<0.04	<0.4	**0.36 J**	**28**	<0.06	**11**	NA	NA	NA
MW-15	6/6/2011	**3.4 J**	**0.22**	<0.0029	**0.58**	**0.71**	<0.008	**0.23**	**15**	**1.3**	**0.25**	<0.00075	**0.26**	**0.17**	<0.0055	**4.7**	**0.017**	<0.002 J	<0.002 J
MW-15	5/10/2012	**16**	**0.24**	<0.0029	**0.63**	**0.33**	**0.0064 J**	**0.11**	**14**	**0.51**	**0.066**	<0.0015	**0.13**	**0.066**	0.0011	**2.1**	**0.034**	**0.033**	**0.0059 J**
MW-15	4/23/2014		NA	NA	NA	**0.18**	<0.008	**0.063**	**15**	**0.34**	**0.021 J**	<0.0075 J	**0.048 J**	**0.028 J**	<0.0055	**1.4**	NA	NA	NA
MW-15	5/6/2015		NA	NA	NA	**0.36 J**	<0.035	**0.13 J**	**16**	**0.64**	**0.058 J**	<0.4	**0.11 J**	<0.099	<0.06	**2.1**	NA	NA	NA
MW-16	6/3/2011	**2.9 J**	**0.078**	<0.0029	**1.1**	0.0025 J	<0.0008	**0.003 J**	**0.99**	**0.0061**	<0.0006 J	<0.0075	**0.028**	**0.0046 J**	<0.00055	**0.012**	**0.022 J**	<0.0099	<0.0099
MW-16*	10/11/2011	**5.5 J**	**0.14**	**0.0059 J**	**1**	**0.0035 J**	<0.0008	**0.0027 J**	**2.7**	**0.094**	<0.0006	<0.00075	**0.017 J+**	**0.0056**	**0.015**	**0.0057**	<0.003	**0.0041 J**	**0.0063 J**
MW-16	5/10/2012	**9.8**	**0.15**	<0.0029	**1**	**0.0021**	<0.00016	**0.0011**	**2.1**	**0.0023**	**0.00074 J**	<0.00015	**0.018**	**0.0051**	<0.00011	**0.0054**	<0.00031	**0.0027**	<0.0002
MW-16	4/23/2014		NA	NA	NA	**0.0015**	<0.00016	**0.00035 J**	**0.36**	**0.00056 J**	**0.00046 J**	<0.00015 J	**0.0022 J-**	**0.0026**	<0.00011	**0.0027**	NA	NA	NA
MW-16	5/6/2015	NA	NA	NA	NA	<0.0006	<0.00052	<0.0006	**0.18**	<0.0006	<0.0006	<0.006	<0.0006	**0.0018 J**	<0.0009	<0.00068	NA	NA	NA
MW-17	6/3/2011	**1 J**	**0.0081 J**	<0.0029	**0.39**	**0.083**	<0.00016	**0.025**	**0.61**	**0.096**	<0.00012 J	<0.00075 J	**0.036**	**0.0032**	<0.00011	**0.078**	**0.017**	<0.0002	<0.0002
MW-17*	10/11/2011	**2.8 J**	**0.036**	<0.0029	**0.72**	**0.17**	<0.00016 J	**0.073**	**5.4**	**0.47**	<0.00012	<0.00015	**0.085**	**0.012**	<0.00011	**0.2**	<0.0003	**0.017**	<0.0002J
MW-17	5/10/2012	**5.8**	**0.026**	<0.0029	**0.5**	**0.29**	<0.008	**0.098**	**2.5**	**0.34**	<0.006	<0.0075	**0.15**	**0.0099 J**	<0.0055	**0.36**	<0.0031	**0.022**	<0.002
MW-17	4/23/2014	NA	NA	NA	NA	**0.16**	<0.0008	**0.059**	**1.3**	**0.039**	<0.0006 J	<0.00075 J	**0.075**	**0.0062**	<0.00055	**0.13**	NA	NA	NA
MW-17	5/4/2015	NA	NA	NA	NA	**0.17**	<0.0017	**0.048**	**0.69**	**0.034**	<0.002	<0.02	**0.075**	**0.0074 J**	<0.003	**0.13**	NA	NA	NA
MW-18	6/3/2011	**18**	**0.11**	**0.0065 J**	**0.56**	**0.57**	<0.016	**0.21**	**22**	**1.4**	<0.012 J	<0.00015	**0.32**	**4.5**	<0.011	**5.5**	**0.039 J**	<0.0002 J	**0.017 J**
MW-18*	10/12/2011	**270**	**0.088**	**0.0076 J**	**0.79**	**1.3**	<0.016	**0.49**	**24**	**1.8**	<0.012	<0.015J	**0.63**	**2.4**	<0.011	**5.4**	**1.5**	**0.12**	**0.2 J-**
MW-18	5/9/2012	**22**	**0.15**	**0.0033 J**	**0.93**	**0.48**	<0.032	**0.19 J**	**22**	**0.96**	<0.024	<0.03	**0.16 J**	**4.5**	<0.022	**4.1**	**0.66**	**0.064**	**0.11**
MW-18	4/23/2014	NA	NA	NA	NA	**0.7**	<0.016	**0.23**	**22**	**1.5**	**0.012 J**	<0.015 J	**0.26**	**0.43**	<0.011	**3.7**	NA	NA	NA
MW-18	5/4/2015	NA	NA	NA	NA	**0.45**	<0.035	**0.14 J**	**22**	**1.1**	<0.04	<0.4	**0.15 J**	**0.73**	<0.06	**2.1**	NA	NA	NA
MW-19	6/3/2011	**3.3 J**	**0.037**	**0.0034 J**	**0.88**	**0.2**	<0.0032	**0.064**	**5.8**	**0.42**	**0.069 J-**	<0.015 J	**0.17**	**0.025**	<0.0022	**0.46**	**0.063**	<0.0002 J	**0.0084 J**
MW-19*	10/12/2011	**3 J**	**0.052**	<0.0029	**0.96**	**0.31**	<0.00016 J	**0.11**	**7.1**	**0.59**	**0.09**	<0.00015J	**0.17 J+**	**0.027 J+**	<0.00011J	**1.1**	**0.0098**	**0.052**	<0.0002J
MW-19	5/10/2012	**6.8**	**0.034**	<0.0029	**0.66**	**0.3**	<0.008	**0.086**	**4.4**	**0.51**	**0.13**	<0.0075	**0.18 J**	**0.026 J**	<0.0055	**0.68**	<0.0031	**0.043**	**0.0021 J**
MW-19	4/24/2014	NA	NA	NA	NA	**0.33**	<0.008	**0.093**	**5.5**	**0.67**	**0.075 J-**	<0.0075 J	**0.17 J-**	**0.038 J**	<0.0055	**0.89**	NA	NA	NA
MW-19	5/6/2015	NA	NA	NA	NA	**0.42**	<0.0087	**0.11**	**6.4**	**0.79**	**0.072**	<0.1	**0.24 J**	**0.037 J**	<0.015	**0.91**	NA	NA	NA
MW-20*	10/12/2011	<0.55	<0.0033	<0.0029	**0.066**	**0.00053 J**	<0.00016	<0.0001	**0.00081 J**	<0.00011	**0.00069 J**	<0.00015	**0.0014**	<0.00015	**0.0023**	<0.00026	<0.0003	<0.000068	<0.0002J
MW-23	5/6/2015	NA	NA	NA	NA	**0.39**	<0.017	**0.14 J**	**7.4**	**0.55**	<0.02	<0.2	**0.064 J**	**0.061 J**	<0.03	**1.2**	NA	NA	NA
MW-24	5/6/2015	NA	NA	NA	NA	**0.66**	<0.0087	**0.23**	**6.2**	**0.54**	<0.01	<0.1	**0.19 J**	<0.025	<0.015	**2.1**	NA	NA	NA
MW-25	12/10/2015	NA	NA	NA	NA	**0.71**	<0.0027	**0.34**	<0.0039	<0.0032	**0.54**	**0.024**	**0.13**	<0.0027	**2**	**1.8**	NA	NA	NA
MW-30	12/10/2015	NA	NA	NA	NA	**0.55**	<0.00014	**0.17**	**5.3**	**0.72**	<0.00011	<0.00018	**0.18**	**0.11**	<0.00025	**2.7**	NA	NA	NA
MW-1	6/7/2011	**1.2 J**	**0.082**	**0.0041 J**	**0.26**	**0.0005 J**	<0.00016	**0.0003 J**	**0.1**	**0.0038**	<0.00012	<0.00015	**0.0044**	**0.014**	<0.00011	**0.02**	**0.037**	<0.0002 J	<0.0002 J
MW-1*	10/12/2011	**0.95 J**	**0.06**	<0.0029	**0.27**	**0.00087 J**	<0.00016	**0.00058 J**	**0.08**	**0.0031**	**0.0097**	<0.00015	**0.0035**	**0.0078**	<0.00011	**0.019**	<0.0003	**0.028**	<0.0002J
MW-1	5/11/2012	<1.5	**0.03**	<0.0029	**0.27**	<0.00014	**0.0059**	<0.0001	**0.011**	**0.00047 J**	**0.009**	<0.00015	**0.00078 J**	**0.0012**	<0.00011	**0.0026**	<0.00031	**0.0034**	<0.0002
MW-1	4/22/2014	NA	NA	NA	NA	**0.00035 J**	<0.00016	**0.00012 J**	**0.094**	**0.0022**	**0.015 J-**	<0.00015 J	**0.0018 J**	**0.0071**	<0.00011	**0.0089**	NA	NA	NA
MW-1	5/4/2015	NA	NA	NA	NA	<0.001	<0.00087	<0.001	**0.057**	<0.001	**0.015**	<0.01	<0.001	**0.0035 J**	<0.0015	**0.0024 J**	NA	NA	NA
MW-2	6/7/2011	**0.56 J**	**0.46**	<0.0029	**0.62**	<0.0007	<0.0008	<0.0005	**1.1**	**0.025**	<0.0006	<0.0022	**0.02**	**0.0084**	<0.00055	**0.0071**	**0.041**	0.0002 R	<0.0002 J
MW-2*	10/12/2011	<0.55	**0.38**	<0.0029	**0.54**	**0.0028 J**	<0.0008	**0.0042 J**	**1.4**	**0.011**	**0.0019 J**	<0.00075	**0.011 J+**	**0.013**	**0.012**	**0.012**	<0.0003	**0.078**	<0.0002J
MW-2	5/10/2012	<1.5	**0.38**	<0.0029	**0.36**	<0.0007	**0.0024 J**	<0.0005	**0.39**	**0.003 J**	**0.0019 J**	**0.00095 J**	**0.0022 J**	**0.0028 J**	<0.00055	**0.002 J**	<0.00031	**0.051**	<0.002
MW-2	4/23/2014	NA	NA	NA	NA	<0.00014	<0.00016	<0.0001	**0.44**	**0.0016**	**0.0031 J-**	<0.00015 J	**0.0014 J**	**0.0059**	<0.00011	**0.0048**	NA	NA	NA
MW-3	6/7/2011	**7.9**	**0.18**	**0.012**	**0.8**	**0.52**	<0.0032	**0.24**	**19**	**0.85**	<0.0024	<0.003	**0.31**	**0.023**	<0.0022	**3.4**	**0.071**	<0.0002 J	**0.0023 J-**
MW-3	10/12/2011	**230**	**0.25**	**0.016**	**0.59**	**1.2**	<0.016	**0.67**	**23**	**1.3**	<0.012	<0.015J	**0.72**	**1.5**	<0.11	**9.5**	**0.13**	**0.17**	<0.0002J
MW-3	5/10/2012	**460**	**0.095**	**0.033**	**1**	**2.7**	**0.081 J**	**1.5**	**17**	**1.5**	<0.024	<0.03	**0.82**	**1.4**	<0.022	**15**	**0.015**	**0.9**	**0.035 J**
MW-3	4/24/2014	NA	NA	NA	NA	**0.73**	<0.0008	**0.24**	**3.9**	**0.6**	<0.0006	<0.00075	**0.2 J-**	**0.0066**	<0.00055	**2.1**	NA	NA	NA
MW-3	5/6/2015	NA	NA	NA	NA	**0.3**	<0.0035	**0.12**	**1.6**	**0.28**	<0.004	<0.04	**0.096 J**	<0.0099	<0.006	**1.6**	NA	NA	NA
MW-4	10/12/2011	<0.55	**0.068**	**0.02**	**0.06**	**0.0036**	<0.00016	**0.002**	**0.089**	**0.0036**	<0.00012	<0.00015	**0.029**	**0.00069 J**	<0.00011	**0.015**	<0.0003	**0.00022 J**	<0.00019J
MW-5	6/7/2011	**6.5**	**0.32**	**0.0036 J**	**0.41**	**0.00097 J**	<0.00016	**0.0014**	**0.09**	**0.0013**	**0.3**	<0.00015	<0.00032	**0.0015**	<0.00011	**0.0034**	**0.19**	**0.0084 J**	0.0002 R
MW-5*	10/12/2011	**150**	**0.18**	**0.004 J**	**0.59**	**0.024**	<0.0032	**0.0087 J**	**1.1**	**0.1**	**0.48**	<0.003	**0.23**	**0.012 J**	**0.41**	**0.034**	<0.0015	**0.96**	<0.00098J
MW-5	5/11/2012	**20**	**0.19**	**0.0044 J**	**0.49**	**0.0022 J**	**0.0017 J**	<0.0005	**0.16**	**0.003 J**	**0.46**	<0.00075	**0.015**	**0.0018 J**	<0.00055	**0.0049 J**	**0.015**	**0.26**	<0.00099
MW-6	6/7/2011	**3.5 J**	**0.034**	**0.0085 J**	**0.53**	**0.035**	<0.0016	**0.0062 J**	**10**	**0.5**	<0.0012	<0.0015	**0.21 J**	**0.013**	<0.0011	**0.044**	**0.073**	<0.0002	<0.0002 J
MW-6	10/12/2011	**8.4 J**	**0.022**	**0.021**	**0.74**	**0.15**	<0.0032	**0.045**	**7.5**	**0.41**	<0.0024	<0.003	**0.22 J+**	**0.023**	**0.05**	**0.71**	**0.0053 J-**	**0.084**	0.0002 R
MW-6	5/11/2012	**14**	**0.067**	**0.011 J**	**0.72**	**0.37**	<0.008	**0.11**	**13**	**0.58**	<0.006	**0.0091 J**	**0.33 J**	**0.065**	<0.0055	**1.4**	**0.053**	**0.077**	<0.00099
MW-6	4/24/2014	NA	NA	NA	NA	**0.15**	<0.0008	**0.04**	**1.2**	**0.24**	<0.0006	<0.00075	**0.13 J-**	**0.012**	<0.00055	**0.38**	NA	NA	NA
MW-6	5/6/2015	NA	NA	NA	NA	**0.31**	<0.0052	**0.09**	**3.1**	**0.45**	<0.006	<0.06	**0.23**	**0.022 J**	<0.009	**0.62**	NA	NA	NA
MW-6	12/10/2015	NA	NA	NA	NA	**0.075**	<0.0027	**0.021**	**0.37**	**0.13**	<0.0021	<0.0035	**0.14**	<0.004	<0.005	**0.15**	NA	NA	NA

NOTES:
1. All units are mg/L. * = Sample for metals analysis was filtered in the field due to turbidity.
2. Data presented is from on-site monitoring wells only.
3. Detected compounds are presented in **bold** type.
4. Extent Evaluation Values provided in Table 3.
5. Shading = Detected compound exceeds the Extent Evaluation Value.
6. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.
7. J = Estimated value. J+ = Estimated value with a potential high bias. J- = Estimated value with potential low bias. R - Value rejected. NA = Not analyzed.
8. MW-13 not sampled due to insufficient groundwater during the May 2012 sampling event.
9. MW-15 not sampled due to insufficient groundwater during the October 2011 sampling event.

TABLE 15
ON-SITE GROUNDWATER SAMPLING RESULTS: TOTAL PETROLEUM HYDROCARBONS JUNE 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

RI/FS Wells installed in upper water-bearing zone

Sample Area:	Extent Evaluation Value	R&H Oil						Tropicana Energy		
Sample Location:		MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20
Sample Date:		6/6/2011	6/6/2011	6/7/2011	6/6/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30
C6-C12	0.98	**8.2**	**4 J**	**17 J**	**3.4 J**	**0.88 J**	**1 J**	**15**	**3.3 J**	<0.36
>C12-C28	0.98	<0.31	<0.31	<0.31	<0.31	**2 J**	<0.31	**2.5 J**	<0.31	<0.31
>C28-C35	0.98	<0.54	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55
C6-C35 (Total)	0.98	**8.2**	**4 J**	**17 J**	**3.4 J**	**2.9 J**	**1 J**	**18**	**3.3 J**	<0.55

Existing deep wells, screen interval through shallow zone to base of alluvium

Sample Area:	Extent Evaluation Value	Tropicana Energy					
Sample Location:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:		6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5
C6-C12	0.98	**1.2 J**	**0.56 J**	**7.9**	<0.36	**1.5 J**	**2.7 J**
>C12-C28	0.98	<0.31	<0.31	<0.31	<0.31	**4.9**	**0.81 J**
>C28-C35	0.98	<0.55	<0.55	<0.55	<0.55	<0.55	<0.55
C6-C35 (Total)	0.98	**1.2 J**	**0.56 J**	**7.9**	<0.55	**6.5**	**3.5 J**

NOTES:
1. All units are mg/L.
2. Samples analyzed by Texas TPH Method TX1005, aliphatic/aromatic fractionation by Method TX1006 not performed.
3. Extent Evaluation Values provided on Table 3.
4. Detected compounds are presented in **bold** type. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. J = Estimated value.
6. bgs = Below ground surface.

TABLE 16
ON-SITE GROUNDWATER SAMPLING RESULTS: METALS JUNE 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

RI/FS Wells installed in upper water-bearing zone												
Sample Area:	Extent Evaluation Value	R&H Oil							Tropicana Energy			
Sample Location:		MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-17*	MW-18	MW-19	MW-20	MW-20*
Sample Date:		6/6/2011	6/6/2011	6/7/2011	6/6/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-30
Aluminum	24	**0.063 J**	<0.022	**0.084 J**	**0.069 J**	**0.13 J**	**0.022 J**	<0.33	**0.087 J**	**0.032 J**	**0.028 J**	<0.28
Arsenic	0.01	**0.31**	**0.035**	**0.28**	**0.22**	**0.078**	**0.0081 J**	**0.0051 J**	**0.11**	**0.037**	<0.0033	<0.0033
Barium	2	**0.55**	**0.11**	**0.41**	**0.46**	**0.49**	**0.17**	**0.18**	**0.32**	**0.21**	**0.17**	**0.19**
Chromium	0.1	**0.0026 J**	**0.0028 J**	**0.0022 J**	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
Cobalt	0.24	**0.0045 J**	**0.034**	**0.011**	**0.0064 J**	**0.0011 J**	**0.0041 J**	**0.0041 J**	**0.0027 J**	**0.0073 J**	**0.00077 J**	**0.0013 J**
Copper	1.3	<0.0077	<0.005	<0.0031	<0.0056	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014	<0.0014
Lead	0.015	**0.0042 J**	**0.0073 J**	**0.01**	<0.0029	<0.0029	<0.0029	<0.0029	**0.0065 J**	**0.0034 J**	<0.0029	<0.0029
Manganese	1.1	**0.76**	**2.5**	**1.6**	**0.58**	**1.1**	**0.39**	**0.38**	**0.56**	**0.88**	**0.11**	**0.13**
Mercury	0.002	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026 J	<0.000026 J	<0.000026 J	<0.000026 J	<0.000026 J	<0.000026 J	<0.000026 J
Nickel	0.49	**0.0051 J**	**0.023**	**0.0094 J**	**0.014**	**0.0039 J**	**0.0035 J**	**0.0034 J**	**0.006 J**	**0.0051 J**	**0.0031 J**	**0.0024 J**
Selenium	0.005	<0.0042	<0.0042	<0.0042	**0.0042 J**	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.044	<0.0017	<0.0017	<0.0017	**0.0027 J**	<0.0017	<0.0017	**0.002 J**	<0.0017	**0.0037 J**	**0.0056 J**	**0.0066 J**
Zinc	7.3	<0.0087	<0.012	<0.021	<0.017	<0.0052	<0.0043	<0.0037	<0.0058	<0.005	<0.0067	<0.0032

Existing deep wells, screen interval through shallow zone to base of alluvium							
Sample Area:	Extent Evaluation Value	Tropicana Energy					
Sample Location:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:		6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5
Aluminum	24	**0.18 J**	**0.12 J**	**1.1**	**0.15 J**	<0.022	**0.075 J**
Arsenic	0.01	**0.082**	**0.46**	**0.18**	<0.0033	**0.32**	**0.034**
Barium	2	**0.57**	**0.19**	**1.2**	**0.29**	**0.47**	**0.3**
Chromium	0.1	**0.0016 J**	**0.0016 J**	**0.0035 J**	**0.0037 J**	<0.0016	**0.0026 J**
Cobalt	0.24	**0.0016 J**	**0.001 J**	**0.0054 J**	<0.00063	**0.0016 J**	<0.00063
Copper	1.3	<0.0032	<0.0022	<0.0042	<0.0079	<0.0039	<0.0065
Lead	0.015	**0.0041 J**	<0.0029	**0.012**	**0.0085 J**	**0.0036 J**	**0.0085 J**
Manganese	1.1	**0.26**	**0.62**	**0.8**	**0.38**	**0.41**	**0.53**
Mercury	0.002	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026
Nickel	0.49	**0.0056 J**	**0.0042 J**	**0.0023 J**	**0.0019 J**	**<0.0018**	**0.0026 J**
Selenium	0.005	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.044	<0.0017	<0.0017	**0.0032 J**	**0.0066 J**	<0.0017	**0.0043 J**
Zinc	7.3	<0.0055	<0.013	<0.015	<0.022	<0.011	<0.024

NOTES:
1. All units are mg/L. * = sample analyzed for metals was filtered in the field due to turbidity greater than 10 NTUs per the Work Plan (10um filter).
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. J = Estimated vlaue. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.

TABLE 17
ON-SITE GROUNDWATER SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS JUNE 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent	R&H Oil						Tropicana Energy			Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium					
Sample Location:	Evaluation	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:	Value	6/6/2011	6/6/2011	6/7/2011	6/6/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-40	11-42	10-48	10-44	10.5-43	10-54.5
1,1,1,2-Tetrachloroethane	0.035	<0.009	<0.00018	<0.009	<0.009	<0.0009	<0.00018	<0.018	<0.0036	<0.00018	<0.00018	<0.0009	<0.0036	<0.00018	<0.00018	<0.0018
1,1,1-Trichloroethane	0.20	<0.0075	<0.00015	<0.0075	<0.0075	<0.00075 J	<0.00015	<0.015 J	<0.003 J	<0.00015	<0.00015	<0.00075	<0.003	<0.00015	<0.00015	<0.0015
1,1,2,2-Tetrachloroethane	0.0046	<0.011	<0.00022	<0.011	<0.011	<0.0011	<0.00022	<0.022	<0.0044	<0.00022	<0.00022	<0.0011	<0.0044	<0.00022	<0.00022	<0.0022
1,1,2-Trichloroethane	0.005	<0.014	<0.00028	<0.014	<0.014	<0.0014	<0.00028	<0.028	<0.0056	<0.00028	<0.00028	<0.0014	<0.0056	<0.00028	<0.00028	<0.0028
1,1-Dichloroethane	4.9	<0.0055	<0.00011	<0.0055	<0.0055	<0.00055 J	<0.00011	<0.011 J	<0.0022 J	<0.00011	<0.00011	<0.00055	<0.0022	<0.00011	<0.00011	<0.0011
1,1-Dichloroethene	0.007	<0.0095	<0.00019	<0.0095	<0.0095	<0.00095	<0.00019	<0.019	<0.0038	<0.00019	<0.00019	<0.00095	<0.0038	<0.00019	<0.00019	<0.0019
1,1-Dichloropropene	0.0091	<0.011	<0.00021	<0.011	<0.011	<0.0011	<0.00021	<0.021	<0.0042	<0.00021	<0.00021	<0.0011	<0.0042	<0.00021	<0.00021	<0.0021
1,2,3-Trichloropropane	0.00003	<0.015	<0.00029	<0.015	<0.015	<0.0015 J	<0.00029	<0.029 J	<0.0058 J	<0.00029	<0.00029	<0.0015	<0.0058	<0.00029	<0.00029	<0.0029
1,2,4-Trichlorobenzene	0.07	<0.016	<0.00031	<0.016	<0.016	<0.0016	<0.00031	<0.031	<0.0062	<0.00031	<0.00031	<0.0016	<0.0062	<0.00031	<0.00031	<0.0031
1,2,4-Trimethylbenzene	1.2	**1.1**	**0.21**	**0.71**	**0.71**	0.0025 J	**0.083**	**0.57**	**0.2**	<0.00014	**0.0005 J**	<0.0007	**0.52**	<0.00014	**0.00097 J**	**0.035**
1,2-Dibromo-3-Chloropropane	0.0002	<0.041	<0.00081	<0.041	<0.041	<0.0041	<0.00081	<0.081	<0.016	<0.00081	<0.00081	<0.0041	<0.016	<0.00081	<0.00081	<0.0081
1,2-Dibromoethane	0.00005	<0.009	<0.00018	<0.009	<0.009	<0.0009	<0.00018	<0.018	<0.0036	<0.00018	<0.00018	<0.0009	<0.0036	<0.00018	<0.00018	<0.0018
1,2-Dichlorobenzene	0.60	<0.005	<0.0001	<0.005	<0.005	<0.0005	<0.0001	<0.01	<0.002	<0.0001	<0.0001	<0.0005	<0.002	<0.0001	<0.0001	<0.001
1,2-Dichloroethane	0.005	<0.007	<0.00014	<0.007	<0.007	<0.0007 J	<0.00014	<0.014 J	<0.0028 J	<0.00014	<0.00014	<0.0007	<0.0028	<0.00014	**0.0034**	<0.0014
1,2-Dichloropropane	0.005	<0.008	<0.00016	<0.008	<0.008	<0.0008	<0.00016	<0.016	<0.0032	<0.00016	<0.00016	<0.0008	<0.0032	<0.00016	<0.00016	<0.0016
1,3,5-Trimethylbenzene	1.20	**0.39**	**0.064**	**0.26**	**0.23**	**0.003 J**	**0.025**	**0.21**	**0.064**	<0.0001	**0.0003 J**	<0.0005	**0.24**	**0.0001 J**	**0.0014**	**0.0062 J**
1,3-Dichlorobenzene	0.73	<0.0065	<0.00013	<0.0065	<0.0065	<0.00065	<0.00013	<0.013	<0.0026	<0.00013	<0.00013	<0.00065	<0.0026	<0.00013	<0.00013	<0.0013
1,3-Dichloropropane	0.0091	<0.011	<0.00022	<0.011	<0.011	<0.0011 J	<0.00022	<0.022 J	<0.0044 J	<0.00022	<0.00022	<0.0011	<0.0044	<0.00022	<0.00022	<0.0022
1,4-Dichlorobenzene	0.075	<0.0055	<0.00011	<0.0055	<0.0055	<0.00055	<0.00011	<0.011	<0.0022	<0.00011	<0.00011	<0.00055	<0.0022	<0.00011	<0.00011	<0.0011
2,2-Dichloropropane	0.013	<0.0065	<0.00013	<0.0065	<0.0065	<0.00065	<0.00013 J	<0.013	<0.0026	<0.00013 J	<0.00013	<0.00065	<0.0026	<0.00013	<0.00013	<0.0013
2-Butanone (MEK)	15	<0.038	**0.093**	<0.038	<0.038	<0.0038 J	**0.031 J-**	<0.076 J	<0.015 J	<0.00076 J	<0.00076	<0.0038	<0.015	<0.00076	<0.00076	<0.0076
2-Chlorotoluene	0.49	<0.0065	<0.00013	<0.0065	<0.0065	<0.00065	<0.00013	<0.013	<0.0026	<0.00013	<0.00013	<0.00065	<0.0026	<0.00013	<0.00013	<0.0013
2-Hexanone	0.12	<0.018	<0.00035	<0.018	<0.018	<0.0018 J	<0.00035 J	<0.035 J	<0.007 J	<0.00035 J	<0.00035	<0.0018	<0.007	<0.00035	<0.00035	<0.0035
4-Chlorotoluene	0.49	<0.007	<0.00014	<0.007	<0.007	<0.0007	<0.00014	<0.014	<0.0028	<0.00014	<0.00014	<0.0007	<0.0028	<0.00014	<0.00014	<0.0014
4-Isopropyltoluene	2.4	**0.0083 J**	**0.0017**	**0.0052 J**	**0.0056 J**	<0.0005	**0.0023**	<0.01	**0.004 J**	<0.0001	**0.0004 J**	**0.0007 J**	**0.007 J**	<0.0001	<0.0001	**0.0029 J**
4-Methyl-2-pentanone (MIBK)	2	<0.023	<0.00045	<0.023	<0.023	<0.0023	<0.00045 J	<0.045	<0.009	<0.00045 J	<0.00045	<0.0023	<0.009	<0.00045	<0.00045	<0.0045
Acetone	22	<0.05	<0.00099	<0.05	<0.05	0.18 J-	<0.00099	0.76 J-	0.27 J-	<0.00099	<0.00099	<0.005	<0.02	<0.00099	<0.00099	<0.0099
Benzene	0.005	**28**	**11**	**29**	**15**	**0.99**	**0.61**	**22**	**5.8**	**0.001**	**0.1**	**1.1**	**19**	**0.0001 J**	**0.09**	**10**
Bromobenzene	0.20	<0.0095	<0.00019	<0.0095	<0.0095	<0.00095	<0.00019	<0.019	<0.0038	<0.00019	<0.00019	<0.00095	<0.0038	<0.00019	<0.00019	<0.0019
Bromodichloromethane	0.015	<0.008	<0.00016	<0.008	<0.008	<0.0008 J	<0.00016	<0.016 J	<0.0032 J	<0.00016	<0.00016	<0.0008	<0.0032	<0.00016	<0.00016	<0.0016
Bromoform	0.12	<0.0095	<0.00019	<0.0095	<0.0095	<0.00095	<0.00019	<0.019	<0.0038	<0.00019	<0.00019	<0.00095	<0.0038	<0.00019	<0.00019	<0.0019
Bromomethane	0.034	<0.013	<0.00025	<0.013	<0.013	<0.0013 J	<0.00025	<0.025 J	<0.005 J	<0.00025	<0.00025	<0.0013	<0.005	<0.00025	<0.00025	<0.0025
Carbon disulfide	2.4	<0.012	<0.00024	<0.012	<0.012	<0.0012 J	<0.00024	<0.024 J	<0.0048 J	<0.00024	**0.0003 J**	<0.0012	<0.0048	<0.00024	<0.00024	<0.0024
Carbon tetrachloride	0.005	<0.0075	<0.00015	<0.0075	<0.0075	<0.00075 J	<0.00015	<0.015 J	<0.003 J	<0.00015	<0.00015	<0.00075	<0.003	<0.00015	<0.00015	<0.0015
Chlorobenzene	0.1	<0.006	<0.00012	<0.006	<0.006	<0.0006	<0.00012	<0.012	<0.0024	<0.00012	<0.00012	<0.0006	<0.0024	<0.00012	<0.00012	<0.0012
Chloroethane	9.8	<0.004	<0.00008	<0.004	<0.004	<0.0004	<0.00008	<0.008	<0.0016	<0.00008	<0.00008	<0.0004	<0.0016	<0.00008	<0.00008	<0.0008
Chloroform	0.24	**0.022 J**	<0.00013	<0.0065	<0.0065	**0.0023 J**	**0.0072**	<0.013	**0.0039 J**	<0.00013	<0.00013	<0.00065	<0.0026	<0.00013	<0.00013	<0.0013
Chloromethane	0.07	<0.009	<0.00018	<0.009	<0.009	<0.0009	<0.00018 J	<0.018	<0.0036	<0.00018 J	<0.00018	<0.0009	<0.0036	<0.00018	<0.00018	<0.0018
cis-1,2-Dichloroethene	0.07	<0.003	**0.0098**	**0.0048 J**	<0.003	<0.0003 J	**0.0002 J**	<0.006 J	<0.0012 J	<0.00006	<0.00006	<0.0003	<0.0012	<0.00006	<0.00006	<0.0006
cis-1,3-Dichloropropene	0.0017	<0.009	<0.00018	<0.009	<0.009	<0.0009	<0.00018	<0.018	<0.0036	<0.00018	<0.00018	<0.0009	<0.0036	<0.00018	<0.00018	<0.0018
Dibromochloromethane	0.011	<0.0075	<0.00015	<0.0075	<0.0075	<0.00075	<0.00015	<0.015	<0.003	<0.00015	<0.00015	<0.00075	<0.003	<0.00015	<0.00015	<0.0015
Dibromomethane	0.12	<0.026	<0.00052	<0.026	<0.026	<0.0026 J	<0.00052	<0.052 J	<0.01 J	<0.00052	<0.00052	<0.0026	<0.01	<0.00052	<0.00052	<0.0052
Dichlorodifluoromethane	4.9	<0.006	<0.00012	<0.006	<0.006	<0.0006 J	<0.00012	<0.012 J	<0.0024 J	<0.00012	<0.00012	<0.0006	<0.0024	<0.00012	<0.00012	<0.0012
Ethylbenzene	0.7	**1.8**	**0.68**	**1.3**	**1.3**	**0.0061**	**0.096**	**1.4**	**0.42**	<0.00011	**0.0038**	**0.025**	**0.85**	<0.00011	**0.0013**	**0.5**
Hexachlorobutadiene	0.012	<0.0085	<0.00017	<0.0085	<0.0085	<0.00085	<0.00017	<0.017	<0.0034	<0.00017	<0.00017	<0.00085	<0.0034	<0.00017	<0.00017	<0.0017
Iodomethane	0.034	<0.1	<0.002	<0.1	<0.1	<0.01 J	<0.002 J	<0.2 J	<0.04 J	<0.002 J	<0.002	<0.01	<0.04	<0.002	<0.002	<0.02
Isopropylbenzene	2.4	**0.075**	**0.023**	**0.055**	**0.053**	**0.019**	**0.016**	**0.11**	**0.033**	**0.0002 J**	**0.1**	**0.042**	**0.077**	**0.0012**	**0.032**	**0.049**
Methyl tert-butyl ether	0.24	<0.006	<0.00012	<0.006	**0.25**	<0.0006 J	<0.00012 J	<0.012 J	**0.069 J-**	**0.0005 J**	<0.00012	<0.0006	<0.0024	<0.00012	**0.3**	<0.0012
Methylene Chloride	0.005	**0.019 J**	<0.00015	**0.0085 J**	<0.0075	<0.00075 J	<0.00015	<0.015 J	<0.003 J	<0.00015	<0.00015	<0.0022	<0.003	<0.00015	<0.00015	<0.0015
Naphthalene	0.49	**0.41 J**	**0.092 J**	**0.29 J**	**0.26**	**0.028**	**0.036**	**0.32**	**0.17**	<0.00032	**0.0044**	**0.02**	**0.31**	**0.0014**	<0.00032	**0.21 J**
n-Butylbenzene	1.2	**0.018 J**	**0.0049**	**0.011 J**	**0.015 J**	**0.0032 J**	**0.0063**	<0.016	**0.017 J**	<0.00016	**0.0073**	**0.0037 J**	**0.015 J**	<0.00016	**0.0049**	**0.0083 J**
N-Propylbenzene	1.0	**0.11**	**0.043**	**0.069**	**0.093**	**0.02**	**0.029**	**0.11**	**0.046**	<0.00015	**0.13**	**0.043**	**0.098**	**0.00067 J**	**0.04**	**0.069**
sec-Butylbenzene	0.98	<0.006	**0.0015**	<0.006	<0.006	**0.0014 J**	**0.0025**	<0.012	**0.0048 J**	<0.00012	**0.0084**	**0.0038 J**	**0.0082 J**	**0.0002 J**	**0.0053**	**0.0064 J**
Styrene	0.10	<0.0035	<0.00007	<0.0035	<0.0035	<0.00035	<0.00007	<0.007	<0.0014	<0.00007	<0.00007	<0.00035	<0.0014	<0.00007	<0.00007	<0.0007
tert-Butylbenzene	0.98	<0.004	**0.0003 J**	<0.004	<0.004	**0.0024 J**	**0.0004 J**	<0.008	**0.0089 J**	<0.00008	**0.0017**	**0.001 J**	**0.0016 J**	<0.00008	**0.0014**	**0.0013 J**
Tetrachloroethene	0.005	<0.0065	<0.00013	<0.0065	<0.0065	<0.00065	<0.00037	<0.013	<0.0026	<0.00017	<0.00013	<0.00065	<0.0026	<0.00013	<0.00013	<0.0013
Toluene	1	**0.18**	**4.3**	**22**	**0.17**	**0.0046 J**	**0.0032**	**4.5**	**0.025**	<0.00015	**0.014**	**0.0084**	**0.023**	<0.00015	**0.0015**	**0.013**
trans-1,2-Dichloroethene	0.1	<0.0045	<0.00009	<0.0045	<0.0045	<0.00045 J	<0.00009 J	<0.009 J	<0.0018 J	<0.00009 J	<0.00009	<0.00045	<0.0018	<0.00009	<0.00009	<0.0009
trans-1,3-Dichloropropene	0.0091	<0.011	<0.00021	<0.011	<0.011	<0.0011	<0.00021	<0.021	<0.0042	<0.00021	<0.00021	<0.0011	<0.0042	<0.00021	<0.00021	<0.0021
Trichloroethene	0.005	<0.009	**0.0005 J**	<0.009	<0.009	<0.0009	**0.0005 J**	<0.018	<0.0036	**0.0002 J**	<0.00018	<0.0009	<0.0036	<0.00018	<0.00018	<0.0018
Trichlorofluoromethane	7.3	<0.004	<0.00008	<0.004	<0.004	<0.0004	<0.00008	<0.008	<0.0016	<0.00008	<0.00008	<0.0004	<0.0016	<0.00008	<0.00008	<0.0008
Vinyl chloride	0.002	<0.0055	<0.00011	<0.0055	<0.0055	<0.00055	<0.00011	<0.011	<0.0022	<0.00011	<0.00011	<0.00055	<0.0022	<0.00011	<0.00011	<0.0011
Xylenes, Total	10	**8.4**	**1**	**8.9**	**4.7**	**0.012**	**0.078**	**5.5**	**0.46**	**0.0003 J**	**0.02**	**0.0071**	**3.4**	**0.0009 J**	**0.0034**	**0.044**

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.
6. J = Estimated value. J- = Estimated value with a potential low bias.

TABLE 18
ON-SITE GROUNDWATER SAMPLING RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS JUNE 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Extent Evaluation Value	R&H Oil						Tropicana Energy			Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium					
Sample Location:		MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:		6/6/2011	6/6/2011	6/7/2011	6/6/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/3/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-40	11-42	10-48	10-44	10.5-43	10-54.5
2,4,5-Trichlorophenol	2.4	<0.00025 J	<0.00025 J	<0.0025	<0.0025	<0.012	<0.00025	<0.012	<0.0025	<0.00025	<0.00025	<0.00025	<0.00025 J	<0.00025	0.00025 R	<0.00025 J
2,4,6-Trichlorophenol	0.024	<0.00018 J	<0.00018 J	<0.0018	<0.0018	<0.0089	<0.00018	<0.0089	<0.0018	<0.00018	<0.00018	<0.00018	<0.00018 J	<0.00018	0.00018 R	<0.00018 J
2,4-Dichlorophenol	0.073	<0.00015 J	<0.00015 J	<0.0015	<0.0015	<0.0074	<0.00015	<0.0074	<0.0015	<0.00015	<0.00015	<0.00015	<0.00015 J	<0.00015	0.00015 R	<0.00015 J
2,4-Dimethylphenol	0.49	**0.018 J-**	**0.037**	**0.45**	<0.0031	<0.015	<0.00031	**0.11 J**	**0.0077 J**	<0.00031	<0.00031	<0.00031	**0.15**	<0.00031	0.00031 R	<0.00031 J
2,4-Dinitrophenol	0.049	<0.00038 J	<0.00038 J	<0.0038 J	<0.0038 J	<0.019	<0.00039	<0.019	<0.0039	<0.00039	<0.00038 J	<0.00038 J	<0.00038 J	<0.00038 J	0.00038 R	<0.00038 J
2,4-Dinitrotoluene	0.0013	<0.00013	<0.00013	<0.0013	<0.0013	<0.0064	<0.00013	<0.0064	<0.0013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013 J	<0.00013
2,6-Dinitrotoluene	0.0013	<0.000079	<0.000079	<0.00079	<0.00079	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079 J	<0.000079
2-Chloronaphthalene	2.0	<0.000079	<0.000079	<0.00079	<0.00079	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079 J	<0.000079
2-Chlorophenol	0.12	<0.00013 J	<0.00013 J	<0.0013	<0.0013	<0.0064	<0.00013	<0.0064	<0.0013	<0.00013	<0.00013	<0.00013	<0.00013 J	<0.00013	0.00013 R	<0.00013 J
2-Methylnaphthalene	0.098	**0.085**	**0.0088**	**0.044**	**0.017**	**0.022 J**	**0.017**	**0.039 J**	**0.063**	<0.000069	**0.037**	**0.041**	**0.071**	<0.000069	**0.19**	**0.073**
2-Nitroaniline	0.0073	<0.00019	<0.00019	<0.0019	<0.0019	<0.0094	<0.00019	<0.0094	<0.0019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019 J	<0.00019
2-Nitrophenol	0.049	<0.00022 J	<0.00022 J	<0.0022	<0.0022	<0.011	<0.00022	<0.011	<0.0022	<0.00022	<0.00022	<0.00022	<0.00022 J	<0.00022	0.00022 R	<0.00022 J
3 & 4 Methylphenol	0.12	**0.058 J-**	**0.063 J-**	**0.22 J-**	<0.002 J	<0.0099	<0.0002	**0.017 J**	**0.0084 J**	<0.0002	<0.0002 J	<0.0002 J	**0.0023 J-**	<0.0002 J	0.0002 R	<0.0002 J
3,3'-Dichlorobenzidine	0.0020	<0.00018 J	<0.00018 J	<0.0018 J	<0.0018 J	<0.0089	<0.00018	<0.0089	<0.0018	<0.00018	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J
3-Nitroaniline	0.0073	<0.00016 J	<0.00016 J	<0.0016 J	<0.0016 J	<0.0079	<0.00016	<0.0079	<0.0016	<0.00016	<0.00016 J	<0.00016 J	<0.00016 J	<0.00016 J	<0.00016 J	<0.00016 J
4,6-Dinitro-2-methylphenol	0.0024	<0.00082 J	<0.00082 J	<0.0082 J	<0.0082 J	<0.041	<0.00082	<0.041	<0.0082	<0.00082	<0.00082 J	<0.00082 J	<0.00082 J	<0.00082 J	0.00082 R	<0.00082 J
4-Bromophenyl phenyl ether	0.000061	<0.000099	<0.000099	<0.00099	<0.00099	<0.0049	<0.000099	<0.005	<0.00099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099 J	<0.000099
4-Chloro-3-methylphenol	0.12	<0.00017 J	<0.00017 J	<0.0017	<0.0017	<0.0084	<0.00017	<0.0084	<0.0017	<0.00017	<0.00017	<0.00017	<0.00017 J	<0.00017	0.00017 R	<0.00017 J
4-Chloroaniline	0.0046	<0.00021 J	<0.00021 J	<0.0021 J	<0.0021 J	<0.01	<0.00021	<0.01	<0.0021	<0.00021	<0.00021 J	<0.00021 J	<0.00021 J	<0.00021 J	<0.00021 J	<0.00021 J
4-Chlorophenyl phenyl ether	0.000061	<0.000099	<0.000099	<0.00099	<0.00099	<0.0049	<0.000099	<0.005	<0.00099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099 J	<0.000099
4-Nitroaniline	0.046	<0.00025	<0.00025	<0.0025	<0.0025	<0.012	<0.00025	<0.012	<0.0025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025 J	<0.00025
4-Nitrophenol	0.049	<0.00055 J	<0.00055 J	<0.0055 J	<0.0055 J	<0.028 J	<0.00055 J	<0.028 J	<0.0055 J	<0.00055 J	<0.00055 J	<0.00055 J	<0.00055 J	<0.00055 J	0.00055 R	<0.00055 J
Acenaphthene	1.5	<0.000079	<0.000079	<0.00079	<0.00079	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079	**0.001 J**	<0.000079	<0.000079	<0.000079 J	<0.000079
Acenaphthylene	1.5	<0.000059	<0.000059	<0.00059	<0.00059	<0.003	<0.000059	<0.003	<0.00059	<0.000059	<0.000059	<0.000059	<0.000059	<0.000059	<0.000059 J	<0.000059
Aniline	0.16	<0.000079 J	<0.000079 J	<0.00079 J	<0.00079 J	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J
Anthracene	7.3	<0.000049	<0.000049	<0.00049	<0.00049	<0.0025	<0.000049	<0.0025	<0.0005	<0.00005	<0.000049	<0.000049	<0.000049	<0.000049	<0.000049 J	<0.000049
Benzo[a]anthracene	0.0013	<0.000079	<0.000079	<0.00079	<0.00079	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079 J	<0.000079
Benzo[a]pyrene	0.00020	<0.000079	<0.000079	<0.00079	<0.00079	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079 J	<0.000079
Benzo[b]fluoranthene	0.0013	<0.000069	<0.000069	<0.00069	<0.00069	<0.0034	<0.000069	<0.0035	<0.00069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069 J	<0.000069
Benzo[g,h,i]perylene	0.73	<0.000079 J	<0.000079 J	<0.00079 J	<0.00079 J	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J
Benzo[k]fluoranthene	0.013	<0.000089	<0.000089	<0.00089	<0.00089	<0.0044	<0.000089	<0.0045	<0.00089	<0.000089	<0.000089	<0.000089	<0.000089	<0.000089	<0.000089 J	<0.000089
Benzyl alcohol	2.4	<0.00017 J	**0.038 J**	<0.0017	<0.0017	<0.0084	<0.00017	<0.0084	<0.0017	<0.00017	<0.00017	<0.00017	<0.00017 J	<0.00017	0.00017 R	<0.00017 J
Bis(2-chloroethoxy)methane	0.00083	<0.00013	<0.00013	<0.0013	<0.0013	<0.0064	<0.00013	<0.0064	<0.0013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013 J	<0.00013
Bis(2-chloroethyl)ether	0.00083	<0.00015	<0.00015	<0.0015	<0.0015	<0.0074	<0.00015	<0.0074	<0.0015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015 J	<0.00015
Bis(2-chloroisopropyl) ether	0.013	<0.00039	<0.00039	<0.0039	<0.0039	<0.02	<0.0004	<0.02	<0.004	<0.0004	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039 J	<0.00039
Bis(2-ethylhexyl) phthalate	0.0060	<0.00036 J	<0.00036 J	<0.0036 J	<0.0036 J	<0.018	<0.00037	<0.018	<0.0037	<0.00037	<0.00036 J	<0.00036 J	<0.00036 J	<0.00036 J	<0.00036 J	<0.00036 J
Butyl benzyl phthalate	0.48	<0.00012	<0.00012	<0.0012	<0.0012	<0.0059	<0.00012	<0.0059	<0.0012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012 J	<0.00012
Chrysene	0.13	<0.000079	<0.000079	<0.00079	<0.00079	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079 J	<0.000079
Dibenz(a,h)anthracene	0.00020	<0.000079 J	<0.000079 J	<0.00079 J	<0.00079 J	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J	<0.000079 J
Dibenzofuran	0.098	<0.000079	<0.000079	<0.00079	<0.00079	<0.0039	<0.000079	<0.004	<0.00079	<0.000079	**0.0014 J**	**0.00079 J**	<0.000079	<0.000079	<0.000079 J	<0.000079
Diethyl phthalate	20	<0.0015	<0.0015	<0.015	<0.015	<0.074	<0.0015	<0.074	<0.015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015 J	<0.0015
Dimethyl phthalate	20	<0.000069	<0.000069	<0.00069	<0.00069	<0.0034	<0.000069	<0.0035	<0.00069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069 J	<0.000069
Di-n-butyl phthalate	2.4	<0.00011	**0.0015 J**	<0.0011	<0.0011	<0.0054	<0.00011	<0.0054	<0.0011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011 J	<0.00011
Di-n-octyl phthalate	0.24	<0.00016 J	<0.00016 J	<0.0016 J	<0.0016 J	<0.0079	<0.00016	<0.0079	<0.0016	<0.00016	<0.00016 J	<0.00016 J	<0.00016 J	<0.00016 J	<0.00016 J	<0.00016 J
Fluoranthene	0.98	<0.000069	<0.000069	<0.00069	<0.00069	<0.0034	<0.000069	<0.0035	<0.00069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069 J	<0.000069
Fluorene	0.98	<0.000069	<0.000069	<0.00069	<0.00069	<0.0034	<0.000069	<0.0035	<0.00069	<0.000069	0.0015	**0.0011 J**	<0.000069	<0.000069	**0.0024 J-**	**0.0012 J**
Hexachlorobenzene	0.001	<0.00011	<0.00011	<0.0011	<0.0011	<0.0054	<0.00011	<0.0054	<0.0011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011 J	<0.00011
Hexachlorocyclopentadiene	0.050	<0.00013 J	<0.00013 J	<0.0013 J	<0.0013 J	<0.0064	<0.00013	<0.0064	<0.0013	<0.00013	<0.00013 J	<0.00013 J	<0.00013 J	<0.00013 J	<0.00013 J	<0.00013 J
Hexachloroethane	0.017	<0.000099	<0.000099	<0.00099	<0.00099	<0.0049	<0.000099	<0.005	<0.00099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099 J	<0.000099
Indeno[1,2,3-cd]pyrene	0.0013	<0.000069 J	<0.000069 J	<0.00069 J	<0.00069 J	<0.0034	<0.000069	<0.0035	<0.00069	<0.000069	<0.000069 J	<0.000069 J	<0.000069 J	<0.000069 J	<0.000069 J	<0.000069 J
Isophorone	0.96	<0.00011	<0.00011	<0.0011	<0.0011	<0.0054	<0.00011	<0.0054	<0.0011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011 J	<0.00011
Nitrobenzene	0.049	<0.00011	<0.00011	<0.0011	<0.0011	<0.0054	<0.00011	<0.0054	<0.0011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011 J	<0.00011
N-Nitrosodi-n-propylamine	0.00013	<0.000099	<0.000099	<0.00099	<0.00099	<0.0049	<0.000099	<0.005	<0.00099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099 J	<0.000099
Pentachlorophenol	0.0010	<0.0006 J	<0.0006 J	<0.006	<0.006	<0.03	<0.0006	<0.03	<0.006	<0.0006	<0.0006	<0.0006	<0.0006 J	<0.0006	0.0006 R	<0.0006 J
Phenanthrene	0.73	<0.000059	<0.000059	<0.00059	<0.00059	<0.003	<0.000059	<0.003	<0.00059	<0.000059	**0.001 J**	<0.000059	<0.000059	<0.000059	<0.000059 J	<0.000059
Phenol	7.3	**0.015 J-**	**0.15 J-**	**0.059 J-**	**0.011 J**	**0.0053 J**	**0.0049 J-**	**0.036 J**	**0.014 J**	<0.00004 J	<0.000039 J	<0.000039 J	<0.000039 J	<0.000039 J	0.000039 R	<0.000039 J
Pyrene	0.73	<0.00011	<0.00011	<0.0011	<0.0011	<0.0054	<0.00011	<0.0054	<0.0011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011 J	<0.00011

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.
6. J = Estimated value. J- = Estimated value with a potential low bias. R = Result was rejected.

TABLE 19
ON-SITE GROUNDWATER SAMPLING RESULTS: TOTAL PETROLEUM HYDROCARBONS OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

RI/FS Wells installed in upper water-bearing zone

Sample Area:	Extent Evaluation Value	R&H Oil					Tropicana Energy		
Sample Location:		MW-12	MW-13	MW-14	MW-16	MW-17	MW-18	MW-19	MW-20
Sample Date:		10/12/2011	10/13/2011	10/12/2011	10/11/2011	10/11/2011	10/12/2011	10/12/2011	10/12/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30
C6-C12	0.98	**340**	**6.4**	**63**	**1.9 J**	**2.8 J**	**120**	**3 J**	<0.36
>C12-C28	0.98	**150**	<0.31	**35**	**3.6 J**	<0.31	**130**	<0.31	<0.31
>C28-C35	0.98	**22**	<0.55	**8**	<0.55	<0.55	**20**	<0.54	<0.55
C6-C35 (Total)	0.98	**510**	**6.4**	**110**	**5.5 J**	**2.8 J**	**270**	**3 J**	<0.55

Existing deep wells, screen interval through shallow zone to base of alluvium

Sample Area:	Extent Evaluation Value	Tropicana Energy					
Sample Location:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:		10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5
C6-C12	0.98	**0.95 J**	<0.36	**110**	<0.36	**14**	**4.7 J**
>C12-C28	0.98	<0.31	<0.31	**100**	<0.31	**120**	**3.2 J**
>C28-C35	0.98	<0.55	<0.55	**14**	<0.55	**14**	<0.55
C6-C35 (Total)	0.98	**0.95 J**	<0.55	**230**	<0.55	**150**	**8.4 J**

NOTES:
1. All units are mg/L.
2. Samples analyzed by Texas TPH Method TX1005, aliphatic/aromatic fractionation by Method TX1006 not performed.
3. Extent Evaluation Values provided on Table 3.
4. Detected compounds are presented in **bold** type. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. J = Estimated value.
6. bgs = Below ground surface.

TABLE 20
ON-SITE GROUNDWATER SAMPLING RESULTS: METALS OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

RI/FS Wells installed in upper water-bearing zone

Sample Area:	Extent Evaluation Value	R&H Oil					Tropicana Energy		
Sample Location:		MW-12*	MW-13	MW-14	MW-16*	MW-17*	MW-18*	MW-19*	MW-20*
Sample Date:		10/12/2011	10/13/2011	10/12/2011	10/11/2011	10/11/2011	10/12/2011	10/12/2011	10/12/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30
Aluminum	24	**0.1 J**	<0.022	**0.095 J**	**0.062 J**	**0.057 J**	**0.14 J**	**0.11 J**	**0.057 J**
Arsenic	0.01	**0.18**	**0.062**	**0.077**	**0.14**	**0.036**	**0.088**	**0.052**	<0.0033
Barium	2	**0.73**	**0.037**	**0.79**	**0.37**	**0.13**	**0.61**	**0.2**	**0.15**
Chromium	0.1	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
Cobalt	0.24	**0.0038 J**	<0.00063	**0.0087 J**	**0.0074 J**	**0.0033 J**	**0.007 J**	**0.0032 J**	<0.00063
Copper	1.3	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Lead	0.015	**0.0081 J**	<0.0029	**0.01**	**0.0059 J**	<0.0029	**0.0076 J**	<0.0029	<0.0029
Manganese	1.1	**0.79**	**2.9**	**0.73**	**1**	**0.72**	**0.79**	**0.96**	**0.066**
Mercury	0.002	<0.000026J	<0.000026J	<0.000026J	<0.000026J	<0.000026J	<0.000026J	<0.000026J	<0.000026J
Nickel	0.49	**0.0031 J**	**0.0023 J**	**0.0056 J**	**0.0094 J**	<0.0018	**0.0087 J**	**0.002 J**	<0.0018
Selenium	0.005	<0.0042	<0.0042	<0.0042	**0.0088 J**	<0.0042	**0.0059 J**	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.044	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	<0.0017	**0.0058 J**
Zinc	7.3	**0.0053 J**	**0.0024 J**	**0.013 J**	<0.0087	<0.0022	<0.0076	<0.0022	<0.0022

Existing deep wells, screen interval through shallow zone to base of alluvium

Sample Area:	Extent Evaluation Value	Tropicana Energy					
Sample Location:		MW-1*	MW-2*	MW-3	MW-4	MW-5*	MW-6
Sample Date:		10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5
Aluminum	24	**0.037 J**	**0.048 J**	**0.12 J**	**0.4 J**	**0.084 J**	**0.12 J**
Arsenic	0.01	**0.06**	**0.38**	**0.25**	**0.068**	**0.18**	**0.022**
Barium	2	**0.55**	**0.19**	**1.4**	**0.47**	**0.4**	**0.35**
Chromium	0.1	<0.0016	<0.0016	<0.0016	**0.0023 J**	<0.0016	**0.0027 J**
Cobalt	0.24	<0.00063	<0.00063	**0.005 J**	**0.0025 J**	**0.0011 J**	**0.0037 J**
Copper	1.3	<0.0015	<0.0015	<0.0026	<0.011	<0.0015	<0.0034
Lead	0.015	<0.0029	<0.0029	**0.016**	**0.02**	**0.004 J**	**0.021**
Manganese	1.1	**0.27**	**0.54**	**0.59**	**0.6**	**0.59**	**0.74**
Mercury	0.002	<0.000026J	<0.000026J	<0.000026J	**0.000099 J**	<0.000026J	<0.000026J
Nickel	0.49	<0.0018	**0.0025 J**	**0.0028 J**	**0.0051 J**	<0.0018	**0.0071 J**
Selenium	0.005	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.044	<0.0017	<0.0017	<0.0017	**0.011**	<0.0017	**0.0036 J**
Zinc	7.3	<0.0022	<0.0022	**0.0076 J**	**<0.065**	<0.0038	<0.014

NOTES:
1. All units are mg/L. * = sample analyzed for metals was filtered in the field due to turbidity greater than 10 NTUs per the Work Plan (10um filter).
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. J = Estimated value. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.\

TABLE 21
ON-SITE GROUNDWATER SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		R&H Oil					Tropicana Energy			Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium					
Sample Location:	Extent	MW-12	MW-13	MW-14	MW-16	MW-17	MW-18	MW-19	MW-20	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:	Evaluation Value	10/12/2011	10/13/2011	10/12/2011	10/11/2011	10/11/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-40	11-42	10-48	10-44	10.5-43	10-54.5
1,1,1,2-Tetrachloroethane	0.035	<0.018	<0.018	<0.018	<0.0009	<0.00018	<0.018	<0.00018	<0.00018	<0.00018	<0.0009	<0.018	<0.00018	<0.0036	<0.0036
1,1,1-Trichloroethane	0.20	<0.015	<0.015	<0.015	<0.00075	<0.00015J	<0.015	<0.00015J	<0.00015	<0.00015	<0.00075	<0.015	<0.00015	<0.003	<0.003
1,1,2,2-Tetrachloroethane	0.0046	<0.022J	<0.022J	<0.022J	<0.0011	<0.00022J	<0.022J	<0.00022J	<0.00022J	<0.00022J	<0.0011	<0.022J	<0.00022J	<0.0044J	<0.0044
1,1,2-Trichloroethane	0.005	<0.028	<0.028	<0.028	<0.0014	<0.00028	<0.028	<0.00028	<0.00028	<0.00028	<0.0014	<0.028	<0.00028	<0.0056	<0.0056
1,1-Dichloroethane	4.9	<0.011	<0.011	<0.011	<0.00055	<0.00011J	<0.011	<0.00011J	<0.00011	<0.00011	<0.00055	<0.011	<0.00011	<0.0022	<0.0022
1,1-Dichloroethene	0.007	<0.019	<0.019	<0.019	<0.00095	<0.00019	<0.019	<0.00019J	<0.00019	<0.00019	<0.00095	<0.019	<0.00019	**0.046**	<0.0038
1,1-Dichloropropene	0.0091	<0.021	<0.021	<0.021	<0.0011	<0.00021	<0.021	<0.00021	<0.00021	<0.00021	<0.0011	<0.021	<0.00021	<0.0042	<0.0042
1,2,3-Trichloropropane	0.00003	<0.029J	<0.029J	<0.029J	<0.0015	<0.00029J	<0.029J	<0.00029J	<0.00029J	<0.00029J	<0.0015	<0.029J	<0.00029J	<0.0058J	<0.0058
1,2,4-Trichlorobenzene	0.07	<0.031	<0.031	<0.031	<0.0016	<0.00031	<0.031	<0.00031	<0.00031	<0.00031	<0.0016	<0.031	<0.00031	<0.0062	<0.0062
1,2,4-Trimethylbenzene	1.2	**1.6**	**0.25**	**1**	**0.0035 J**	**0.17**	**1.3**	**0.31**	**0.00053 J**	**0.00087 J**	**0.0028 J**	**1.2**	**0.0036**	**0.024**	**0.15**
1,2-Dibromo-3-Chloropropane	0.0002	<0.081J	<0.081J	<0.081J	<0.0041	<0.00081J	<0.081J	<0.00081J	<0.00081J	<0.00081J	<0.0041	<0.081J	<0.00081J	<0.016J	<0.016
1,2-Dibromoethane	0.00005	<0.018	<0.018	<0.018	<0.0009	<0.00018	<0.018	<0.00018	<0.00018	<0.00018	<0.0009	<0.018	<0.00018	<0.0036	<0.0036
1,2-Dichlorobenzene	0.60	<0.01	<0.01	<0.01	<0.0005	<0.0001	<0.01	<0.0001	<0.0001	<0.0001	<0.0005	<0.01	<0.0001	<0.002	<0.002
1,2-Dichloroethane	0.005	<0.014	<0.014	<0.014	<0.0007	<0.00014J	<0.014	<0.00014J	<0.00014	<0.00014	<0.0007	<0.014	<0.00014	**0.041**	<0.0028
1,2-Dichloropropane	0.005	<0.016	<0.016	<0.016	<0.0008	<0.00016J	<0.016	<0.00016J	<0.00016	<0.00016	<0.0008	<0.016	<0.00016	<0.0032	<0.0032
1,3,5-Trimethylbenzene	1.20	**0.65**	**0.083 J**	**0.41**	**0.0027 J**	**0.073**	**0.49**	**0.11**	<0.0001	**0.00058 J**	**0.0042 J**	**0.67**	**0.002**	**0.0087 J**	**0.045**
1,3-Dichlorobenzene	0.73	<0.013	<0.013	<0.013	<0.00065	<0.00013	<0.013	<0.00013	<0.00013	<0.00013	<0.00065	<0.013	<0.00013	<0.0026	<0.0026
1,3-Dichloropropane	0.0091	<0.022	<0.022	<0.022	<0.0011	<0.00022	<0.022	<0.00022	<0.00022	<0.00022	<0.0011	<0.022	<0.00022	<0.0044	<0.0044
1,4-Dichlorobenzene	0.075	<0.011	<0.011	<0.011	<0.00055	<0.00011	<0.011	<0.00011	<0.00011	<0.00011	<0.00055	<0.011	<0.00011	<0.0022	<0.0022
2,2-Dichloropropane	0.013	<0.013	<0.013	<0.013	<0.00065	<0.00013J	<0.013	<0.00013J	<0.00013	<0.00013	<0.00065	<0.013	<0.00013	<0.0026	<0.0026
2-Butanone (MEK)	15	<0.076J	<0.076J	<0.076J	<0.0038	<0.00076J	<0.076J	<0.00076J	<0.00076J	<0.00076J	<0.0038	<0.076J	<0.00076J	<0.015J	<0.015
2-Chlorotoluene	0.49	<0.013	<0.013	<0.013	<0.00065	<0.00013	<0.013	<0.00013	<0.00013	<0.00013	<0.00065	<0.013	<0.00013	<0.0026	<0.0026
2-Hexanone	0.12	<0.035	<0.035	<0.035	<0.0018	<0.00035	<0.035	**0.0061 J+**	<0.00035	<0.00035	<0.0018	<0.035	<0.00035	<0.007	<0.007
4-Chlorotoluene	0.49	<0.014	<0.014	<0.014	<0.0007	<0.00014	<0.014	<0.00014	<0.00014	<0.00014	<0.0007	<0.014	<0.00014	<0.0028	<0.0028
4-Isopropyltoluene	2.4	**0.025 J**	<0.01	**0.019 J**	<0.0005	**0.0025**	**0.035 J**	**0.0057 J+**	<0.0001	**0.0004 J**	**0.0006 J**	**0.024 J**	**0.0002 J**	<0.002	**0.0047 J**
4-Methyl-2-pentanone (MIBK)	2	<0.045	<0.045	<0.045	<0.0023	<0.00045J	<0.045J	<0.00045J	<0.00045J	<0.00045J	<0.0023	<0.045J	**0.0019 J**	<0.009J	<0.009
Acetone	22	<0.099J	<0.099J	<0.099J	<0.005	<0.00099	<0.099J	<0.00099J	<0.00099	<0.00099	<0.005	<0.099J	<0.00099	<0.02	**0.67**
Benzene	0.005	**27**	**14**	**30**	**2.7**	**5.4**	**24**	**7.1**	**0.00081 J**	**0.08**	**1.4**	**23**	**0.089**	**1.1**	**7.5**
Bromobenzene	0.20	<0.019	<0.019	<0.019	<0.00095	<0.00019	<0.019	<0.00019	<0.00019	<0.00019	<0.00095	<0.019	<0.00019	<0.0038	<0.0038
Bromodichloromethane	0.015	<0.016	<0.016	<0.016	<0.0008	<0.00016	<0.016	<0.00016	<0.00016	<0.00016	<0.0008	<0.016	<0.00016	<0.0032	<0.0032
Bromoform	0.12	<0.019	<0.019	<0.019	<0.00095J	<0.00019	<0.019	<0.00019	<0.00019	<0.00019	<0.00095J	<0.019	<0.00019	<0.0038	<0.0038J
Bromomethane	0.034	<0.025	<0.025	<0.025	<0.0013	<0.00025	<0.025	<0.00025J	<0.00025	<0.00025	<0.0013	<0.025	<0.00025	<0.005	<0.005
Carbon disulfide	2.4	<0.024	<0.024	<0.024	<0.0012	<0.00024	<0.024	<0.00024J	<0.00024	<0.00024	<0.0012	<0.024	<0.00024	<0.0048	<0.0048
Carbon tetrachloride	0.005	<0.015	<0.015	<0.015	<0.00075	<0.00015J	<0.015	<0.00015J	<0.00015	<0.00015	<0.00075	<0.015	<0.00015	<0.003	<0.003
Chlorobenzene	0.1	<0.012	<0.012	<0.012	<0.0006	<0.00012	<0.012	<0.00012	<0.00012	<0.00012	<0.0006	<0.012	<0.00012	**0.0054 J**	<0.0024
Chloroethane	9.8	<0.008	<0.008	<0.008	<0.0004	<0.00008	<0.008	<0.00008J	<0.00008	<0.00008	<0.0004	<0.008	<0.00008	<0.0016	<0.0016
Chloroform	0.24	<0.013	<0.013	<0.013	**0.0033 J**	**0.0045**	<0.013	**0.0092 J+**	<0.00013	<0.00013	<0.00065	<0.013	<0.00013	**0.0045 J**	**0.012 J**
Chloromethane	0.07	<0.018J	<0.018J	<0.018J	<0.0009	<0.00018J	<0.018J	<0.00018J	<0.00018J	<0.00018J	<0.0009	<0.018J	<0.00018J	<0.0036J	<0.0036
cis-1,2-Dichloroethene	0.07	<0.006	<0.006	<0.006	<0.0003	<0.00006	<0.006	<0.00006J	<0.00006	<0.00006	<0.0003	<0.006	<0.00006	**0.003 J**	<0.0012
cis-1,3-Dichloropropene	0.0017	<0.018	<0.018	<0.018	<0.0009	<0.00018	<0.018	<0.00018	<0.00018	<0.00018	<0.0009	<0.018	<0.00018	<0.0036	<0.0036
Dibromochloromethane	0.011	<0.015	<0.015	<0.015	<0.00075	<0.00015	<0.015	<0.00015	<0.00015	<0.00015	<0.00075	<0.015	<0.00015	<0.003	<0.003
Dibromomethane	0.12	<0.052	<0.052	<0.052	<0.0026	<0.00052J	<0.052	<0.00052J	<0.00052	<0.00052	<0.0026	<0.052	<0.00052	<0.01	<0.01
Dichlorodifluoromethane	4.9	<0.012J	<0.012J	<0.012J	<0.0006J	<0.00012J	<0.012J	<0.00012J	<0.00012J	<0.00012J	<0.0006J	<0.012J	<0.00012J	<0.0024J	<0.0024J
Ethylbenzene	0.7	**2.1**	**0.81**	**1.7**	**0.0094**	**0.47**	**1.8**	**0.59**	<0.00011	**0.0031**	**0.011**	**1.3**	**0.0036**	**0.1**	**0.41**
Hexachlorobutadiene	0.012	<0.017	<0.017	<0.017	<0.00085	<0.00017	<0.017	<0.00017	<0.00017	<0.00017	<0.00085	<0.017	<0.00017	<0.0034	<0.0034
Iodomethane	0.034	<0.2	<0.2	<0.2	<0.01	<0.002	<0.2	<0.002J	<0.002	<0.002	<0.01	<0.2	<0.002	<0.04	<0.04
Isopropylbenzene	2.4	**0.27**	**0.23**	**0.26**	**0.02**	**0.017**	**0.29**	**0.027 J+**	<0.00018	**0.077**	**0.051**	**0.27**	**0.0034**	**0.062**	**0.075**
Methyl tert-butyl ether	0.24	<0.012	<0.012	<0.012	<0.0006	<0.00012	<0.012	**0.09**	**0.00069 J**	**0.0097**	**0.0019 J**	<0.012	<0.00012	**0.48**	<0.0024
Methylene Chloride	0.005	<0.015J	<0.015J	<0.015J	<0.00075	<0.00015	<0.015J	<0.00015J	<0.00015	<0.00015	<0.00075	<0.015J	<0.00015	<0.003	<0.003
Naphthalene	0.49	**0.78**	**0.25**	**0.66**	**0.017 J+**	**0.085**	**0.63**	**0.17 J+**	**0.0014**	**0.0035**	**0.011 J+**	**0.72**	**0.029**	**0.23**	**0.22 J+**
n-Butylbenzene	1.2	**0.12**	<0.016	**0.11**	**0.005**	**0.0049**	**0.14**	**0.0084 J+**	<0.00016	**0.0055**	**0.0081**	**0.11**	<0.00098	**0.025**	**0.023**
N-Propylbenzene	1.0	**0.2**	**0.1**	**0.15**	**0.016**	**0.031**	**0.2**	**0.045 J+**	<0.00015	**0.094**	**0.059**	**0.16**	**0.002**	**0.05**	**0.071**
sec-Butylbenzene	0.98	**0.085 J**	<0.012	<0.012	**0.0045 J**	<0.00012	**0.093 J**	**0.0034 J+**	<0.00012	**0.0073**	**0.0083**	**0.082 J**	**0.00089 J**	**0.02**	**0.019 J**
Styrene	0.10	<0.007	<0.007	<0.007	<0.00035	<0.00007	<0.007	<0.00007	<0.00007	<0.00007	<0.00035	<0.007	<0.00007	<0.0014	<0.0014
tert-Butylbenzene	0.98	<0.008	**0.1**	<0.008	**0.0041 J**	**0.0011**	<0.008	**0.0017 J+**	<0.00008	**0.0022**	**0.0049 J**	<0.008	**0.00084 J**	**0.017 J**	**0.017 J**
Tetrachloroethene	0.005	<0.013	<0.013	<0.013	<0.00065	<0.00013	<0.013	<0.00013	<0.00013	<0.00013	<0.00065	<0.013	<0.00013	<0.0026	<0.0026
Toluene	1	**0.11**	**2.9**	**30**	**0.0056**	**0.012**	**2.4**	**0.027 J+**	<0.00015	**0.0078**	**0.013**	**1.5**	**0.00069 J**	**0.012 J**	**0.023**
trans-1,2-Dichloroethene	0.1	<0.009	<0.009	<0.009	<0.00045	<0.00009	<0.009	<0.00009J	<0.00009	<0.00009	<0.00045	<0.009	<0.00009	<0.0018	<0.0018
trans-1,3-Dichloropropene	0.0091	<0.021J	<0.021J	<0.021J	<0.0011	<0.00021	<0.021J	<0.00021	<0.00021	<0.00021	<0.0011	<0.021J	<0.00021	<0.0042	<0.0042
Trichloroethene	0.005	<0.018	<0.018	<0.018	<0.0009	<0.00018J	<0.018	<0.00018J	<0.00018	<0.00018	<0.0009	<0.018	<0.00018	**0.0037 J**	<0.0036
Trichlorofluoromethane	7.3	<0.008	<0.008	<0.008	<0.0004	<0.00008	<0.008	<0.00008J	<0.00008	<0.00008	<0.0004	<0.008	<0.00008	<0.0016	<0.0016
Vinyl chloride	0.002	<0.011	<0.011	<0.011	**0.015**	<0.00011	<0.011	<0.00011J	**0.0023**	<0.00011	**0.012**	<0.011	<0.00011	**0.41**	**0.05**
Xylenes, Total	10	**9**	**1.3**	**11**	**0.0057**	**0.2**	**5.4**	**1.1**	<0.00026	**0.019**	**0.012**	**9.5**	**0.015**	**0.034**	**0.71**

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.
6. J = Estimated value. J+ = Estimated value with a potentially high bias.

TABLE 22
ON-SITE GROUNDWATER SAMPLING RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		R&H Oil					Tropicana Energy			Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium					
Sample Location:	Extent	MW-12	MW-13	MW-14	MW-16	MW-17	MW-18	MW-19	MW-20	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:	Evaluation Value	10/12/2011	10/13/2011	10/12/2011	10/11/2011	10/11/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011	10/12/2011
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-40	11-42	10-48	10-44	10.5-43	10-54.5
2,4,5-Trichlorophenol	2.4	<0.0025	<0.00028	<0.0025	<0.0024	<0.00024	<0.0012	<0.00024	<0.00024	<0.00024	<0.00024	<0.0025	<0.00024	<0.0012	0.00025 R
2,4,6-Trichlorophenol	0.024	<0.0018	<0.0002	<0.0018	<0.0018	<0.00018	<0.00088	<0.00018	<0.00018	<0.00018	<0.00018	<0.0018	<0.00018	<0.00088	0.00018 R
2,4-Dichlorophenol	0.073	<0.0015	<0.00017	<0.0015	<0.0015	<0.00015	<0.00074	<0.00015	<0.00015	<0.00015	<0.00015	<0.0015	<0.00015	<0.00073	0.00015 R
2,4-Dimethylphenol	0.49	<0.0031	**0.026**	**0.59**	<0.003	<0.0003	**1.5**	**0.0098**	<0.0003	<0.0003	<0.0003	**0.13**	<0.0003	<0.0015	**0.0053 J-**
2,4-Dinitrophenol	0.049	<0.0039J	<0.00043	<0.0039J	<0.0038	<0.00038	<0.0019	<0.00038	<0.00038	<0.00038	<0.00038	<0.0039J	<0.00038	<0.0019	0.00038 R
2,4-Dinitrotoluene	0.0013	<0.0013	<0.00014	<0.0013	<0.0013	<0.00013	<0.00064	<0.00013	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013	<0.00063	<0.00013
2,6-Dinitrotoluene	0.0013	<0.0008	<0.000089	<0.0008	<0.00078	<0.000078	<0.00039	<0.000078	<0.000078	<0.000078	<0.000078	<0.0008	<0.000078	<0.00039	<0.000078
2-Chloronaphthalene	2.0	<0.0008	<0.000089	<0.0008	<0.00078	<0.000078	<0.00039	<0.000078	<0.000078	<0.000078	<0.000078	<0.0008	<0.000078	<0.00039	<0.000078
2-Chlorophenol	0.12	<0.0013	<0.00014	<0.0013	<0.0013	<0.00013	<0.00064	<0.00013	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013	<0.00063	0.00013 R
2-Methylnaphthalene	0.098	**0.29**	**0.0088**	**0.11**	**0.0041 J**	**0.017**	**0.12**	**0.052**	<0.000068	**0.028**	**0.078**	**0.17**	**0.00022 J**	**0.96**	**0.084**
2-Nitroaniline	0.0073	<0.0019	<0.00021	<0.0019	<0.0019	<0.00019	<0.00093	<0.0019	<0.00019	<0.00019	<0.00019	<0.0019	<0.00018	<0.00093	<0.00019
2-Nitrophenol	0.049	<0.0022	<0.00024	<0.0022	<0.0021	<0.00021	<0.0011	<0.00021	<0.00021	<0.00021	<0.00021	<0.0022	<0.00021	<0.0011	0.00022 R
3 & 4 Methylphenol	0.12	<0.002J	**0.025 J-**	**0.14 J-**	**0.0063 J**	<0.0002J	**0.2 J-**	<0.0002J	<0.0002J	<0.0002J	<0.0002J	<0.002J	<0.00019J	<0.00098J	0.0002 R
3,3'-Dichlorobenzidine	0.0020	<0.0018J	<0.0002	<0.0018J	0.0018 R	0.00018 R	0.00088 R	0.00018 R	0.00018 R	0.00018 R	0.00018 R	<0.0018J	0.00018 R	0.00088 R	0.00018 R
3-Nitroaniline	0.0073	<0.0016J	<0.00018	<0.0016J	<0.0016	<0.00016	<0.00078	<0.00016	<0.00016	<0.00016	<0.00016	<0.0016J	<0.00016	<0.00078	<0.00016
4,6-Dinitro-2-methylphenol	0.0024	<0.0083	<0.00092J	<0.0083	<0.0081	<0.00081	<0.0041	<0.00081	<0.00081	<0.00081	<0.00081	<0.0083	<0.00081	<0.004	0.00081 R
4-Bromophenyl phenyl ether	0.000061	<0.001	<0.00011	<0.001	<0.00098	<0.000098	<0.00049	<0.000098	<0.000098	<0.000098	<0.000098	<0.001	<0.000097	<0.00049	<0.000098
4-Chloro-3-methylphenol	0.12	<0.0017	<0.00019	<0.0017	<0.0017	<0.00017	<0.00083	<0.00017	<0.00017	<0.00017	<0.00017	<0.0017	<0.00017	<0.00083	0.00017 R
4-Chloroaniline	0.0046	<0.0021	<0.00023	<0.0021	<0.002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0021	<0.0002	<0.001	<0.00021
4-Chlorophenyl phenyl ether	0.000061	<0.001	<0.00011	<0.001	<0.00098	<0.000098	<0.00049	<0.000098	<0.000098	<0.000098	<0.000098	<0.001	<0.000097	<0.00049	<0.000098
4-Nitroaniline	0.046	<0.0025J	<0.00028	<0.0025J	<0.0024	<0.00024	<0.0012	<0.00024	<0.00024	<0.00024	<0.00024	<0.0025J	<0.00024	<0.0012	<0.00025
4-Nitrophenol	0.049	<0.0056J	<0.00062J	<0.0056J	<0.0055J	<0.00055J	<0.0027J	<0.00055J	<0.00055J	<0.00055J	<0.00055J	<0.0056J	<0.00054J	<0.0027J	0.00055 R
Acenaphthene	1.5	<0.0008	<0.000089	<0.0008	<0.00078	<0.000078	<0.00039	**0.00026 J**	<0.000078	<0.000078	**0.0013**	<0.0008	<0.000078	<0.00039	**0.00028 J**
Acenaphthylene	1.5	<0.0006	<0.000067	<0.0006	<0.00059	<0.000059	<0.00029	<0.000059	<0.000059	<0.000059	<0.000059	<0.0006	<0.000058	<0.00029	<0.000059
Aniline	0.16	<0.0008J	<0.000089J	<0.0089	<0.00078J	<0.000078J	<0.00039J	<0.000078J	<0.000078J	<0.000078J	<0.000078J	<0.0008J	<0.000078J	<0.00039J	<0.000078J
Anthracene	7.3	<0.0005	<0.000056	<0.0005	<0.00049	<0.000049	<0.00025	<0.000049	<0.000078	<0.000049	<0.000049	<0.0005	<0.000049	<0.00024	<0.000049
Benzo[a]anthracene	0.0013	<0.0008	<0.000089	<0.0008	<0.00078	<0.000078	<0.00039	<0.000078	<0.000078	<0.000078	<0.000078	<0.0008	<0.000078	<0.00039	<0.000078
Benzo[a]pyrene	0.00020	<0.0008	<0.000089	<0.0008	<0.00078	<0.000078	<0.00039	<0.000078	<0.000078	<0.000078	<0.000078	<0.0008	<0.000078	<0.00039	<0.000078
Benzo[b]fluoranthene	0.0013	<0.0007	<0.000078	<0.0007	<0.00068	<0.000068	<0.00034	<0.000068	<0.000068	<0.000068	<0.000068	<0.0007	<0.000068	<0.00034	<0.000069
Benzo[g,h,i]perylene	0.73	<0.0008	<0.000089	<0.0008	<0.00078J	<0.000078J	<0.00039J	<0.000078J	<0.000078J	<0.000078J	<0.000078J	<0.0008	<0.000078J	<0.00039J	<0.000078J
Benzo[k]fluoranthene	0.013	<0.0009	<0.0001	<0.0009	<0.00088	<0.000088	<0.00044	<0.000088	<0.000088	<0.000088	<0.000088	<0.0009	<0.000088	<0.00044	<0.000088
Benzyl alcohol	2.4	<0.0017J	<0.00019J	<0.0017J	<0.0017J	<0.00017J	<0.00083J	<0.00017J	<0.00017J	<0.00017J	<0.00017J	<0.0017J	<0.00017J	<0.00083J	0.00017 R
Bis(2-chloroethoxy)methane	0.00083	<0.0013	<0.00014	<0.0013	<0.0013	<0.00013	<0.00064	<0.00013	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013	<0.00063	<0.00013
Bis(2-chloroethyl)ether	0.00083	<0.0015	<0.00017	<0.0015	<0.0015	<0.00015	<0.00074	<0.00015	<0.00015	<0.00015	<0.00015	<0.0015	<0.00015	<0.00073	<0.00015
Bis(2-chloroisopropyl) ether	0.013	<0.004	<0.00044J	<0.004	<0.0039	<0.00039	<0.002	<0.00039	<0.00039	<0.00039	<0.00039	<0.004	<0.00039	<0.002	<0.00039
Bis(2-ethylhexyl) phthalate	0.0060	<0.0037	<0.00041	<0.0037	<0.0036J	<0.00036J	<0.0018J	<0.00036J	<0.00036J	<0.00036J	<0.00036J	<0.0037	<0.00036J	<0.0018J	<0.00036J
Butyl benzyl phthalate	0.48	<0.0012	<0.00013	<0.0012	<0.0012	<0.00012	<0.00059	<0.00012	<0.00012	<0.00012	<0.00012	<0.0012	<0.00012	<0.00059	<0.00012
Chrysene	0.13	<0.0008	<0.000089	<0.0008	<0.00078	<0.000078	<0.00039	<0.000078	<0.000078	<0.000078	<0.000078	<0.0008	<0.000078	<0.00039	<0.000078
Dibenz(a,h)anthracene	0.00020	<0.0008	<0.000089	<0.0008	<0.00078J	<0.000078J	<0.00039J	<0.000078J	<0.000078J	<0.000078J	<0.000078J	<0.0008	<0.000078J	<0.00039J	<0.000078J
Dibenzofuran	0.098	<0.0008	<0.000089	<0.0008	<0.00078	<0.000078	<0.00039	<0.000078	<0.000078	**0.0017**	**0.00045 J**	<0.0008	<0.000078	<0.00039	<0.000078
Diethyl phthalate	20	<0.015	<0.0017	<0.015	<0.015	<0.0015	<0.0074	<0.0015	<0.0015	<0.0015	<0.0015	<0.015	<0.0015	<0.0073	<0.0015
Dimethyl phthalate	20	<0.0007	<0.000078	<0.0007	<0.00068	<0.000068	<0.00034	<0.000068	<0.000068	<0.000068	<0.000068	<0.0007	<0.000068	<0.00034	<0.000069
Di-n-butyl phthalate	2.4	<0.0011	<0.00012	<0.0011	<0.0011	<0.00036	<0.00054	<0.00011	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011	<0.00054	<0.00011
Di-n-octyl phthalate*	0.24	<0.0016	<0.00018	<0.0016	<0.0016J	<0.00016J	<0.00078J	<0.00016J	<0.00016J	<0.00016J	<0.00016J	<0.0016	<0.00016J	<0.00078J	<0.00016J
Fluoranthene	0.98	**0.0021 J**	<0.000078	<0.0007	<0.00068	<0.000068	<0.00034	<0.000068	<0.000068	<0.000068	<0.000068	<0.0007	<0.000068	<0.00034	<0.000069
Fluorene	0.98	<0.0007	<0.000078	<0.0007	<0.00068	<0.000068	<0.00034	**0.00043 J**	<0.000068	**0.0016**	**0.0015**	<0.0007	<0.000068	**0.021**	**0.00079 J**
Hexachlorobenzene	0.0010	<0.0011	<0.00012	<0.0011	<0.0011	<0.00011	<0.0054	<0.00011	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011	<0.00054	<0.00011
Hexachlorocyclopentadiene	0.050	<0.0013	<0.00014	<0.0013	<0.0013	<0.00013	<0.00064	<0.00013	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013	<0.00063	<0.00013
Hexachloroethane	0.0170	<0.001	<0.00011	<0.001	<0.00098	<0.000098	<0.00049	<0.000098	<0.000098	<0.000098	<0.000098	<0.001	<0.000097	<0.00049	<0.000098
Indeno[1,2,3-cd]pyrene	0.0013	<0.0007	<0.000078	<0.0007	<0.00068J	<0.000068J	<0.00034J	<0.000068J	<0.000068J	<0.000068J	<0.000068J	<0.0007	<0.000068J	<0.00034J	<0.000069J
Isophorone	0.96	<0.0011	<0.00012	<0.0011	<0.0011	<0.00011	<0.00054	<0.00011	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011	<0.00054	<0.00011
Nitrobenzene	0.049	<0.0011	<0.00012	<0.0011	<0.0011	<0.00011	<0.00054	<0.00011	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011	<0.00054	<0.00011
N-Nitrosodi-n-propylamine	0.00013	<0.001	<0.00011J	<0.001	<0.00098	<0.000098	<0.00049	<0.000098	<0.000098	<0.000098	<0.000098	<0.001	<0.000097	<0.00049	<0.000098
Pentachlorophenol	0.0010	<0.0061	<0.00068	<0.0061	<0.006	<0.0006	<0.003	<0.0006	<0.0006	<0.0006	<0.0006	<0.0061	<0.00059	<0.003	0.0006 R
Phenanthrene	0.73	**0.0039 J**	<0.000067	<0.0006	<0.00059	<0.000059	<0.00029	<0.000059	<0.000059	**0.00066 J**	<0.000059	<0.0006	<0.000058	**0.014**	<0.000059
Phenol	7.3	**0.066 J-**	**0.086 J-**	**0.044 J-**	<0.00039J	**0.0053 J-**	**0.03 J-**	**0.0016 J-**	<0.000039J	<0.000039J	**0.0011 J**	**0.038 J-**	<0.000039J	<0.0002J	**0.0074 J-**
Pyrene	0.73	**0.0015 J**	<0.00012	<0.0011	<0.0011	<0.00011	<0.00054	<0.00011	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011	**0.0053 J**	<0.00011

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.
6. J = Estimated value. J- = Estimated value with potential low bias. R - Data rejected, see data validation report.

TABLE 23
ON-SITE GROUNDWATER SAMPLING RESULTS: TOTAL PETROLEUM HYDROCARBONS MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

RI/FS Wells installed in upper water-bearing zone

Sample Area:	Extent Evaluation Value	R&H Oil					Tropicana Energy		
Sample Location:		MW-12	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20
Sample Date:		5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/9/2012	5/10/2012	5/9/2012
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30
C6-C12	0.98	**17**	**40**	**12**	**4.9**	**2.7**	**19**	**4.4**	<0.8
>C12-C28	0.98	<0.94	**1.1J**	**3.9**	**4.9**	**3.1**	**2.7**	**2.4**	<0.93
>C28-C35	0.98	<0.94	<0.93	<0.94	<0.93	<0.94	<0.94	<0.93	<0.93
C6-C35 (Total)	0.98	**17**	**41**	**16**	**9.8**	**5.8**	**22**	**6.8**	<1.5

Existing deep wells, screen interval through shallow zone to base of alluvium

Sample Area:	Extent Evaluation Value	Tropicana Energy					
Sample Location:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:		5/11/2012	5/10/2012	5/10/2012	5/9/2012	5/11/2012	5/11/2012
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5
C6-C12	0.98	<0.81	<0.81	**280**	<0.81	**2.8**	**9.6**
>C12-C28	0.98	<0.94	<0.94	**160**	<0.94	**16**	**4.6**
>C28-C35	0.98	<0.94	<0.94	**21**	<0.94	<0.93	<0.94
C6-C35 (Total)	0.98	<1.5	<1.5	**460**	<1.5	**20**	**14**

NOTES:
1. All units are mg/L.
2. Samples analyzed by Texas TPH Method TX1005, aliphatic/aromatic fractionation by Method TX1006 not performed.
3. Extent Evaluation Values provided on Table 3.
4. Detected compounds are presented in **bold** type. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. J = Estimated value.
6. bgs = Below ground surface.

TABLE 24
ON-SITE GROUNDWATER SAMPLING RESULTS: METALS MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

RI/FS Wells installed in upper water-bearing zone

Sample Area:	Extent Evaluation Value	R&H Oil					Tropicana Energy		
Sample Location:		MW-12	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20
Sample Date:		5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/9/2012	5/10/2012	5/9/2012
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30
Aluminum	24	**0.057 J**	**0.07 J**	**0.037 J**	**0.06 J**	**0.059 J**	**0.041 J**	**0.043 J**	**0.1 J**
Arsenic	0.01	**0.21**	**0.33**	**0.24**	**0.15**	**0.026**	**0.15**	**0.034**	<0.0033
Barium	2	**0.62**	**0.44**	**0.47**	**0.33**	**0.12**	**0.4**	**0.16**	**0.14**
Chromium	0.1	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
Cobalt	0.24	**0.0037 J**	**0.0078 J**	**0.004 J**	**0.0009 J**	**0.0013 J**	**0.0029 J**	<0.00063	**0.0007 J**
Copper	1.3	<0.0015	<0.0017	<0.003	<0.0015	<0.0015	<0.0024	<0.0015	<0.0015
Lead	0.015	**0.0038 J**	**0.0077 J**	<0.0029	<0.0029	<0.0029	**0.0033 J**	<0.0029	<0.0029
Manganese	1.1	**0.89**	**1**	**0.63**	**1**	**0.5**	**0.93**	**0.66**	**0.083**
Mercury	0.002	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026
Nickel	0.49	**0.0052 J**	**0.0061 J**	**0.0094 J**	**0.0023 J**	<0.0018	**0.0047 J**	<0.0018	<0.0018
Selenium	0.005	<0.0042	<0.0042	**0.005 J**	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.044	<0.0017	<0.0017	**0.0032 J**	<0.0017	<0.0017	<0.0017	<0.0017	**0.0061 J**
Zinc	7.3	<0.0046	<0.0052	<0.0048	<0.0037	<0.0028	<0.0034	<0.009	<0.0044

Existing deep wells, screen interval through shallow zone to base of alluvium

Sample Area:	Extent Evaluation Value	Tropicana Energy					
Sample Location:		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:		5/11/2012	5/10/2012	5/10/2012	5/9/2012	5/11/2012	5/11/2012
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5
Aluminum	24	<0.077	**0.077 J**	**0.066 J**	**0.051 J**	<0.034	<0.053
Arsenic	0.01	**0.03**	**0.38**	**0.095**	**0.0034 J**	**0.19**	**0.067**
Barium	2	**0.51**	**0.18**	**0.44**	**0.23**	**0.45**	**0.41**
Chromium	0.1	<0.0016	<0.0016	**0.0018 J**	**0.0022 J**	<0.0016	**0.0023 J**
Cobalt	0.24	**0.0026 J**	**0.001 J**	**0.0025 J**	<0.00063	**0.0041 J**	**0.0012 J**
Copper	1.3	**0.003 J**	<0.0015	<0.0081	<0.0049	**0.0057 J**	**0.0029 J**
Lead	0.015	<0.0029	<0.0029	**0.033**	**0.0032 J**	**0.0044 J**	**0.011**
Manganese	1.1	**0.27**	**0.36**	**1**	**0.31**	**0.49**	**0.72**
Mercury	0.002	<0.000026 J	<0.000026	<0.000026	<0.000026	<0.000026 J	<0.000026 J
Nickel	0.49	**0.0087 J**	**0.0033 J**	**0.0047 J**	**0.0032 J**	**0.0045 J**	**0.0055 J**
Selenium	0.005	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.044	<0.0017	<0.0017	**0.0068 J**	**0.0088 J**	<0.0017	**0.0042 J**
Zinc	7.3	<0.0058	<0.0048	<0.0091	<0.012	**0.074**	<0.012

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. J = Estimated value. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.

TABLE 25
ON-SITE GROUNDWATER SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		R&H Oil					Tropicana Energy			Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium					
Sample Location:	Extent	MW-12	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:	Evaluation Value	5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/9/2012	5/10/2012	5/9/2012	5/11/2012	5/10/2012	5/10/2012	5/9/2012	5/11/2012	5/11/2012
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-40	11-42	10-48	10-44	10.5-43	10-54.5
1,1,1,2-Tetrachloroethane	0.035	<0.009	<0.036	<0.0018	<0.00018	<0.009	<0.036	<0.009	<0.00018	<0.00018	<0.0009	<0.036	<0.0009	<0.0009	<0.009
1,1,1-Trichloroethane	0.20	<0.0075	<0.03	<0.0015	<0.00015	<0.0075	<0.03	<0.0075	<0.00015	<0.00015	<0.00075	<0.03	<0.00075	<0.00075	<0.0075
1,1,2,2-Tetrachloroethane	0.0046	<0.011	<0.044	<0.0022	<0.00022	<0.011	<0.044	<0.011	<0.00022	<0.00022	<0.0011	<0.044	<0.0011	<0.0011	<0.011
1,1,2-Trichloroethane	0.005	<0.014	<0.056	<0.0028	<0.00028	<0.014	<0.056	<0.014	<0.00028	<0.00028	<0.0014	<0.056	<0.0014	<0.0014	<0.014
1,1-Dichloroethane	4.9	<0.0055	<0.022	<0.0011	<0.00011	<0.0055	<0.022	<0.0055	<0.00011	<0.00011	<0.00055	<0.022	<0.00055	<0.00055	<0.0055
1,1-Dichloroethene	0.007	<0.0095	<0.038	<0.0019	<0.00019	<0.0095	<0.038	<0.0095	<0.00019	<0.00019	<0.00095	<0.038	<0.00095	<0.00095	<0.0095
1,1-Dichloropropene	0.0091	<0.011	<0.042	<0.0021	<0.00021	<0.011	<0.042	<0.011	<0.00021	<0.00021	<0.0011	<0.042	<0.0011	<0.0011	<0.011
1,2,3-Trichloropropane	0.00003	<0.015	<0.058	<0.0029	<0.00029	<0.015	<0.058	<0.015	<0.00029	<0.00029	<0.0015	<0.058	<0.0015	<0.0015	<0.015
1,2,4-Trichlorobenzene	0.07	<0.016	<0.062	<0.0031	<0.00031	<0.016	<0.062	<0.016	<0.00031	<0.00031	<0.0016	<0.062	<0.0016	<0.0016	<0.016
1,2,4-Trimethylbenzene	1.2	**1.2**	**1.1**	**0.33**	**0.0021**	**0.29**	**0.48**	**0.3**	<0.00014	<0.00014	<0.0007	**2.7**	<0.0007	**0.0022 J**	**0.37**
1,2-Dibromo-3-Chloropropane	0.0002	<0.041	<0.16	<0.0081	<0.00081	<0.041	<0.16	<0.041	<0.00081	<0.00081	<0.0041	<0.16	<0.0041	<0.0041	<0.041
1,2-Dibromoethane	0.00005	<0.009	<0.036	<0.0018	<0.00018	<0.009	<0.036	<0.009	<0.00018	<0.00018	<0.0009	<0.036	<0.0009	<0.0009	<0.009
1,2-Dichlorobenzene	0.60	<0.005	<0.02	<0.001	<0.0001	<0.005	<0.02	<0.005	<0.0001	<0.0001	<0.0005	<0.02	<0.0005	<0.0005	<0.005
1,2-Dichloroethane	0.005	<0.007	<0.028	<0.0014	<0.00014	<0.007	<0.028	<0.007	<0.00014	<0.00014	<0.0007	<0.028	<0.0007	<0.0007	<0.007
1,2-Dichloropropane	0.005	**0.023 J**	<0.032	**0.0064 J**	<0.00016	<0.008	<0.032	<0.008	<0.00016	**0.0059**	**0.0024 J**	**0.081 J**	<0.0008	**0.0017 J**	<0.008
1,3,5-Trimethylbenzene	1.20	**0.4**	**0.44**	**0.11**	**0.0011**	**0.098**	**0.19 J**	**0.086**	<0.0001	<0.0001	<0.0005	**1.5**	<0.0005	<0.0005	**0.11**
1,3-Dichlorobenzene	0.73	<0.0065	<0.026	<0.0013	<0.00013	<0.0065	<0.026	<0.0065	<0.00013	<0.00013	<0.00065	<0.026	<0.00065	<0.00065	<0.0065
1,3-Dichloropropane	0.0091	<0.011	<0.044	<0.0022	<0.00022	<0.011	<0.044	<0.011	<0.00022	<0.00022	<0.0011	<0.044	<0.0011	<0.0011	<0.011
1,4-Dichlorobenzene	0.075	<0.0055	<0.022	<0.0011	<0.00011	<0.0055	<0.022	<0.0055	<0.00011	<0.00011	<0.00055	<0.022	<0.00055	<0.00055	<0.0055
2,2-Dichloropropane	0.013	<0.0065	<0.026	<0.0013	<0.00013	<0.0065	<0.026	<0.0065	<0.00013	<0.00013	<0.00065	<0.026	<0.00065	<0.00065	<0.0065
2-Butanone (MEK)	15	<0.038 J	<0.15 J	<0.0076 J	<0.00076 J	<0.038 J	<0.15 J	<0.038 J	<0.00076 J	<0.00076 J	<0.0038 J	<0.15 J	<0.0038	<0.0038 J	<0.038 J
2-Chlorotoluene	0.49	<0.0065	<0.026	<0.0013	<0.00013	<0.0065	<0.026	<0.0065	<0.00013	<0.00013	<0.00065	<0.026	<0.00065	<0.00065	<0.0065
2-Hexanone	0.12	<0.018	<0.07	<0.0035	<0.00035	<0.018	<0.07	<0.018	<0.00035	<0.00035	<0.0018	<0.07	<0.0018	<0.0018	<0.018
4-Chlorotoluene	0.49	<0.007	<0.028	<0.0014	<0.00014	<0.007	<0.028	<0.007	<0.00014	<0.00014	<0.0007	<0.028	<0.0007	<0.0007	<0.007
4-Isopropyltoluene	2.4	**0.0093 J**	<0.02	**0.0026 J**	**0.00036 J**	<0.005	<0.02	<0.005	<0.0001	<0.0001	**0.0023 J**	**0.072 J**	<0.0005	<0.0005	<0.005
4-Methyl-2-pentanone (MIBK)	2	<0.023	<0.09	<0.0045	<0.00045	<0.023	<0.09	<0.023	<0.00045	<0.00045	<0.0023	<0.09	<0.0023	<0.0023	<0.023
Acetone	22	<0.05	<0.2	<0.0099	<0.00099	<0.05	<0.2	<0.05	<0.00099	<0.00099	<0.005	<0.2	<0.005	<0.005	<0.05
Benzene	0.005	**26**	**31**	**14**	**2.1**	**2.5**	**22**	**4.4**	<0.00008	**0.011**	**0.39**	**17**	**0.00041 J**	**0.16**	**13**
Bromobenzene	0.20	<0.0095	<0.038	<0.0019	<0.00019	<0.0095	<0.038	<0.0095	<0.00019	<0.00019	<0.00095	<0.038	<0.00095	<0.00095	<0.0095
Bromodichloromethane	0.015	<0.008	<0.032	<0.0016	<0.00016	<0.008	<0.032	<0.008	<0.00016	<0.00016	<0.0008	<0.032	<0.0008	<0.0008	<0.008
Bromoform	0.12	<0.0095	<0.038	<0.0019	<0.00019	<0.0095	<0.038	<0.0095	<0.00019	<0.00019	<0.00095	<0.038	<0.00095	<0.00095	<0.0095
Bromomethane	0.034	<0.013	<0.05	<0.0025	<0.00025	<0.013	<0.05	<0.013	<0.00025	<0.00025	<0.0013	<0.05	<0.0013	<0.0013	<0.013
Carbon disulfide	2.4	<0.012	<0.048	<0.0024	<0.00024	<0.012	<0.048	<0.012	<0.00024	<0.00024	<0.0012	<0.048	<0.0012	<0.0012	<0.012
Carbon tetrachloride	0.005	<0.0075	<0.03	<0.0015	<0.00015	<0.0075	<0.03	<0.0075	<0.00015	<0.00015	<0.00075	<0.03	<0.00075	<0.00075	<0.0075
Chlorobenzene	0.1	<0.006	<0.024	<0.0012	<0.00012	<0.006	<0.024	<0.006	<0.00012	<0.00012	<0.0006	<0.024	<0.0006	<0.0006	<0.006
Chloroethane	9.8	<0.004	<0.016	<0.0008	<0.00008	<0.004	<0.016	<0.004	<0.00008	<0.00008	<0.0004	<0.016	<0.0004	<0.0004	<0.004
Chloroform	0.24	**0.02 J**	<0.026	**0.0075 J**	**0.0028**	**0.017 J**	<0.026	**0.013 J**	<0.00013	**0.00033 J**	<0.00065	**0.043 J**	<0.00065	**0.0014 J**	<0.0065
Chloromethane	0.07	<0.009	<0.036	<0.0018	<0.00018	<0.009	<0.036	<0.009	<0.00018	<0.00018	<0.0009	<0.036	<0.0009	<0.0009	<0.009
cis-1,2-Dichloroethene	0.07	<0.003	<0.012	<0.0006	<0.00006	<0.003	<0.012	<0.003	<0.00006	<0.00006	<0.0003	<0.012	<0.0003	<0.0003	<0.003
cis-1,3-Dichloropropene	0.0017	<0.009	<0.036	<0.0018	<0.00018	<0.009	<0.036	<0.009	<0.00018	<0.00018	<0.0009	<0.036	<0.0009	<0.0009	<0.009
Dibromochloromethane	0.011	<0.0075	<0.03	<0.0015	<0.00015	<0.0075	<0.03	<0.0075	<0.00015	<0.00015	<0.00075	<0.03	<0.00075	<0.00075	<0.0075
Dibromomethane	0.12	<0.026	<0.1	<0.0052	<0.00052	<0.026	<0.1	<0.026	<0.00052	<0.00052	<0.0026	<0.1	<0.0026	<0.0026	<0.026
Dichlorodifluoromethane	4.9	<0.006	<0.024	<0.0012 J	<0.00012	<0.006	<0.024 J	<0.006	<0.00012 J	<0.00012 J	<0.0006 J	<0.024	<0.0006 J	<0.0006 J	<0.006 J
Ethylbenzene	0.7	**1.7**	**1.4**	**0.51**	**0.0023**	**0.34**	**0.96**	**0.51**	<0.00011	**0.00047 J**	**0.003 J**	**1.5**	<0.00055	**0.003 J**	**0.58**
Hexachlorobutadiene	0.012	<0.0085	<0.034	<0.0017	<0.00017	<0.0085	<0.034	<0.0085	<0.00017	<0.00017	<0.00085	<0.034	<0.00085	<0.00085	<0.0085
Iodomethane	0.034	<0.1	<0.4	<0.02	<0.002	<0.1	<0.4	<0.1	<0.002	<0.002	<0.01	<0.4	<0.01	<0.01	<0.1
Isopropylbenzene	2.4	**0.076**	**0.081 J**	**0.022**	**0.022**	**0.022 J**	**0.056 J**	**0.03 J**	<0.00018	**0.029**	**0.029**	**0.18 J**	<0.0009	**0.019**	**0.042 J**
Methyl tert-butyl ether	0.24	<0.006	<0.024	**0.066**	**0.00074 J**	<0.006	<0.024	**0.13**	**0.0031**	**0.009**	**0.0019 J**	<0.024	<0.0006	**0.46**	<0.006
Methylene Chloride	0.005	<0.0075	<0.03	<0.0015	<0.00015	<0.0075	<0.03	<0.0075	<0.00015	<0.00015	**0.00095 J**	<0.03	<0.00075	<0.00075	**0.0091 J**
Naphthalene	0.49	**0.51**	**0.35**	**0.13**	**0.018**	**0.15**	**0.16 J**	**0.18**	<0.00032	**0.00078 J**	**0.0022 J**	**0.82**	<0.0016	**0.015**	**0.33**
n-Butylbenzene	1.2	**0.025 J**	<0.032	**0.0076 J**	**0.0016**	<0.008	<0.032	<0.008	<0.00016	**0.0027**	**0.0032 J**	**0.19 J**	<0.0008	**0.0045 J**	**0.012 J**
N-Propylbenzene	1.0	**0.12**	**0.11 J**	**0.036**	**0.024**	**0.041 J**	**0.052 J**	**0.048 J**	<0.00015	**0.031**	**0.031**	**0.26**	<0.00075	**0.023**	**0.058**
sec-Butylbenzene	0.98	<0.006	<0.024	**0.0022 J**	**0.0015**	<0.006	<0.024	<0.006	<0.00012	**0.0029**	**0.0034 J**	**0.047 J**	<0.0006	**0.0034 J**	<0.006
Styrene	0.10	**0.007 J**	**0.1 J**	**0.008 J**	**0.000078 J**	<0.0035	**0.019 J**	<0.0035	<0.00007	<0.00007	<0.00035	**0.083 J**	<0.00035	<0.00035	**0.0051 J**
tert-Butylbenzene	0.98	<0.004	<0.016	**0.047**	**0.00042 J**	<0.004	<0.016	<0.004	<0.00008	**0.00094 J**	**0.00089 J**	<0.016	<0.0004	**0.00097 J**	<0.004
Tetrachloroethene	0.005	<0.0065	<0.026	<0.0013	<0.00013	<0.0065	<0.026	<0.0065	<0.00013	<0.00013	<0.00065	<0.026	<0.00065	<0.00065	<0.0065
Toluene	1	**0.1**	**28**	**0.066**	**0.0051**	**0.0099 J**	**4.5**	**0.026 J**	<0.00015	**0.0012**	**0.0028 J**	**1.4**	<0.00075	**0.0018 J**	**0.065**
trans-1,2-Dichloroethene	0.1	<0.0045	<0.018	<0.0009	<0.00009	<0.0045	<0.018	<0.0045	<0.00009	<0.00009	<0.00045	<0.018	<0.00045	<0.00045	<0.0045
trans-1,3-Dichloropropene	0.0091	<0.011	<0.042	<0.0021	<0.00021	<0.011	<0.042	<0.011	<0.00021	<0.00021	<0.0011	<0.042	<0.0011	<0.0011	<0.011
Trichloroethene	0.005	<0.009	<0.036	<0.0018	<0.00018	<0.009	<0.036	<0.009	<0.00018	<0.00018	<0.0009	<0.036	<0.0009	<0.0009	<0.009
Trichlorofluoromethane	7.3	<0.004	<0.016	<0.0008	<0.00008	<0.004	<0.016	<0.004	<0.00008	<0.00008	<0.0004	<0.016	<0.0004	<0.0004	<0.004
Vinyl chloride	0.002	<0.0055	<0.022	<0.0011	<0.00011	<0.0055	<0.022	<0.0055	<0.00011	<0.00011	<0.00055	<0.022	<0.00055	<0.00055	<0.0055
Xylenes, Total	10	**8**	**13**	**2.1**	**0.0054**	**0.36**	**4.1**	**0.68**	<0.00026	**0.0026**	**0.002 J**	**15**	<0.0013	**0.0049 J**	**1.4**

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. J = Estimated value.

TABLE 26
ON-SITE GROUNDWATER SAMPLING RESULTS: SEMI-VOLATILE ORGANIC COMPOUNDS MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		R&H Oil					Tropicana Energy			Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium					
Sample Location:	Extent	MW-12	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
Sample Date:	Evaluation Value	5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/10/2012	5/9/2012	5/10/2012	5/9/2012	5/11/2012	5/10/2012	5/10/2012	5/9/2012	5/11/2012	5/11/2012
Screen Interval (ft bgs):		10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-40	11-42	10-48	10-44	10.5-43	10-54.5
2,4,5-Trichlorophenol	2.4	<0.0025	<0.012	<0.0025	<0.00025	<0.0025	<0.0025	<0.0025	<0.00025	<0.00025	<0.0025	<0.012	<0.00025	<0.0012	<0.0012
2,4,6-Trichlorophenol	0.024	<0.0018	<0.0089	<0.0018	<0.00018	<0.0018	<0.0018	<0.0018	<0.00018	<0.00018	<0.0018	<0.0089	<0.00018	<0.00089	<0.00089
2,4-Dichlorophenol	0.073	<0.0015	<0.0074	<0.0015	<0.00015	<0.0015	<0.0015	<0.0015	<0.00015	<0.00015	<0.0015	<0.0074	<0.00015	<0.00074	<0.00074
2,4-Dimethylphenol	0.49	**0.06**	**0.64**	**0.034**	<0.00031	<0.0031	**0.66**	<0.0031	<0.00031	<0.00031	<0.0031	**0.015**	<0.00031	**0.0015**	**0.053**
2,4-Dinitrophenol	0.049	<0.0038	<0.019	<0.0038	<0.00039 J	<0.0039	<0.0038	<0.0039	<0.00038 J	<0.00038	<0.0038	<0.019	<0.00038 J	<0.0019	<0.0019
2,4-Dinitrotoluene	0.0013	<0.0013	<0.0064	<0.0013	<0.00013	<0.0013	<0.0013	<0.0013	<0.00013	<0.00013	<0.0013	<0.0064	<0.00013	<0.00064	<0.00064
2,6-Dinitrotoluene	0.0013	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079	<0.00079	<0.0039	<0.000079	<0.00039	<0.00039
2-Chloronaphthalene	2.0	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079	<0.00079	<0.0039	<0.000079	<0.00039	<0.00039
2-Chlorophenol	0.12	<0.0013	<0.0064	<0.0013	<0.00013	<0.0013	<0.0013	<0.0013	<0.00013	<0.00013	<0.0013	<0.0064	<0.00013	<0.00064	<0.00064
2-Methylnaphthalene	0.098	**0.076**	**0.058 J**	**0.033**	**0.0027**	**0.022**	**0.064**	**0.043**	**0.0002 J**	**0.0034**	**0.051**	**0.9**	<0.000069	**0.26**	**0.077**
2-Nitroaniline	0.0073	<0.0019	<0.0094	<0.0019	<0.00019	<0.0019	<0.0019	<0.0019	<0.00019	<0.00019	<0.0019	<0.0094	<0.00019	<0.00094	<0.00094
2-Nitrophenol	0.049	<0.0022	<0.011	<0.0022	<0.00022	<0.0022	<0.0022	<0.0022	<0.00022	<0.00022	<0.0022	<0.011	<0.00022	<0.0011	<0.0011
3 & 4 Methylphenol	0.12	**0.047**	**0.086**	**0.0059 J**	<0.0002	<0.002	**0.11**	**0.0021 J**	<0.0002	<0.0002	<0.002	**0.035 J**	<0.0002	<0.00099	<0.00099
3,3'-Dichlorobenzidine	0.0020	<0.0018	<0.0089	<0.0018	<0.00018	<0.0018	<0.0018	<0.0018	<0.00018	0.00018 R	<0.0018	<0.0089	<0.00018	0.00089 R	0.00089 R
3-Nitroaniline	0.0073	<0.0016	<0.0079	<0.0016	<0.00016	<0.0016	<0.0016	<0.0016	<0.00016	<0.00016	<0.0016	<0.0079	<0.00016	<0.00079	<0.00079
4,6-Dinitro-2-methylphenol	0.0024	<0.0082 J	<0.041 J	<0.0082 J	<0.00082 J	<0.0083 J	<0.0082 J	<0.0083 J	<0.00082 J	<0.00082	<0.0082 J	<0.041 J	<0.00082 J	<0.0041	<0.0041
4-Bromophenyl phenyl ether	0.000061	<0.00099	<0.005	<0.00099	<0.000099	<0.001	<0.00099	<0.001	<0.000099	<0.000099	<0.00099	<0.0049	<0.000099	<0.00049	<0.00049
4-Chloro-3-methylphenol	0.12	<0.0017	<0.0084	<0.0017	<0.00017	<0.0017	<0.0017	<0.0017	<0.00017	<0.00017	<0.0017	<0.0084	<0.00017	<0.00084	<0.00084
4-Chloroaniline	0.0046	<0.0021	<0.01	<0.0021	<0.00021	<0.0021	<0.0021	<0.0021	<0.00021	<0.00021	<0.0021	<0.01	<0.00021	<0.001	<0.001
4-Chlorophenyl phenyl ether	0.000061	<0.00099	<0.005	<0.00099	<0.000099	<0.001	<0.00099	<0.001	<0.000099	<0.000099	<0.00099	<0.0049	<0.000099	<0.00049	<0.00049
4-Nitroaniline	0.046	<0.0025	<0.012	<0.0025	<0.00025	<0.0025	<0.0025	<0.0025	<0.00025	<0.00025 J	<0.0025	<0.012	<0.00025	<0.0012 J	<0.0012 J
4-Nitrophenol	0.049	<0.0055	<0.028	<0.0055	<0.00055	<0.0056	<0.0055	<0.0056	<0.00055	<0.00055 J	<0.0055	<0.028	<0.00055	<0.0028 J	<0.0028 J
Acenaphthene	1.5	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	**0.00044 J**	**0.0015 J**	<0.0039	<0.000079	**0.0023 J**	**0.00075 J**
Acenaphthylene	1.5	<0.00059	<0.003	<0.00059	<0.000059	<0.0006	<0.00059	<0.0006	<0.000059	<0.000059	<0.00059	<0.003	<0.000059	<0.0003	<0.0003
Aniline	0.16	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079 J	<0.00079	<0.0039	<0.000079	<0.00039 J	<0.00039 J
Anthracene	7.3	<0.00049	<0.0025	<0.00049	<0.00005	<0.0005	<0.00049	<0.0005	<0.000049	**0.00016 J**	<0.00049	<0.0025	<0.000049	<0.00025	<0.00025
Benzo[a]anthracene	0.0013	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079	<0.00079	<0.0039	<0.000079	<0.00039	<0.00039
Benzo[a]pyrene	0.00020	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079	<0.00079	<0.0039	<0.000079	<0.00039	<0.00039
Benzo[b]fluoranthene	0.0013	<0.00069	<0.0035	<0.00069	<0.000069	<0.0007	<0.00069	<0.0007	<0.000069	<0.000069	<0.00069	<0.0034	<0.000069	<0.00034	<0.00034
Benzo[g,h,i]perylene	0.73	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079 J	<0.00079	<0.0039	<0.000079	<0.00039 J	<0.00039 J
Benzo[k]fluoranthene	0.013	<0.00089	<0.0045	<0.00089	<0.000089	<0.0009	<0.00089	<0.0009	<0.000089	<0.000089	<0.00089	<0.0044	<0.000089	<0.00044	<0.00044
Benzyl alcohol	2.4	<0.0017	<0.0084	<0.0017	<0.00017	<0.0017	<0.0017	<0.0017	<0.00017	<0.00017	<0.0017	<0.0084	<0.00017	<0.00084	<0.00084
Bis(2-chloroethoxy)methane	0.00083	<0.0013	<0.0064	<0.0013	<0.00013	<0.0013	<0.0013	<0.0013	<0.00013	<0.00013	<0.0013	<0.0064	<0.00013	<0.00064	<0.00064
Bis(2-chloroethyl)ether	0.00083	<0.0015	<0.0074	<0.0015	<0.00015	<0.0015	<0.0015	<0.0015	<0.00015	<0.00015	<0.0015	<0.0074	<0.00015	<0.00074	<0.00074
Bis(2-chloroisopropyl) ether	0.013	<0.0039	<0.02	<0.0039	<0.0004	<0.004	<0.0039	<0.004	<0.00039	<0.00039	<0.0039	<0.02	<0.00039	<0.002	<0.002
Bis(2-ethylhexyl) phthalate	0.0060	<0.0036	<0.018	<0.0036	<0.00037	<0.0037	<0.0036	<0.0037	<0.00036	**0.0004 J**	<0.0036	<0.018	<0.00036	<0.0018	<0.0018
Butyl benzyl phthalate	0.48	<0.0012	<0.0059	<0.0012	<0.00012	<0.0012	<0.0012	<0.0012	**0.00031 J**	<0.00057	<0.0012	<0.0059	<0.00012	<0.00059	<0.00059
Chrysene	0.13	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079	<0.00079	<0.0039	<0.000079	<0.00039	<0.00039
Dibenz(a,h)anthracene	0.00020	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	<0.000079	<0.00079	<0.0039	<0.000079	<0.00039	<0.00039
Dibenzofuran	0.098	<0.00079	<0.004	<0.00079	<0.000079	<0.0008	<0.00079	<0.0008	<0.000079	**0.00093 J**	<0.00079	<0.0039	<0.000079	**0.0012 J**	<0.00039
Diethyl phthalate	20	<0.015	<0.074	<0.015	<0.0015	<0.015	<0.015	<0.015	<0.0015	<0.0015	<0.015	<0.074	<0.0015	<0.0074	<0.0074
Dimethyl phthalate	20	<0.00069	<0.0035	<0.00069	<0.000069	<0.0007	<0.00069	<0.0007	<0.000069	<0.000069	<0.00069	<0.0034	<0.000069	<0.00034	<0.00034
Di-n-butyl phthalate	2.4	<0.0011	<0.0054	<0.0011	<0.00011	<0.0011	<0.0011	<0.0011	**0.00011 J**	**0.00031 J**	<0.0011	<0.0054	<0.00011	<0.00054	<0.00054
Di-n-octyl phthalate	0.24	<0.0016	<0.0079	<0.0016	<0.00016	<0.0016	<0.0016	<0.0016	<0.00016	<0.00016	<0.0016	<0.0079	<0.00016	<0.00079	<0.00079
Fluoranthene	0.98	<0.00069	<0.0035	<0.00069	<0.000069	<0.0007	<0.00069	<0.0007	<0.000069	<0.000069	<0.00069	<0.0034	<0.000069	<0.00034	<0.00034
Fluorene	0.98	<0.00069	<0.0035	<0.00069	<0.000069	<0.0007	<0.00069	<0.0007	<0.000069	**0.0012 J**	**0.0016 J**	<0.0034	**0.0002 J**	**0.0042 J**	<0.00034
Hexachlorobenzene	0.0010	<0.0011	<0.0054	<0.0011	<0.00011	<0.0011	<0.0011	<0.0011	<0.00011	<0.00011	<0.0011	<0.0054	<0.00011	<0.00054	<0.00054
Hexachlorocyclopentadiene	0.050	<0.0013 J	<0.0064 J	<0.0013 J	<0.00013 J	<0.0013 J	<0.0013 J	<0.0013 J	<0.0013 J	<0.00013	<0.0013 J	<0.0064 J	<0.00013 J	<0.00064	<0.00064
Hexachloroethane	0.0170	<0.00099	<0.005	<0.00099	<0.000099	<0.001	<0.00099	<0.001	<0.000099	<0.000099	<0.00099	<0.0049	<0.000099	<0.00049	<0.00049
Indeno[1,2,3-cd]pyrene	0.0013	<0.00069	<0.0035	<0.00069	<0.000069	<0.0007	<0.00069	<0.0007	<0.000069	<0.000069	<0.00069	<0.0034	<0.000069	<0.00034	<0.00034
Isophorone	0.96	<0.0011	<0.0054	<0.0011	<0.00011	<0.0011	<0.0011	<0.0011	<0.00011	<0.00011	<0.0011	<0.0054	<0.00011	<0.00054	<0.00054
Nitrobenzene	0.049	<0.0011	<0.0054	<0.0011	<0.00011	<0.0011	<0.0011	<0.0011	<0.00011	<0.00011	<0.0011	<0.0054	<0.00011	<0.00054	<0.00054
N-Nitrosodi-n-propylamine	0.00013	<0.00099	<0.005	<0.00099	<0.000099	<0.001	<0.00099	<0.001	<0.000099	<0.000099	<0.00099	<0.0049	<0.000099	<0.00049	<0.00049
Pentachlorophenol	0.0010	<0.006	<0.03	<0.006	<0.0006	<0.0061	<0.006	<0.0061	<0.0006	<0.0006	<0.006	<0.03	<0.0006	<0.003	<0.003
Phenanthrene	0.73	<0.00059	<0.003	<0.00059	<0.000059	<0.0006	<0.00059	<0.0006	<0.000059	**0.00035 J**	<0.00059	<0.003	<0.000059	**0.002 J**	**0.00092 J**
Phenol	7.3	**0.024**	**0.024 J**	**0.073**	<0.00004	**0.0025 J**	**0.031**	**0.0039 J**	<0.000039	<0.000039 J	<0.00039	**0.018 J**	<0.000039	**0.0012 J**	**0.013 J-**
Pyrene	0.73	<0.0011	<0.0054	<0.0011	<0.00011	<0.0011	<0.0011	<0.0011	<0.00011	<0.00011	<0.0011	<0.0054	<0.00011	<0.00054	<0.00054

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface.
6. J = Estimated value. J- = Estimated value with potential low bias. R - Data rejected, see data validation report.

TABLE 27
ON-SITE GROUNDWATER SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS APRIL 2014
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium						R&H Oil						Tropicana Energy		
Sample Location:	Extent	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20
Sample Date:	Evaluation Value	4/22/2014	4/23/2014	4/24/2014	4/23/2014	4/24/2014	4/24/2014	4/23/2014	4/24/2014	4/24/2014	4/23/2014	4/23/2014	4/23/2014	4/23/2014	4/24/2014	4/22/2014
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30
Constituent	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1,1,1,2-Tetrachloroethane	0.035	<0.00018	<0.00018	<0.0009	<0.00018	<0.00018	<0.0009	<0.009	<0.009	<0.036	<0.009	<0.00018	<0.0009	<0.018	<0.009	<0.00018
1,1,1-Trichloroethane	0.20	<0.00015	<0.00015	<0.00075	<0.00015	<0.00015	<0.00075	<0.0075	<0.0075	<0.03	<0.0075	**0.0016**	<0.00075	<0.015	<0.0075	<0.00015
1,1,2,2-Tetrachloroethane	0.0046	<0.00022	<0.00022	<0.0011	<0.00022	<0.00022	<0.0011	<0.011	<0.011	<0.044	<0.011	<0.00022	<0.0011	<0.022	<0.011	<0.00022
1,1,2-Trichloroethane	0.005	<0.00028	<0.00028	<0.0014	<0.00028	<0.00028	<0.0014	<0.014	<0.014	<0.056	<0.014	<0.00028	<0.0014	<0.028	<0.014	<0.00028
1,1-Dichloroethane	4.9	**0.0003 J**	<0.00011	<0.00055	<0.00011	<0.00011	<0.00055	<0.0055	<0.0055	<0.022	<0.0055	<0.00011	<0.00055	<0.011	<0.0055	<0.00011
1,1-Dichloroethene	0.007	<0.00019	<0.00019	<0.00095	<0.00019	<0.00019	<0.00095	<0.0095	<0.0095	<0.038	<0.0095	<0.00019	<0.00095	<0.019	<0.0095	<0.00019
1,1-Dichloropropene	0.0091	<0.00021	<0.00021	<0.0011	<0.00021	<0.00021	<0.0011	<0.011	<0.011	<0.042	<0.011	<0.00021	<0.0011	<0.021	<0.011	<0.00021
1,2,3-Trichloropropane	0.00003	<0.00029	<0.00029	<0.0015	<0.00029	<0.00029	<0.0015	<0.015	<0.015	<0.058	<0.015	<0.00029	<0.0015	<0.029	<0.015	<0.00029
1,2,4-Trichlorobenzene	0.07	<0.00031	<0.00031	<0.0016	<0.00031	<0.00031 J	<0.0016	<0.016	<0.016	<0.062	<0.016	<0.00031	<0.0016	<0.031	<0.016	<0.00031
1,2,4-Trimethylbenzene	1.2	**0.00035 J**	<0.00014	**0.73**	<0.00014	**0.0015**	**0.15**	**0.88**	**0.58**	**0.73**	**0.18**	**0.0015**	**0.16**	**0.7**	**0.33**	<0.00014
1,2-Dibromo-3-Chloropropane	0.0002	<0.00081 J	<0.00081	<0.0041	<0.00081	<0.00081 J	<0.0041	<0.041	<0.041 J	<0.16 J	<0.041 J	<0.00081 J	<0.0041	<0.081	<0.041 J	<0.00081 J
1,2-Dibromoethane	0.00005	<0.00018	<0.00018	<0.0009	<0.00018	<0.00018	<0.0009	<0.009	<0.009	<0.036	<0.009	<0.00018	<0.0009	<0.018	<0.009	<0.00018
1,2-Dichlorobenzene	0.60	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0005	<0.005	<0.005	<0.02	<0.005	<0.0001	<0.0005	<0.01	<0.005	<0.0001
1,2-Dichloroethane	0.005	<0.00014	<0.00014	<0.0007	<0.00014	<0.00014	<0.0007	<0.007	<0.007	<0.028	<0.007	<0.00014	<0.0007	<0.014	<0.007	<0.00014
1,2-Dichloropropane	0.005	<0.00016	<0.00016	<0.0008	<0.00016	<0.00016	<0.0008	<0.008	<0.008	<0.032	<0.008	<0.00016	<0.0008	<0.016	<0.008	<0.00016
1,3,5-Trimethylbenzene	1.20	**0.00012 J**	<0.0001	**0.24**	<0.0001	<0.0001	**0.04**	**0.47**	**0.11**	**0.28**	**0.063**	**0.00035 J**	**0.059**	**0.23**	**0.093**	<0.0001
1,3-Dichlorobenzene	0.73	<0.00013	<0.00013	<0.00065	<0.00013	<0.00013	<0.00065	<0.0065	<0.0065	<0.026	<0.0065	<0.00013	<0.00065	<0.013	<0.0065	<0.00013
1,3-Dichloropropane	0.0091	<0.00022	<0.00022	<0.0011	<0.00022	<0.00022	<0.0011	<0.011	<0.011	<0.044	<0.011	<0.00022	<0.0011	<0.022	<0.011	<0.00022
1,4-Dichlorobenzene	0.075	<0.00011	<0.00011	<0.00055	<0.00011	<0.00011	<0.00055	<0.0055	<0.0055	<0.022	<0.0055	<0.00011	<0.00055	<0.011	<0.0055	<0.00011
2,2-Dichloropropane	0.013	<0.00013	<0.00013	<0.00065	<0.00013	<0.00013	<0.00065	<0.0065	<0.0065	<0.026	<0.0065	<0.00013	<0.00065	<0.013	<0.0065	<0.00013
2-Butanone (MEK)	15	<0.00076 J	<0.00076	<0.0038	<0.00076	<0.00076	<0.0038	<0.038	<0.038 J	<0.15 J	<0.038 J	<0.00076 J	<0.0038	<0.076	<0.038 J	<0.00076 J
2-Chlorotoluene	0.49	<0.00013	<0.00013	<0.00065	<0.00013	<0.00013	<0.00065	<0.0065	<0.0065	<0.026	<0.0065	<0.00013	<0.00065	<0.013	<0.0065	<0.00013
2-Hexanone	0.12	**0.051**	<0.00035	<0.0018	<0.00035	<0.00035 J	<0.0018	<0.018	<0.018	<0.07	<0.018	<0.00035	<0.0018	<0.035	<0.018	<0.00035
4-Chlorotoluene*	0.49	**0.00036 J**	<0.00014	<0.0007	<0.00014	<0.00014	<0.0007	<0.007	<0.007	<0.028	<0.007	<0.00014	<0.0007	<0.014	<0.007	<0.00014
4-Isopropyltoluene	2.4	**0.00022 J**	**0.00022 J**	**0.0081**	<0.0001	**0.00037 J**	**0.0016 J**	**0.0096 J**	<0.005	<0.02	<0.005	**0.00019 J**	**0.0024 J**	<0.01	<0.005	<0.0001
4-Methyl-2-pentanone (MIBK)	2	<0.00045	<0.00045 J	<0.0023	<0.00045 J	<0.00045	<0.0023	<0.023 J	<0.023	<0.09	<0.023	<0.00045	<0.0023 J	<0.045 J	<0.023	<0.00045
Acetone	22	<0.00099 J	<0.00099	<0.005	**0.004 J**	<0.00099	<0.005	<0.05 J	<0.05 J	<0.2 J	<0.05 J	<0.00099 J	<0.005 J	<0.099 J	<0.05 J	<0.00099 J
Benzene	0.005	**0.094**	**0.44**	**3.9**	<0.00008	**0.00037 J**	**1.2**	**22**	**11**	**24**	**15**	**0.36**	**1.3**	**22**	**5.5**	**0.000091 J**
Bromobenzene	0.20	<0.00019	<0.00019	<0.00095	<0.00019	<0.00019	<0.00095	<0.0095	<0.0095	<0.038	<0.0095	<0.00019	<0.00095	<0.019	<0.0095	<0.00019
Bromodichloromethane	0.015	<0.00016	<0.00016	<0.0008	<0.00016	<0.00016	<0.0008	<0.008	<0.008	<0.032	<0.008	<0.00016	<0.0008	<0.016	<0.008	<0.00016
Bromoform	0.12	<0.00019	<0.00019 J	<0.00095	<0.00019 J	<0.00019	<0.00095	<0.0095 J	<0.0095	<0.038	<0.0095	<0.00019	<0.00095 J	<0.019 J	<0.0095	<0.00019
Bromomethane	0.034	<0.00025	<0.00025	<0.0013	<0.00025	<0.00025	<0.0013	<0.013	<0.013	<0.05	<0.013	<0.00025	<0.0013	<0.025	<0.013	<0.00025
Carbon disulfide	2.4	<0.00024	<0.00024	<0.0012	<0.00024	**0.0014 J**	<0.0012	<0.012	<0.012	<0.048	<0.012	<0.00024	<0.0012	<0.024	<0.012	<0.00024
Carbon tetrachloride	0.005	<0.00015	<0.00015	<0.00075	<0.00015	<0.00015	<0.00075	<0.0075	<0.0075	<0.03	<0.0075	<0.00015	<0.00075	<0.015	<0.0075	<0.00015
Chlorobenzene	0.1	<0.00012	<0.00012	<0.0006	<0.00012	<0.00012	<0.0006	<0.006	<0.006	<0.024	<0.006	<0.00012	<0.0006	<0.012	<0.006	<0.00012
Chloroethane	9.8	<0.00008	<0.00008	<0.0004	<0.00008	<0.00008	<0.0004	<0.004	<0.004	<0.016	<0.004	<0.00008	<0.0004	<0.008	<0.004	<0.00008
Chloroform	0.24	<0.00013	<0.00013	<0.00065	<0.00013	<0.00013	<0.00065	**0.0086 J**	<0.0065	<0.026	<0.0065	<0.00013	<0.00065	<0.013	<0.0065	<0.00013
Chloromethane	0.07	<0.00018	<0.00018	<0.0009	<0.00018	<0.00018 J	<0.0009	<0.009	<0.009	<0.036	<0.009	<0.00018	<0.0009	<0.018	<0.009	<0.00018
cis-1,2-Dichloroethene	0.07	<0.00006	<0.00006	<0.0003	<0.00006	<0.00006	**0.0012 J**	<0.003	<0.003	<0.012	<0.003	<0.00006	<0.0003	<0.006	<0.003	<0.00006
cis-1,3-Dichloropropene	0.0017	<0.00018	<0.00018	<0.0009	<0.00018	<0.00018	<0.0009	<0.009	<0.009	<0.036	<0.009	<0.00018	<0.0009	<0.018	<0.009	<0.00018
Dibromochloromethane	0.011	<0.00015	<0.00015	<0.00075	<0.00015	<0.00015	<0.00075	<0.0075	<0.0075	<0.03	<0.0075	<0.00015	<0.00075	<0.015	<0.0075	<0.00015
Dibromomethane	0.12	<0.00052	<0.00052	<0.0026	<0.00052	<0.00052	<0.0026	<0.026	<0.026	<0.1	<0.026	<0.00052	<0.0026	<0.052	<0.026	<0.00052
Dichlorodifluoromethane	4.9	<0.00012	<0.00012 J	<0.0006	<0.00012 J	<0.00012	<0.0006	<0.006 J	<0.006	<0.024	<0.006	<0.00012	<0.0006 J	<0.012 J	<0.006	<0.00012
Ethylbenzene	0.7	**0.0022**	**0.0016**	**0.6**	<0.00011	**0.00033 J**	**0.24**	**1.3**	**0.95**	**1.2**	**0.34**	**0.00056 J**	**0.039**	**1.5**	**0.67**	<0.00011
Hexachlorobutadiene	0.012	<0.00017	<0.00017	<0.00085	<0.00017	<0.00017	<0.00085	<0.0085	<0.0085	<0.034	<0.0085	<0.00017	<0.00085	<0.017	<0.0085	<0.00017
Iodomethane	0.034	<0.00016	<0.00016	<0.00079	<0.00016	<0.00016	<0.00079	<0.0079	<0.0079	<0.032	<0.0079	**0.00028 J**	<0.00079	<0.016	<0.0079	<0.00016
Isopropylbenzene	2.4	**0.091**	**0.039**	**0.052**	**0.00038 J**	**0.013**	**0.023**	**0.051**	**0.034 J**	**0.057 J**	**0.012 J**	**0.012**	**0.015**	**0.073 J**	**0.031 J**	<0.00018
Methyl tert-butyl ether	0.24	**0.015 J-**	**0.0031 J-**	<0.0006	**0.00016 J**	**0.099 J-**	<0.0006	<0.006 J	<0.006 J	<0.024 J	**0.021 J**	**0.00046 J**	<0.0006 J	**0.012 J**	**0.075 J-**	**0.0025 J-**
Methylene Chloride	0.005	<0.00015 J	<0.00015 J	<0.00075	<0.00015 J	<0.00015	<0.00075	<0.0075 J	<0.0075 J	<0.03 J	<0.0075 J	<0.00015 J	<0.00075 J	<0.015 J	<0.0075 J	<0.00015 J
Naphthalene	0.49	**0.0018 J**	**0.0014 J**	**0.2 J-**	<0.00032	**0.018 J+**	**0.13 J-**	**0.37**	**0.11 J-**	**0.22 J**	**0.048 J**	**0.0022 J-**	**0.075**	**0.26**	**0.17 J-**	<0.00032
n-Butylbenzene	1.2	**0.0066**	**0.0048**	**0.02**	<0.00016	**0.0046**	**0.0044 J**	**0.022 J**	**0.015 J**	<0.032	<0.008	**0.00094 J**	**0.0082**	<0.016	**0.009 J**	<0.00016
N-Propylbenzene	1.0	**0.12**	**0.05**	**0.073**	<0.00015	**0.015**	**0.033**	**0.076**	**0.081**	**0.083 J**	**0.024 J**	**0.015**	**0.032**	**0.091 J**	**0.057**	<0.00015
sec-Butylbenzene	0.98	**0.0076**	**0.005**	**0.0076**	<0.00012	**0.0044**	**0.0026 J**	<0.006	<0.006	<0.024	<0.006	**0.0009 J**	**0.0027 J**	<0.012	<0.006	<0.00012
Styrene	0.10	<0.00007	<0.00007	<0.00035	<0.00007	<0.00007	<0.00035	**0.0036 J**	<0.0035	<0.014	<0.0035	<0.00007	<0.00035	<0.007	<0.0035	<0.00007
tert-Butylbenzene	0.98	**0.0019**	**0.0011**	**0.0013 J**	<0.00008	**0.0018**	**0.0005 J**	<0.004	<0.004	<0.016	**0.027 J**	**0.00028 J**	**0.00052 J**	<0.008	<0.004	<0.00008
Tetrachloroethene	0.005	<0.00013	<0.00013	<0.00065	<0.00013	<0.00013	<0.00065	<0.0065	<0.0065	<0.026	<0.0065	<0.00013	<0.00065	<0.013	<0.0065	<0.00013
Toluene	1	**0.0071**	**0.0059**	**0.0066**	<0.00015	**0.00032 J**	**0.012**	**0.058**	**0.17**	**29**	**0.028 J**	**0.0026**	**0.0062**	**0.43**	**0.038 J**	<0.00015
trans-1,2-Dichloroethene	0.1	<0.00009	<0.00009	<0.00045	<0.00009	<0.00009	<0.00045	<0.0045	<0.0045	<0.018	<0.0045	<0.00009	<0.00045	<0.009	<0.0045	<0.00009
trans-1,3-Dichloropropene	0.0091	<0.00021	<0.00021	<0.0011	<0.00021	<0.00021	<0.0011	<0.011	<0.011	<0.042	<0.011	<0.00021	<0.0011	<0.021	<0.011	<0.00021
Trichloroethene	0.005	<0.00018	<0.00018	<0.0009	<0.00018	<0.00018	<0.0009	<0.009	<0.009	<0.036	<0.009	<0.00018	<0.0009	<0.018	<0.009	<0.00018
Trichlorofluoromethane	7.3	<0.00008	<0.00008	<0.0004	<0.00008	<0.00008	<0.0004	<0.004	<0.004	<0.016	<0.004	<0.00008	<0.0004	<0.008	<0.004	<0.00008
Vinyl chloride	0.002	<0.00011	<0.00011	<0.00055	<0.00011	<0.00011	<0.00055	<0.0055	<0.0055	<0.022	<0.0055	<0.00011	<0.00055	<0.011	<0.0055	<0.00011
Xylenes, Total	10	**0.0089**	**0.0048**	**2.1**	<0.00026	**0.0027**	**0.38**	**6.2**	**1.3**	**10**	**1.4**	**0.0027**	**0.13**	**3.7**	**0.89**	<0.00026

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. J = Estimated value.

TABLE 28
ON-SITE GROUNDWATER SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS MAY 2015
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		Tropicana Energy - Existing deep wells, screen interval through shallow zone to base of alluvium						R&H Oil								Tropicana Energy		
Sample Location:	Extent	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-23	MW-24	MW-18	MW-19	MW-20
Sample Date:	Evaluation Value	5/4/2015	5/4/2015	5/6/2015	5/4/2015	5/6/2015	5/6/2015	5/4/2015	5/6/2015	5/6/2015	5/6/2015	5/6/2015	5/4/2015	5/6/2015	5/6/2015	5/4/2015	5/6/2015	5/4/2015
Screen Interval (ft bgs):		10-40	11-42	10-48	10-44	10.5-43	10-54.5	10-25	10-25	10-25	10-25	10-25	10-25	10-25	10-30	10-25	10-25	10-30
Constituent	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1,1,1,2-Tetrachloroethane	0.035	<0.001	<0.00042	<0.0042	<0.00042	<0.00063	<0.0063	<0.042	<0.021	<0.042	<0.042	<0.00063	<0.0021	<0.021	<0.01	<0.042	<0.01	<0.00021
1,1,1-Trichloroethane	0.20	<0.0015	<0.0006	<0.006	<0.0006	<0.0009	<0.009	<0.06	<0.03	<0.06	<0.06	<0.0009	<0.003	<0.03	<0.015	<0.06	<0.015	<0.0003
1,1,2,2-Tetrachloroethane	0.0046	<0.00095	<0.00038	<0.0038	<0.00038	<0.00057	<0.0057	<0.038	<0.019	<0.038	<0.038	<0.00057	<0.0019	<0.019	<0.0095	<0.038	<0.0095	<0.00019
1,1,2-Trichloroethane	0.005	<0.00087	<0.00035	<0.0035	<0.00035	<0.00052	<0.0052	<0.035	<0.017	<0.035	<0.035	<0.00052	<0.0017	<0.017	<0.0087	<0.035	<0.0087	<0.00017
1,1-Dichloroethane	4.9	<0.00084	<0.00034	<0.0034	<0.00034	<0.0005	<0.005	<0.034	<0.017	<0.034	<0.034	<0.0005	<0.0017	<0.017	<0.0084	<0.034	<0.0084	<0.00017
1,1-Dichloroethene	0.007	<0.0015	<0.0006	<0.006	<0.0006	<0.0009	<0.009	<0.06	<0.03	<0.06	<0.06	<0.0009	<0.003	<0.03	<0.015	<0.06	<0.015	<0.0003
1,1-Dichloropropene	0.0091	<0.00093	<0.00037	<0.0037	<0.00037	<0.00056	<0.0056	<0.037	<0.019	<0.037	<0.037	<0.00056	<0.0019	<0.019	<0.0093	<0.037	<0.0093	<0.00019
1,2,3-Trichloropropane	0.00003	<0.00096	<0.00038	<0.0038	<0.00038	<0.00057	<0.0057	<0.038	<0.019	<0.038	<0.038	<0.00057	<0.0019	<0.019	<0.0096	<0.038	<0.0096	<0.00019
1,2,4-Trichlorobenzene	0.07	<0.00084	<0.00034	<0.0034	<0.00034	<0.0005	<0.005	<0.034	<0.017	<0.034	<0.034	<0.0005	<0.0017	<0.017	<0.0084	<0.034	<0.0084	<0.00017
1,2,4-Trimethylbenzene	1.2	<0.001	<0.0004	**0.3**	<0.0004	**0.0013 J**	**0.31**	**0.69**	**0.34**	**0.87**	**0.36 J**	<0.0006	**0.17**	**0.39**	**0.66**	**0.45**	**0.42**	<0.0002
1,2-Dibromo-3-Chloropropane	0.0002	<0.0017	<0.0007	<0.007 J	<0.0007	<0.001 J	<0.01 J	<0.07	<0.035 J	<0.07 J	<0.07 J	<0.001 J	<0.0035	<0.035 J	<0.017 J	<0.07	<0.017	<0.00035 J
1,2-Dibromoethane	0.00005	<0.00088	<0.00035	<0.0035	<0.00035	<0.00053	<0.0053	<0.035	<0.018	<0.035	<0.035	<0.00053	<0.0018	<0.018	<0.0088	<0.035	<0.0088	<0.00018
1,2-Dichlorobenzene	0.60	<0.00085	<0.00034	<0.0034	<0.00034	<0.00051	<0.0051	<0.034	<0.017	<0.034	<0.034	<0.00051	<0.0017	<0.017	<0.0085	<0.034	<0.0085	<0.00017
1,2-Dichloroethane	0.005	<0.00086	<0.00034	<0.0034	<0.00034	<0.00052	<0.0052	<0.034	<0.017	<0.034	<0.034	<0.00052	<0.0017	<0.017	<0.0086	<0.034	<0.0086	<0.00017
1,2-Dichloropropane	0.005	<0.00087	<0.00035	<0.0035	<0.00035	<0.00052	<0.0052	<0.035	<0.017	<0.035	<0.035	<0.00052	<0.0017	<0.017	<0.0087	<0.035	<0.0087	<0.00017
1,3,5-Trimethylbenzene	1.20	<0.001	<0.0004	**0.12**	<0.0004	<0.0006	**0.09**	**0.31 J**	**0.072 J**	**0.35 J**	**0.13 J**	<0.0006	**0.048**	**0.14 J**	**0.23**	**0.14 J**	**0.11**	<0.0002
1,3-Dichlorobenzene	0.73	<0.00064	<0.00026	<0.0026	<0.00026	<0.00038	<0.0038	<0.026	<0.013	<0.026	<0.026	<0.00038	<0.0013	<0.013	<0.0064	<0.026	<0.0064	<0.00013
1,3-Dichloropropane	0.0091	<0.00073	<0.00029	<0.0029	<0.00029	<0.00044	<0.0044	<0.029	<0.015	<0.029	<0.029	<0.00044	<0.0015	<0.015	<0.0073	<0.029	<0.0073	<0.00015
1,4-Dichlorobenzene	0.075	<0.001	<0.0004	<0.004	<0.0004	<0.0006	<0.006	<0.04	<0.02	<0.04	<0.04	<0.0006	<0.002	<0.02	<0.01	<0.04	<0.01	<0.0002
2,2-Dichloropropane	0.013	<0.0017	<0.00067	<0.0067	<0.00067	<0.001	<0.01	<0.067	<0.034	<0.067	<0.067	<0.001	<0.0034	<0.034	<0.017	<0.067	<0.017	<0.00034
2-Butanone (MEK)	15	<0.005	<0.002	<0.02 J	<0.002	<0.003 J	<0.03 J	<0.2	<0.1 J	<0.2 J	<0.2 J	<0.003 J	<0.01	<0.1 J	<0.05 J	<0.2	<0.05	<0.001 J
2-Chlorotoluene	0.49	<0.00078	<0.00031	<0.0031	<0.00031	<0.00047	<0.0047	<0.031	<0.016	<0.031	<0.031	<0.00047	<0.0016	<0.016	<0.0078	<0.031	<0.0078	<0.00016
2-Hexanone	0.12	<0.0025	<0.001	<0.01	<0.001	<0.0015	<0.015	<0.1	<0.05	<0.1	<0.1	<0.0015	<0.005	<0.05	<0.025	<0.1	<0.025	<0.0005
4-Chlorotoluene*	0.49	<0.0012	<0.00048	<0.0048	<0.00048	<0.00073	<0.0073	<0.048	<0.024	<0.048	<0.048	<0.00073	<0.0024	<0.024	<0.012	<0.048	<0.012	<0.00024
4-Isopropyltoluene	2.4	<0.00075	<0.0003	<0.003	<0.0003	<0.00045	<0.0045	<0.03	<0.015	<0.03	<0.03	<0.00045	**0.0021 J**	<0.015	<0.0075	<0.03	<0.0075	<0.00015
4-Methyl-2-pentanone (MIBK)	2	<0.0026	<0.001	<0.01	<0.001	<0.0015	<0.015	<0.1	<0.051	<0.1	<0.1	<0.0015	<0.0051	<0.051	<0.026	<0.1	<0.026	<0.00051
Acetone	22	<0.025	<0.01	**0.14 J**	<0.01	<0.015 J	**0.24 J**	<1	<0.5 J	<1 J	<1 J	**0.026 J**	<0.05	**0.54 J**	**0.4 J**	<1	<0.25	<0.005 J
Benzene	0.005	**0.057**	<0.00066	**1.6**	<0.00066	**0.0017 J**	**3.1**	**17**	**15**	**27**	**16**	**0.18**	**0.69**	**7.4**	**6.2**	**22**	**6.4**	<0.00033
Bromobenzene	0.20	<0.00064	<0.00026	<0.0026	<0.00026	<0.00038	<0.0038	<0.026	<0.013	<0.026	<0.026	<0.00038	<0.0013	<0.013	<0.0064	<0.026	<0.0064	<0.00013
Bromodichloromethane	0.015	<0.00088	<0.00035	<0.0035	<0.00035	<0.00053	<0.0053	<0.035	<0.018	<0.035	<0.035	<0.00053	<0.0018	<0.018	<0.0088	<0.035	<0.0088	<0.00018
Bromoform	0.12	<0.0025	<0.001	<0.01	<0.001	<0.0015	<0.015	<0.1	<0.05	<0.1	<0.1	<0.0015	<0.005	<0.05	<0.025	<0.1	<0.025	<0.0005
Bromomethane	0.034	<0.002	<0.00078	<0.0078	<0.00078	<0.0012	<0.012	<0.078	<0.039	<0.078	<0.078	<0.0012	<0.0039	<0.039	<0.02	<0.078	<0.02	<0.00039
Carbon disulfide	2.4	<0.0025	<0.001	<0.01	<0.001	<0.0015	<0.015	<0.1	<0.05	<0.1	<0.1	<0.0015	<0.005	<0.05	<0.025	<0.1	<0.025	<0.0005
Carbon tetrachloride	0.005	<0.0013	<0.0005	<0.005	<0.0005	<0.00075	<0.0075	<0.05	<0.025	<0.05	<0.05	<0.00075	<0.0025	<0.025	<0.013	<0.05	<0.013	<0.00025
Chlorobenzene	0.1	<0.00068	<0.00027	<0.0027	<0.00027	<0.00041	<0.0041	<0.027	<0.014	<0.027	<0.027	<0.00041	<0.0014	<0.014	<0.0068	<0.027	<0.0068	<0.00014
Chloroethane	9.8	<0.002	<0.0008	<0.008	<0.0008	<0.0012	<0.012	<0.08	<0.04	<0.08	<0.08	<0.0012	<0.004	<0.04	<0.02	<0.08	<0.02	<0.0004
Chloroform	0.24	<0.00087	<0.00035	<0.0035	<0.00035	<0.00052	<0.0052	<0.035	<0.017	<0.035	<0.035	<0.00052	<0.0017	<0.017	<0.0087	<0.035	<0.0087	<0.00017
Chloromethane	0.07	<0.002	<0.00078 J	<0.0078	<0.00078 J	<0.0012	<0.012	<0.078 J	<0.039	<0.078	<0.078	<0.0012	<0.0039 J	<0.039	<0.02	<0.078	<0.02	<0.00039
cis-1,2-Dichloroethene	0.07	<0.00061	<0.00024	<0.0024	<0.00024	<0.00036	<0.0036	<0.024	<0.012	<0.024	<0.024	<0.00036	<0.0012	<0.012	<0.0061	<0.024	<0.0061	<0.00012
cis-1,3-Dichloropropene	0.0017	<0.00073	<0.00029	<0.0029	<0.00029	<0.00044	<0.0044	<0.029	<0.015	<0.029	<0.029	<0.00044	<0.0015	<0.015	<0.0073	<0.029	<0.0073	<0.00015
Dibromochloromethane	0.011	<0.0011	<0.00045	<0.0045	<0.00045	<0.00067	<0.0067	<0.045	<0.022	<0.045	<0.045	<0.00067	<0.0022	<0.022	<0.011	<0.045	<0.011	<0.00022
Dibromomethane	0.12	<0.00083	<0.00033	<0.0033	<0.00033	<0.0005	<0.005	<0.033	<0.017	<0.033	<0.033	<0.0005	<0.0017	<0.017	<0.0083	<0.033	<0.0083	<0.00017
Dichlorodifluoromethane	4.9	<0.0021 J	<0.00086 J	<0.0086 J	<0.00086 J	<0.0013 J	<0.013 J	<0.086 J	<0.043 J	<0.086 J	<0.086 J	<0.0013 J	<0.0043 J	<0.043 J	<0.021 J	<0.086	<0.021	<0.00043
Ethylbenzene	0.7	<0.001	<0.0004	**0.28**	<0.0004	<0.0006	**0.45**	**1**	**0.7**	**1.3**	**0.64**	<0.0006	**0.034**	**0.55**	**0.54**	**1.1**	**0.79**	<0.0002
Hexachlorobutadiene	0.012	<0.0043 J	<0.0017 J	<0.017 J	<0.0017 J	<0.0026 J	<0.026 J	<0.17 J	<0.086 J	<0.17 J	<0.17 J	<0.0026 J	<0.0086 J	<0.086 J	<0.043 J	<0.17 J	<0.043	<0.00086
Iodomethane	0.034	<0.0011	<0.00045	<0.0045	<0.00045	<0.00067	<0.0067	<0.045	<0.022	<0.045	<0.045	<0.00067	<0.0022	<0.022	<0.011	<0.045	<0.011	<0.00022
Isopropylbenzene	2.4	**0.034**	**0.0097 J**	**0.026 J**	<0.0004	**0.012 J**	**0.052 J**	<0.04	<0.02	<0.04	<0.04	**0.0059 J**	**0.017 J**	**0.028 J**	**0.062 J**	<0.04	**0.034 J**	<0.0002
Methyl tert-butyl ether	0.24	**0.015**	**0.0074**	<0.004	<0.0004	**0.015**	<0.006	<0.04	<0.02	<0.04	**0.058 J**	<0.0006	<0.002	<0.02	<0.01	<0.04	**0.072**	**0.0022**
Methylene Chloride	0.005	<0.01	<0.004	<0.04	<0.004	<0.006	<0.06	<0.4	<0.2	<0.4	<0.4	<0.006	<0.02	<0.2	<0.1	<0.4	<0.1	<0.002
Naphthalene	0.49	<0.001 J	<0.0004 J	**0.096 J**	<0.0004 J	**0.0042 J**	**0.23**	**0.39 J**	**0.083 J**	**0.36 J**	**0.11 J**	<0.0006	**0.075 J-**	**0.064 J**	**0.19 J**	**0.15 J**	**0.24 J**	<0.0002 J
n-Butylbenzene	1.2	<0.001	<0.0004	<0.004	<0.0004	<0.0006	<0.006	<0.04	<0.02	<0.04	<0.04	<0.0006	<0.002	<0.02	<0.01	<0.04	<0.01	<0.0002
N-Propylbenzene	1.0	**0.044**	**0.01**	**0.035**	<0.00021	**0.014**	**0.076**	**0.064 J**	**0.046 J**	**0.087 J**	<0.021	**0.0073**	**0.032**	**0.074 J**	**0.11**	<0.021	**0.059**	<0.00011
sec-Butylbenzene	0.98	**0.0045 J**	<0.0006	<0.006	<0.0006	<0.0009	<0.009	<0.06	<0.03	<0.06	<0.06	<0.0009	<0.003	<0.03	<0.015	<0.06	<0.015	<0.0003
Styrene	0.10	<0.001	<0.0004	<0.004	<0.0004	<0.0006	<0.006	<0.04	<0.02	<0.04	<0.04	<0.0006	<0.002	<0.02	<0.01	<0.04	<0.01	<0.0002
tert-Butylbenzene	0.98	**0.0011 J**	**0.00054 J**	<0.004	<0.0004	**0.0015 J**	<0.006	<0.04	<0.02	<0.04	<0.04	<0.0006	<0.002	<0.02	<0.01	<0.04	<0.01	<0.0002
Tetrachloroethene	0.005	<0.00095	<0.00038	<0.0038	<0.00038	<0.00057	<0.0057	<0.038	<0.019	<0.038	<0.038	<0.00057	<0.0019	<0.019	<0.0095	<0.038	<0.0095	<0.00019
Toluene	1	**0.0035 J**	<0.00099	<0.0099	<0.00099	<0.0015	**0.022 J**	<0.099	**0.3**	**28**	<0.099	**0.0018 J**	**0.0074 J**	**0.061 J**	<0.025	**0.73**	**0.037 J**	<0.0005
trans-1,2-Dichloroethene	0.1	<0.001	<0.0004	<0.004	<0.0004	<0.0006	<0.006	<0.04	<0.02	<0.04	<0.04	<0.0006	<0.002	<0.02	<0.01	<0.04	<0.01	<0.0002
trans-1,3-Dichloropropene	0.0091	<0.001	<0.0004	<0.004	<0.0004	<0.0006	<0.006	<0.04	<0.02	<0.04	<0.04	<0.0006	<0.002	<0.02	<0.01	<0.04	<0.01	<0.0002
Trichloroethene	0.005	<0.0016	<0.00063	<0.0063	<0.00063	<0.00095	<0.0095	<0.063	<0.032	<0.063	<0.063	<0.00095	<0.0032	<0.032	<0.016	<0.063	<0.016	<0.00032
Trichlorofluoromethane	7.3	<0.0012	<0.00049	<0.0049 J	<0.00049	<0.00073 J	<0.0073 J	<0.049	<0.024 J	<0.049 J	<0.049 J	<0.00073 J	<0.0024	<0.024 J	<0.012 J	<0.049	<0.012	<0.00024
Vinyl chloride	0.002	<0.0015	<0.0006	<0.006	<0.0006	<0.0009	<0.009	<0.06	<0.03	<0.06	<0.06	<0.0009	<0.003	<0.03	<0.015	<0.06	<0.015	<0.0003
Xylenes, Total	10	**0.0024 J**	**0.00056 J**	**1.6**	<0.00045	**0.0014 J**	**0.62**	**4.7**	**0.93**	**11**	**2.1**	<0.00068	**0.13**	**1.2**	**2.1**	**2.1**	**0.91**	<0.00023

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. J = Estimated value.

TABLE 29
ON-SITE/OFF-SITE GROUNDWATER SAMPLING RESULTS: DECEMBER 2015
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		Offsite Wells			Onsite Wells	
Sample Location:	Extent	MW-25	MW-28	MW-29	MW-6	MW-30
Sample Date:	Evaluation Value	12/10/2015	12/10/2015	12/10/2015	12/10/2015	12/10/2015
Screen Interval (ft bgs):		10-25	10-30	10-25	10-54.5	10-25
Constituent	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1,1,1,2-Tetrachloroethane	0.035	<0.0036	<0.00018	<0.00018	<0.0036	<0.00018
1,1,1-Trichloroethane	0.20	<0.0042	<0.00021	<0.00021	<0.0042	<0.00021
1,1,2,2-Tetrachloroethane	0.0046	<0.0039	<0.0002	<0.0002	<0.0039	<0.0002
1,1,2-Trichloroethane	0.005	<0.0042	<0.00021	<0.00021	<0.0042	<0.00021
1,1-Dichloroethane	4.9	<0.0034	<0.00017	<0.00017	<0.0034	**0.00087 J**
1,1-Dichloroethene	0.007	<0.0038	<0.00019	<0.00019	<0.0038	<0.00019
1,1-Dichloropropene	0.0091	<0.0038	<0.00019	<0.00019	<0.0038	<0.00019
1,2,3-Trichloropropane	0.00003	<0.0058	<0.00029	<0.00029	<0.0058	<0.00029
1,2,4-Trichlorobenzene	0.07	<0.0035	<0.00018	<0.00018	<0.0035	<0.00018
1,2,4-Trimethylbenzene	1.2	**0.71**	<0.00022	<0.00022	**0.075**	**0.55**
1,2-Dibromo-3-Chloropropane	0.0002	<0.016	<0.00081	<0.00081	<0.016	<0.00081
1,2-Dibromoethane	0.00005	<0.0022	<0.00011	<0.00011	<0.0022	<0.00011
1,2-Dichlorobenzene	0.60	<0.0031	<0.00015	<0.00015	<0.0031	<0.00015
1,2-Dichloroethane	0.005	<0.0023	<0.00012	<0.00012	<0.0023	<0.00012
1,2-Dichloropropane	0.005	<0.0027	<0.00014	<0.00014	<0.0027	<0.00014
1,3,5-Trimethylbenzene	1.20	**0.34**	<0.00021	<0.00021	**0.021**	**0.17**
1,3-Dichlorobenzene	0.73	<0.0042	<0.00021	<0.00021	<0.0042	<0.00021
1,3-Dichloropropane	0.0091	<0.0044	<0.00022	<0.00022	<0.0044	<0.00022
1,4-Dichlorobenzene	0.075	<0.0035	<0.00018	<0.00018	<0.0035	<0.00018
2,2-Dichloropropane	0.013	<0.0052	<0.00026	<0.00026	<0.0052	<0.00026
2-Butanone (MEK)	15	<0.015	<0.00076	<0.00076	<0.015	**0.00097 J**
2-Chlorotoluene	0.49	<0.0045	<0.00023	<0.00023	<0.0045	<0.00023
2-Hexanone	0.12	<0.0053	<0.00027	<0.00027	<0.0053	<0.00027
4-Chlorotoluene*	0.49	<0.0042	<0.00021	<0.00021	<0.0042	<0.00021
4-Isopropyltoluene	2.4	**0.0071 J**	<0.00023	<0.00023	<0.0046	**0.0053**
4-Methyl-2-pentanone (MIBK)	2	<0.007	<0.00035	<0.00035	<0.007	<0.00035
Acetone	22	<0.0089	<0.00045	<0.00045	<0.0089	<0.00045
Benzene	0.005	**14**	**0.00089 J**	<0.00018	**0.37**	**5.3**
Bromobenzene	0.20	<0.0039	<0.0002	<0.0002	<0.0039	<0.0002
Bromodichloromethane	0.015	<0.0031	<0.00015	<0.00015	<0.0031	<0.00015
Bromoform	0.12	<0.003	<0.00015	<0.00015	<0.003	<0.00015
Bromomethane	0.034	<0.005	<0.00025	<0.00025	<0.005	<0.00025
Carbon disulfide	2.4	<0.0043 J	<0.00022 J	<0.00022 J	<0.0043 J	<0.00022
Carbon tetrachloride	0.005	<0.0037	<0.00018	<0.00018	<0.0037	<0.00018
Chlorobenzene	0.1	<0.0037	<0.00019	<0.00019	<0.0037	<0.00019
Chloroethane	9.8	<0.0048	<0.00024	<0.00024	<0.0048	<0.00024
Chloroform	0.24	<0.003	**0.00034 J**	<0.00015	<0.003	<0.00015
Chloromethane	0.07	<0.0042	<0.00021	<0.00021	<0.0042	<0.00021
cis-1,2-Dichloroethene	0.07	<0.0031	**0.00024 J**	**0.00092 J**	<0.0031	<0.00016
cis-1,3-Dichloropropene	0.0017	<0.0032	<0.00016	<0.00016	<0.0032	<0.00016
Dibromochloromethane	0.011	<0.0024	<0.00012	<0.00012	<0.0024	<0.00012
Dibromomethane	0.12	<0.01	<0.00052	<0.00052	<0.01	<0.00052
Dichlorodifluoromethane	4.9	<0.017	<0.00086	<0.00086	<0.017	<0.00086
Ethylbenzene	0.7	**2**	<0.00021	<0.00021	**0.13**	**0.72**
Hexachlorobutadiene	0.012	<0.0043	<0.00022	<0.00022	<0.0043	<0.00022
Iodomethane	0.034	<0.0032	<0.00016	<0.00016	<0.0032	<0.00016
Isopropylbenzene	2.4	**0.072**	<0.00024	<0.00024	**0.021**	**0.04**
Methyl tert-butyl ether	0.24	<0.0021	<0.00011	<0.00011	<0.0021	<0.00011
Methylene Chloride	0.005	<0.0035 J	<0.00018 J	<0.00018 J	<0.0035 J	<0.00018 J
Naphthalene	0.49	**0.54**	**0.0014 J**	**0.00036 J**	**0.14**	**0.18**
n-Butylbenzene	1.2	**0.024**	**0.00022 J**	<0.00021	**0.0043 J**	**0.013**
N-Propylbenzene	1.0	**0.13**	<0.00023	<0.00023	**0.032**	**0.056**
sec-Butylbenzene	0.98	<0.0045	<0.00022	<0.00022	<0.0045	<0.00022
Styrene	0.10	<0.0035	<0.00018	<0.00018	<0.0035	**0.00067 J**
tert-Butylbenzene	0.98	<0.0043	<0.00022	<0.00022	<0.0043	**0.00083 J**
Tetrachloroethene	0.005	<0.0067	**0.00051 J**	**0.0015**	<0.0067	<0.00033
Toluene	1	**0.014 J**	<0.0002	<0.0002	<0.004	**0.11**
trans-1,2-Dichloroethene	0.1	<0.0038	<0.00019	<0.00019	<0.0038	<0.00019
trans-1,3-Dichloropropene	0.0091	<0.0027	<0.00014	<0.00014	<0.0027	<0.00014
Trichloroethene	0.005	<0.0028	**0.00068 J**	**0.0014**	<0.0028	<0.00014
Trichlorofluoromethane	7.3	<0.0049	<0.00024	<0.00024	<0.0049	<0.00024
Vinyl chloride	0.002	<0.005	<0.00025	<0.00025	<0.005	<0.00025
Xylenes, Total	10	**1.8**	<0.00037	<0.00037	**0.15**	**2.7**

NOTES:
1. All units are mg/L.
2. Detected compounds are presented in **bold** type.
3. Extent Evaluation Values are provided on Table 3.
4. Shading = Detected compound exceeds the Extent Evaluation Value.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. J = Estimated value.

TABLE 30
OFF-SITE GROUNDWATER SAMPLING RESULTS - FEBRUARY 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:	Extent Evaluation	MW-7	MW-8	MW-9	MW-10	MW-11
Sample Date:	Comparison	2/2/2011	2/2/2011	2/2/2011	2/2/2011	2/2/2011
Screen Interval (ft bgs):	Value	30-45	30-45	25-40	23-38	25-40
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Total Petroleum Hydrocarbons by TCEQ Method TX1005						
C6-C12	0.98	<0.36	<0.36	<0.36	<0.36	<0.36
>C12-C28	0.98	<0.31	<0.31	<0.31	<0.31	<0.31
>C28-C35	0.98	<0.55	<0.55	<0.55	<0.55	<0.54
C6-C35	0.98	<0.55	<0.55	<0.55	<0.55	<0.54
Dissolved Metals by US EPA Method 6010B/7471A						
Aluminum	24	**0.46J**	**0.38J**	<0.094	<0.046	**0.54**
Arsenic	0.01	<0.0033	<0.0033	<0.0033	<0.0033	<0.0033
Barium	2	**0.14**	**0.21**	**0.14**	**0.13**	**0.25**
Chromium	0.1	**0.0028J**	**0.0022J**	**0.0019J**	**0.0019J**	**0.0025J**
Cobalt	0.24	**0.0017J**	**0.0029J**	**0.00070J**	**0.0014J**	**0.0041J**
Copper	1.3	<0.0014	<0.0014	**0.0024J**	<0.0014	<0.0014
Lead	0.015	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029
Manganese	3.4	**0.23**	**0.3**	**0.1**	**0.14**	**0.53**
Mercury	0.002	<0.000021	<0.000021	<0.000021	<0.000021	<0.000021
Nickel	0.49	**0.0033J**	**0.0027J**	**0.0028J**	**0.0034J**	**0.0088J**
Selenium	0.05	<0.0042	<0.0042	<0.0042	<0.0042	**0.0048J**
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.44	**0.0053J**	**0.0028J**	**0.0061J**	**0.0041J**	**0.0028J**
Zinc	7.33	**0.0022J**	<0.0022	**0.0025J**	<0.0022	**0.0038J**
Total Metals by US EPA Method 6010B/7471A						
Aluminum	24	**2.1**	**0.76**	<0.064	**0.78**	**0.82**
Arsenic	0.01	<0.0033	<0.0033	<0.0033	<0.0033	<0.0033
Barium	2	**0.14**	**0.21**	**0.13**	**0.13**	**0.23**
Chromium	0.1	**0.0051J**	**0.0032J**	**0.0022J**	**0.0034J**	**0.0036J**
Cobalt	0.24	**0.0023J**	**0.0026J**	<0.00063	**0.0016J**	**0.0043J**
Copper	1.3	<0.0014	**0.0014J**	<0.0014	<0.0014	<0.0014
Lead	0.015	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029
Manganese	3.4	**0.25**	**0.31**	**0.069**	**0.13**	**0.5**
Mercury	0.002	<0.000021	<0.000021	<0.000021	<0.000021	<0.000021
Nickel	0.49	**0.0033J**	**0.0025J**	**0.0019J**	**0.0028J**	**0.0080J**
Selenium	0.05	<0.0042	<0.0042	<0.0042	**0.0044J**	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.44	**0.0093J**	**0.0034J**	**0.0066J**	**0.0059J**	**0.0045J**
Zinc	7.33	**0.0098J**	**0.0024J**	<0.0022	<0.0022	**0.0024J**

TABLE 30
OFF-SITE GROUNDWATER SAMPLING RESULTS - FEBRUARY 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:	Extent Evaluation	MW-7	MW-8	MW-9	MW-10	MW-11
Sample Date:	Comparison	2/2/2011	2/2/2011	2/2/2011	2/2/2011	2/2/2011
Screen Interval (ft bgs):	Value	30-45	30-45	25-40	23-38	25-40
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Volatile Organic Compounds (VOCs) by US EPA Method 8260B						
1,1,1,2-Tetrachloroethane	0.035	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,1,1-Trichloroethane	0.20	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
1,1,2,2-Tetrachloroethane	0.0046	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
1,1,2-Trichloroethane	0.005	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028
1,1-Dichloroethane	4.9	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
1,1-Dichloroethene	0.007	<0.00019	<0.00019	<0.00019	**0.0018**	<0.00019
1,1-Dichloropropene	0.0091	<0.00021J	<0.00021J	<0.00021J	<0.00021J	<0.00021J
1,2,3-Trichloropropane	0.00003	<0.00029	<0.00029	<0.00029	<0.00029	<0.00029
1,2,4-Trichlorobenzene	0.07	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031
1,2,4-Trimethylbenzene	1.2	<0.00014	**0.00015J**	<0.00014	**0.00017J**	<0.00014
1,2-Dibromo-3-Chloropropane	0.0002	<0.00081	<0.00081	<0.00081	<0.00081	<0.00081
1,2-Dibromoethane	0.00005	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,2-Dichlorobenzene	0.60	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,2-Dichloroethane	0.005	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
1,2-Dichloropropane	0.005	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
1,3,5-Trimethylbenzene	1.20	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,3-Dichlorobenzene	0.73	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
1,3-Dichloropropane	0.0091	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
1,4-Dichlorobenzene	0.075	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
2,2-Dichloropropane	0.013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Butanone (MEK)	15	<0.00076	<0.00076	<0.00076	<0.00076	<0.00076
2-Chlorotoluene	0.49	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Hexanone	0.12	<0.00035	<0.00035	<0.00035	**0.0016J**	<0.00035
4-Chlorotoluene	0.49	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
4-Isopropyltoluene	2.4	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
4-Methyl-2-pentanone (MIBK)	2	<0.00045	<0.00045	<0.00045	0.0034	<0.00045
Acetone	22	<0.00099	<0.00099	<0.00099	<0.0037	<0.00099
Benzene	0.005	**0.00027J**	**0.00051J**	<0.00008	**0.00013J**	**0.00051J**
Bromobenzene	0.20	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromodichloromethane	0.015	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Bromoform	0.12	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromomethane	0.034	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
Carbon disulfide	2.4	<0.00024	<0.00039	<0.00046	<0.00072	<0.00042
Carbon tetrachloride	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Chlorobenzene	0.1	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Chloroethane	9.8	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Chloroform	0.24	**0.00017J**	**0.00034J**	**0.0007J**	**0.00036J**	**0.00041J**
Chloromethane	0.07	<0.00018J	<0.00018J	<0.00018J	<0.00018J	<0.00018J
cis-1,2-Dichloroethene	0.07	**0.0017**	**0.0018**	**0.002**	**0.0024**	**0.0023**
cis-1,3-Dichloropropene	0.0017	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Dibromochloromethane	0.011	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Dibromomethane	0.12	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052
Dichlorodifluoromethane	4.9	<0.00012J	<0.00012J	<0.00012J	<0.00012J	<0.00012J
Ethylbenzene	0.7	<0.00011	**0.00018J**	<0.00011	<0.00011	<0.00011
Hexachlorobutadiene	0.012	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

TABLE 30
OFF-SITE GROUNDWATER SAMPLING RESULTS - FEBRUARY 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:	Extent Evaluation	MW-7	MW-8	MW-9	MW-10	MW-11
Sample Date:	Comparison	2/2/2011	2/2/2011	2/2/2011	2/2/2011	2/2/2011
Screen Interval (ft bgs):	Value	30-45	30-45	25-40	23-38	25-40
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Volatile Organic Compounds (VOCs) by US EPA Method 8260B - continued						
Iodomethane	0.034	<0.002	<0.002	<0.002	<0.002	<0.002
Isopropylbenzene	2.4	<0.00018	**0.0016**	<0.00018	<0.00018	**0.00047J**
Methyl tert-butyl ether	0.24	**0.00077J**	<0.00012	<0.00012	<0.00012	<0.00012
Methylene Chloride	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Naphthalene	0.49	<0.00032	<0.002	<0.00097	<0.0021	<0.0012
n-Butylbenzene	1.2	<0.00016	**0.00038J**	<0.00016	<0.00016	<0.00016
N-Propylbenzene	1.0	<0.00015	**0.0021**	<0.00015	<0.00015	**0.00038J**
sec-Butylbenzene	0.98	<0.00012	**0.00048J**	<0.00012	<0.00012	<0.00012
Styrene	0.10	<0.00007J	<0.00007J	<0.00007J	<0.00007J	<0.00007J
tert-Butylbenzene	0.98	<0.00008	<0.00008	<0.00008	**0.00013J**	**0.00012J**
Tetrachloroethene	0.005	<0.00091	**0.0023**	**0.004**	**0.0059**	**0.0073**
Toluene	1	**0.00039J**	**0.00064J**	<0.00015	0.00016J	<0.00015
trans-1,2-Dichloroethene	0.1	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
trans-1,3-Dichloropropene	0.0091	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021
Trichloroethene	0.005	**0.00073J**	**0.0012J+**	**0.002J+**	**0.0033J+**	**0.0031J+**
Trichlorofluoromethane	7.3	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Vinyl chloride	0.002	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Xylenes, Total	10	<0.00026	**0.00053J**	<0.00026	<0.00026	<0.00026
Semi-volatile Organic Compounds (SVOCs) by US EPA Method 8270C						
2,4,5-Trichlorophenol	2.4	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
2,4,6-Trichlorophenol	0.024	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
2,4-Dichlorophenol	0.073	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
2,4-Dimethylphenol	0.489	<0.00031J	<0.00031J	<0.00031J	<0.00031J	<0.00031J
2,4-Dinitrophenol	0.049	<0.00039	<0.00039	<0.00038	<0.00038	<0.00039
2,4-Dinitrotoluene	0.0013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2,6-Dinitrotoluene	0.0013	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
2-Chloronaphthalene	1.96	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
2-Chlorophenol	0.12	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Methylnaphthalene	0.098	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
2-Nitroaniline	0.0073	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
2-Nitrophenol	0.049	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
3 & 4 Methylphenol	0.12	<0.0002J	<0.0002J	<0.0002J	<0.0002J	<0.0002J
3,3'-Dichlorobenzidine	0.0020	<0.00018J	<0.00018J	<0.00018J	<0.00018J	<0.00018J
3-Nitroaniline	0.0073	<0.00016J	<0.00016J	<0.00016J	<0.00016J	<0.00016J
4,6-Dinitro-2-methylphenol	0.0024	<0.00082	<0.00082	<0.00082	<0.00082	<0.00082
4-Bromophenyl phenyl ether	0.000061	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099
4-Chloro-3-methylphenol	0.12	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
4-Chloroaniline	0.0046	<0.00021J	<0.00021J	<0.00021J	<0.00021J	<0.00021J
4-Chlorophenyl phenyl ether	0.000061	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099
4-Nitroaniline	0.046	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
4-Nitrophenol	0.049	<0.00055J	<0.00055J	<0.00055J	<0.00055J	<0.00055J
Acenaphthene	1.47	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
Acenaphthylene	1.47	<0.000059	<0.000059	<0.000059	<0.000059	<0.000059
Aniline	0.16	<0.000079J	<0.000079J	<0.000079J	<0.000079J	<0.000079J
Anthracene	7.33	<0.00005	<0.00005	<0.000049	<0.000049	<0.000049

TABLE 30
OFF-SITE GROUNDWATER SAMPLING RESULTS - FEBRUARY 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:	Extent Evaluation	MW-7	MW-8	MW-9	MW-10	MW-11
Sample Date:	Comparison	2/2/2011	2/2/2011	2/2/2011	2/2/2011	2/2/2011
Screen Interval (ft bgs):	Value	30-45	30-45	25-40	23-38	25-40
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Semi-volatile Organic Compounds (SVOCs) by US EPA Method 8270C - continued						
Benzo[a]anthracene	0.0013	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
Benzo[a]pyrene	0.0002	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
Benzo[b]fluoranthene	0.0013	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Benzo[g,h,i]perylene	0.73	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
Benzo[k]fluoranthene	0.013	<0.000089	<0.000089	<0.000089	<0.000089	<0.000089
Benzyl alcohol	2.44	<0.00017J	<0.00017J	<0.00017J	<0.00017J	<0.00017J
Bis(2-chloroethoxy)methane	0.00083	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Bis(2-chloroethyl)ether	0.00083	<0.00015J	<0.00015J	<0.00015J	<0.00015J	<0.00015J
Bis(2-chloroisopropyl) ether	0.013	<0.0004	<0.0004	<0.00039	<0.00039	<0.0004
Bis(2-ethylhexyl) phthalate	0.006	<0.00037	<0.00037	<0.00036	<0.00036	**0.0027**
Butyl benzyl phthalate	0.48	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Chrysene	0.13	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
Dibenz(a,h)anthracene	0.00013	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
Dibenzofuran	0.098	<0.000079J	<0.000079J	<0.000079J	<0.000079J	<0.000079J
Diethyl phthalate	19.55	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Dimethyl phthalate	19.55	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Di-n-butyl phthalate	2.44	**0.015J**	**0.078J**	**0.0009J**	<0.00011	**0.0012J**
Di-n-octyl phthalate	0.24	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Fluoranthene	0.98	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Fluorene	0.98	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Hexachlorobenzene	0.001	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Hexachlorocyclopentadiene	0.05	<0.00013J	<0.00013J	<0.00013J	<0.00013J	<0.00013J
Hexachloroethane	0.017	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099
Indeno[1,2,3-cd]pyrene	0.00125	<0.000069	<0.000069	<0.000069	<0.000069	<0.000069
Isophorone	0.96	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Nitrobenzene	0.049	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
N-Nitrosodi-n-propylamine	0.00013	<0.000099	<0.000099	<0.000099	<0.000099	<0.000099
Pentachlorophenol	0.001	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Phenanthrene	0.73	<0.000059	<0.000059	<0.000059	<0.000059	<0.000059
Phenol	7.33	**0.00059J**	**0.00028J**	<0.000039J	<0.000039J	<0.00004J
Pyrene	0.73	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011

NOTES:
1. Extent Evaluation Values provided on Table 3.
2. Detected compounds are presented in **bold** type.
3. Shading = Detected compound exceeds the Extent Evaluation Value.
4. < = Compound not detected at indicated detection limit. J = Estimated value. J+ = Estimated value with potential high bias.

TABLE 31
OFF-SITE GROUNDWATER SAMPLING RESULTS - OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:		MW-7*	MW-8*	MW-9	MW-10	MW-11
Sample Date:	Extent Evaluation	10/13/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Total Petroleum Hydrocarbons by TCEQ Method TX1005						
C6-C12	0.98	<0.36	<0.36	<0.36	<0.36	<0.36
>C12-C28	0.98	<0.31	<0.31	<0.31	<0.31	<0.31
>C28-C35	0.98	<0.55	<0.55	<0.55	<0.55	<0.55
C6-C35	0.98	<0.55	<0.55	<0.55	<0.55	<0.55
Dissolved Metals by US EPA Method 6010B/7471A						
Aluminum	24	<0.022	<0.022	<0.022	**0.074J**	**0.25J**
Arsenic	0.01	<0.0033	<0.0033	<0.0033	<0.0033	<0.0033
Barium	2	**0.13**	**0.27**	**0.13**	**0.13**	**0.13**
Chromium	0.1	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
Cobalt	0.24	<0.00063	<0.00063	<0.00063	<0.00063	<0.00063
Copper	1.3	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Lead	0.015	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029
Manganese	3.4	**0.16**	**0.39**	**0.023**	**0.089**	**0.024**
Mercury	0.002	<0.000026J	<0.000026J	<0.000026J	<0.000026J	<0.000026J
Nickel	0.49	**0.0023J**	<0.0018	<0.0018	**0.002J**	**0.0018J**
Selenium	0.05	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.44	**0.0038J**	<0.0017	**0.0077J**	**0.0019J**	**0.0056J**
Zinc	7.33	**0.0022**	**0.0046J**	**0.0047J**	**0.0044J**	**0.0064J**
Volatile Organic Compounds (VOCs) by US EPA Method 8260B						
1,1,1,2-Tetrachloroethane	0.035	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,1,1-Trichloroethane	0.20	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
1,1,2,2-Tetrachloroethane	0.0046	<0.00022J	<0.00022J	<0.00022J	<0.00022J	<0.00022J
1,1,2-Trichloroethane	0.005	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028
1,1-Dichloroethane	4.9	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
1,1-Dichloroethene	0.007	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
1,1-Dichloropropene	0.0091	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021
1,2,3-Trichloropropane	0.00003	<0.00029J	<0.00029J	<0.00029J	<0.00029J	<0.00029J
1,2,4-Trichlorobenzene	0.07	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031
1,2,4-Trimethylbenzene	1.2	**0.00055J**	**0.00014**	<0.00014	<0.00014	<0.00014
1,2-Dibromo-3-Chloropropane	0.0002	<0.00081J	<0.00081J	<0.00081J	<0.00081J	<0.00081J
1,2-Dibromoethane	0.00005	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,2-Dichlorobenzene	0.60	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,2-Dichloroethane	0.005	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
1,2-Dichloropropane	0.005	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
1,3,5-Trimethylbenzene	1.20	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,3-Dichlorobenzene	0.73	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
1,3-Dichloropropane	0.0091	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
1,4-Dichlorobenzene	0.075	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
2,2-Dichloropropane	0.013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Butanone (MEK)	15	<0.00076J	<0.00076J	<0.00076J	<0.00076J	<0.00076J
2-Chlorotoluene	0.49	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Hexanone	0.12	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035
4-Chlorotoluene	0.49	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
4-Isopropyltoluene	2.4	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
4-Methyl-2-pentanone (MIBK)	2	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045J
Acetone	22	<0.00099J	<0.00099J	<0.00099J	<0.00099J	<0.00099J
Benzene	0.005	**0.00067J**	**0.001**	**0.00027J**	**0.00081J**	**0.00022J**
Bromobenzene	0.20	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromodichloromethane	0.015	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Bromoform	0.12	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromomethane	0.034	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025

TABLE 31
OFF-SITE GROUNDWATER SAMPLING RESULTS - OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:		MW-7*	MW-8*	MW-9	MW-10	MW-11
Sample Date:	Extent Evaluation	10/13/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Volatile Organic Compounds (VOCs) by US EPA Method 8260B - continued						
Carbon disulfide	2.4	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024
Carbon tetrachloride	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Chlorobenzene	0.1	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Chloroethane	9.8	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Chloroform	0.24	**0.00019J**	<0.00013	**0.00055J**	<0.00013	**0.00041J**
Chloromethane	0.07	<0.00018J	<0.00018J	<0.00018J	<0.00018J	<0.00018J
cis-1,2-Dichloroethene	0.07	**0.00014J**	<0.00006	**0.00033J**	<0.00006	<0.0006
cis-1,3-Dichloropropene	0.0017	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Dibromochloromethane	0.011	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Dibromomethane	0.12	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052
Dichlorodifluoromethane	4.9	<0.00012J	<0.00012J	<0.00012J	<0.00012J	<0.00012J
Ethylbenzene	0.7	**0.00017J**	**0.00016J**	**0.00097J**	**0.00021J**	**0.00033J**
Hexachlorobutadiene	0.012	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
Iodomethane	0.034	<0.002	<0.002	<0.002	<0.002	<0.002
Isopropylbenzene	2.4	<0.00018	0.0023	0.0024	<0.00018	<0.00018
Methyl tert-butyl ether	0.24	**0.0006J**	**0.00015J**	<0.00012	<0.00012	<0.00012
Methylene Chloride	0.005	<0.00015J	<0.00015J	<0.00015J	<0.00015J	<0.00015J
Naphthalene	0.49	**0.0013**	**0.0013**	<0.00032	<0.00032	**0.0015**
n-Butylbenzene	1.2	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
N-Propylbenzene	1.0	<0.00015	<0.00015	**0.00095J**	<0.00015	<0.00015
sec-Butylbenzene	0.98	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Styrene	0.10	<0.00007	<0.00007	<0.00007	<0.00007	<0.0007
tert-Butylbenzene	0.98	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Tetrachloroethene	0.005	**0.00047J**	**0.00039J**	**0.003J+**	**0.0011J+**	**0.0068J+**
Toluene	1	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
trans-1,2-Dichloroethene	0.1	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
trans-1,3-Dichloropropene	0.0091	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021J
Trichloroethene	0.005	**0.00061J**	**0.00019J**	**0.0017**	**0.00045J**	**0.0032**
Trichlorofluoromethane	7.3	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Vinyl chloride	0.002	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Xylenes, Total	10	**0.00039J**	**0.00046J**	<0.00026	<0.00026	**0.00027J**
Semi-volatile Organic Compounds (SVOCs) by US EPA Method 8270C						
2,4,5-Trichlorophenol	2.4	<0.00025	<0.00025	<0.00025	<0.0025	<0.00025
2,4,6-Trichlorophenol	0.024	<0.00018	<0.00018	<0.00018	<0.0018	<0.00018
2,4-Dichlorophenol	0.073	<0.00015	<0.00015	<0.00015	<0.0015	<0.00015
2,4-Dimethylphenol	0.489	<0.00031	<0.00031	<0.00031	<0.0031	<0.00031
2,4-Dinitrophenol	0.049	<0.00039	<0.00039J	<0.00039J	<0.0039J	<0.00039J
2,4-Dinitrotoluene	0.0013	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013
2,6-Dinitrotoluene	0.0013	<0.00008	<0.00008	<0.00008	<0.0008	<0.00008
2-Chloronaphthalene	1.96	<0.00008	<0.00008	<0.00008	<0.0008	<0.00008
2-Chlorophenol	0.12	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013
2-Methylnaphthalene	0.098	<0.00007	<0.00007	<0.00007	<0.0007	<0.00007
2-Nitroaniline	0.0073	<0.00019	<0.00019	<0.00019	<0.0019	<0.00019
2-Nitrophenol	0.049	<0.00022	<0.00022	<0.00022	<0.0022	<0.00022
3 & 4 Methylphenol	0.12	<0.0002J	<0.0002J	<0.0002J	<0.002J	<0.0002J
3,3'-Dichlorobenzidine	0.0020	<0.00018	<0.00018	<0.00018	<0.0018J	<0.00018
3-Nitroaniline	0.0073	<0.00016	<0.00016	<0.00016	<0.0016J	<0.00016
4,6-Dinitro-2-methylphenol	0.0024	<0.00083	<0.00083	<0.00083	<0.0083	<0.00083
4-Bromophenyl phenyl ether	0.000061	<0.0001	<0.0001	<0.0001	<0.001	<0.001
4-Chloro-3-methylphenol	0.12	<0.00017	<0.00017	<0.00017	<0.0017	<0.00017
4-Chloroaniline	0.0046	<0.00021	<0.00021	<0.00021	<0.0021	<0.00021
4-Chlorophenyl phenyl ether	0.000061	<0.0001	<0.0001	<0.0001	<0.001	<0.0001

TABLE 31
OFF-SITE GROUNDWATER SAMPLING RESULTS - OCTOBER 2011
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:		MW-7*	MW-8*	MW-9	MW-10	MW-11
Sample Date:	Extent Evaluation	10/13/2011	10/13/2011	10/13/2011	10/13/2011	10/13/2011
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Semi-volatile Organic Compounds (SVOCs) by US EPA Method 8270C - continued						
4-Nitroaniline	0.046	<0.00025	<0.00025	<0.00025	<0.0025J	<0.00025
4-Nitrophenol	0.049	<0.00056	<0.00056	<0.00056	<0.0056J	<0.00056
Acenaphthene	1.47	<0.00008	<0.00008	<0.00008	<0.0008	<0.00008
Acenaphthylene	1.47	<0.00006	<0.00006	<0.00006	<0.0006	<0.00006
Aniline	0.16	<0.00008	<0.00008	<0.00008	<0.0008J	<0.00008
Anthracene	7.33	<0.00005	<0.00005	<0.00005	<0.0005	<0.00005
Benzo[a]anthracene	0.0013	<0.00008	<0.00008	<0.00008	<0.0008	<0.00008
Benzo[a]pyrene	0.0002	<0.00008	<0.00008	<0.00008	<0.0008	<0.00008
Benzo[b]fluoranthene	0.0013	<0.00007	<0.00007	<0.00007	<0.0007	<0.00007
Benzo[g,h,i]perylene	0.73	<0.00008	<0.00008	<0.00008	<0.0008	<0.00008
Benzo[k]fluoranthene	0.013	<0.00009	<0.00009	<0.00009	<0.0009	<0.00009
Benzyl alcohol	2.44	<0.00017	<0.00017	<0.00017	<0.0017J	<0.00017
Bis(2-chloroethoxy)methane	0.00083	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013
Bis(2-chloroethyl)ether	0.00083	<0.00015	<0.00015	<0.00015	<0.0015	<0.00015
Bis(2-chloroisopropyl) ether	0.013	<0.0004	<0.0004	<0.0004	<0.004	<0.0004
Bis(2-ethylhexyl) phthalate	0.006	<0.00037	<0.00037	<0.00037	<0.0037	<0.00037
Butyl benzyl phthalate	0.48	<0.00012	<0.00012	<0.00012	<0.0012	<0.00014
Chrysene	0.13	<0.00008	<0.0008	<0.00008	<0.0008	<0.00008
Dibenz(a,h)anthracene	0.00013	<0.00008	<0.00008	<0.00008	<0.0008	<0.00008
Dibenzofuran	0.098	<0.00008	<0.00008	<0.00008	**0.001 J**	<0.00008
Diethyl phthalate	19.55	<0.0015	<0.0015	<0.0015	<0.015	<0.0015
Dimethyl phthalate	19.55	<0.00007	<0.00007	<0.00007	<0.0007	<0.00007
Di-n-butyl phthalate	2.44	**0.00022 J**	**0.0043**	**0.00033J**	<0.0011	<0.00011
Di-n-octyl phthalate	0.24	<0.00016	<0.00016	<0.00016	<0.0016	<0.00016
Fluoranthene	0.98	<0.00007	<0.00007	<0.00007	<0.0007	<0.00007
Fluorene	0.98	<0.00007	<0.00007	<0.00007	<0.0007	<0.00007
Hexachlorobenzene	0.001	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011
Hexachlorocyclopentadiene	0.05	<0.00013	<0.00013	<0.00013	<0.0013	<0.00013
Hexachloroethane	0.017	<0.0001	<0.0001	<0.0001	<0.001	<0.0001
Indeno[1,2,3-cd]pyrene	0.00125	<0.00007	<0.00007	<0.00007	<0.0007	<0.00007
Isophorone	0.96	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011
Nitrobenzene	0.049	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011
N-Nitrosodi-n-propylamine	0.00013	<0.0001	<0.0001	<0.0001	<0.001	<0.0001
Pentachlorophenol	0.001	<0.00061	<0.00061	<0.00061	<0.0061	<0.00061
Phenanthrene	0.73	<0.00006	<0.00006	<0.00006	<0.0006	<0.00006
Phenol	7.33	<0.00004	<0.00004	<0.00004	<0.0004J	<0.00004
Pyrene	0.73	<0.00011	<0.00011	<0.00011	<0.0011	<0.00011

NOTES:
1. Extent Evaluation Values provided on Table 3.
2. Detected compounds are presented in **bold** type.
3. Shading = Detected compound exceeds the Extent Evaluation Value.
4. < = Compound not detected at indicated detection limit. J = Estimated value. J+ = Estimated value with potential high bias.
5. * = sample was filtered in the field due to turbidity (dissolved metals).

TABLE 32
OFF-SITE GROUNDWATER SAMPLING RESULTS - MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:		MW-7	MW-8	MW-9	MW-10	MW-11	MW-21	MW-22
Sample Date:	Extent Evaluation	5/11/2012	5/11/2012	5/9/2012	5/11/2012	5/11/2012	5/9/2012	5/9/2012
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40	8-23	10-25
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Total Petroleum Hydrocarbons by TCEQ Method TX1005								
C6-C12	0.98	<0.8	<0.8	<0.8	<0.81	<0.82	<0.8	<0.81
>C12-C28	0.98	<0.93	<0.93	<0.93	<0.94	<0.94	<0.93	<0.93
>C28-C35	0.98	<0.93	<0.93	<0.93	<0.94	<0.94	<0.93	<0.93
C6-C35	0.98	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Metals by US EPA Method 6010B/7471A								
Aluminum	24	<0.084	**0.34 J**	**0.034 J**	**0.3 J**	<0.022	**0.14 J**	**0.041 J**
Arsenic	0.01	**0.0043 J**	**0.0044 J**	<0.0033	<0.0033	<0.0033	**0.019**	<0.0033
Barium	2	**0.14**	**0.3**	**0.21**	**0.11**	**0.13**	**0.11**	**0.18**
Chromium	0.1	<0.0016	**0.0018 J**	**0.0016 J**	<0.0016	<0.0016	<0.0016	<0.0016
Cobalt	0.24	<0.00063	<0.00063	<0.00063	<0.00063	<0.00063	**0.0025 J**	**0.0007 J**
Copper	1.3	**0.0049 J**	<0.0015	<0.0022	**0.0027 J**	**0.0022 J**	<0.0015	<0.0015
Lead	0.015	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029
Manganese	3.4	**0.019**	**0.45**	**0.024**	**0.08**	**0.011**	**0.29**	**0.19**
Mercury	0.002	<0.000026	<0.000026	<0.000026	<0.000035	<0.000026	<0.000026	<0.000026
Nickel	0.49	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	**0.0022 J**	<0.0018
Selenium	0.05	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	0.002	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	0.44	<0.0017	<0.0017	**0.0092 J**	**0.0026 J**	**0.0074 J**	**0.0093 J**	**0.0042 J**
Zinc	7.33	<0.012	<0.0037	<0.0031	<0.0092	<0.0044	<0.0037	<0.003
Volatile Organic Compounds (VOCs) by US EPA Method 8260B								
1,1,1,2-Tetrachloroethane	0.035	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,1,1-Trichloroethane	0.20	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
1,1,2,2-Tetrachloroethane	0.0046	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
1,1,2-Trichloroethane	0.005	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028
1,1-Dichloroethane	4.9	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
1,1-Dichloroethene	0.007	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
1,1-Dichloropropene	0.0091	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021
1,2,3-Trichloropropane	0.00003	<0.00029	<0.00029	<0.00029	<0.00029	<0.00029	<0.00029	<0.00029
1,2,4-Trichlorobenzene	0.07	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031
1,2,4-Trimethylbenzene	1.2	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
1,2-Dibromo-3-Chloropropane	0.0002	<0.00081	<0.00081	<0.00081	<0.00081	<0.00081	<0.00081	<0.00081
1,2-Dibromoethane	0.00005	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,2-Dichlorobenzene	0.60	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,2-Dichloroethane	0.005	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	**0.00072 J**	<0.00014
1,2-Dichloropropane	0.005	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
1,3,5-Trimethylbenzene	1.20	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,3-Dichlorobenzene	0.73	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
1,3-Dichloropropane	0.0091	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
1,4-Dichlorobenzene	0.075	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
2,2-Dichloropropane	0.013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Butanone (MEK)	15	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J
2-Chlorotoluene	0.49	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Hexanone	0.12	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035
4-Chlorotoluene	0.49	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
4-Isopropyltoluene	2.4	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
4-Methyl-2-pentanone (MIBK)	2	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Acetone	22	<0.00099	<0.00099	<0.00099	<0.00099	<0.00099	<0.00099	<0.00099
Benzene	0.005	**0.00014 J**	**0.00023 J**	**0.00023 J**	<0.00008	<0.00008	**0.00033 J**	<0.00008
Bromobenzene	0.20	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromodichloromethane	0.015	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	**0.0012**	<0.00016
Bromoform	0.12	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromomethane	0.034	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025

TABLE 32
OFF-SITE GROUNDWATER SAMPLING RESULTS - MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:		MW-7	MW-8	MW-9	MW-10	MW-11	MW-21	MW-22
Sample Date:	Extent Evaluation	5/11/2012	5/11/2012	5/9/2012	5/11/2012	5/11/2012	5/9/2012	5/9/2012
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40	8-23	10-25
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Volatile Organic Compounds (VOCs) by US EPA Method 8260B - continued								
Carbon disulfide	2.4	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024
Carbon tetrachloride	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Chlorobenzene	0.1	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Chloroethane	9.8	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Chloroform	0.24	<0.00013	<0.00013	**0.00038 J**	<0.00013	**0.00035 J**	**0.00017 J**	<0.00013
Chloromethane	0.07	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
cis-1,2-Dichloroethene	0.07	<0.00006	<0.00006	<0.00006	<0.00006	**0.00057 J**	**0.00082 J**	<0.00006
cis-1,3-Dichloropropene	0.0017	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Dibromochloromethane	0.011	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Dibromomethane	0.12	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052
Dichlorodifluoromethane	4.9	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J
Ethylbenzene	0.7	<0.00011	<0.00011	**0.0012**	<0.00011	<0.00011	**0.0066**	<0.00011
Hexachlorobutadiene	0.012	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
Iodomethane	0.034	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Isopropylbenzene	2.4	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	**0.0019**	<0.00018
Methyl tert-butyl ether	0.24	**0.0014**	**0.00017 J**	<0.00012	<0.00012	<0.00012	**0.00037 J**	**0.00053 J**
Methylene Chloride	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Naphthalene	0.49	<0.00032	<0.00032	<0.00032	<0.00032	<0.00032	**0.0033**	**0.00069 J**
n-Butylbenzene	1.2	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	**0.00037 J**	<0.00016
N-Propylbenzene	1.0	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	**0.0023**	<0.00015
sec-Butylbenzene	0.98	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	**0.00026 J**	<0.00012
Styrene	0.10	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	0.00007	<0.00007
tert-Butylbenzene	0.98	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	**0.00019 J**	<0.00008
Tetrachloroethene	0.005	<0.00013	<0.00013	**0.0012**	<0.00013	**0.0038**	**0.0012**	**0.0014**
Toluene	1	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
trans-1,2-Dichloroethene	0.1	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
trans-1,3-Dichloropropene	0.0091	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021
Trichloroethene	0.005	<0.00018	<0.00018	**0.0012**	<0.00018	**0.002**	**0.0023**	**0.0012**
Trichlorofluoromethane	7.3	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Vinyl chloride	0.002	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Xylenes, Total	10	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026
Semi-volatile Organic Compounds (SVOCs) by US EPA Method 8270C								
2,4,5-Trichlorophenol	2.4	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
2,4,6-Trichlorophenol	0.024	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
2,4-Dichlorophenol	0.073	<0.00015	<0.00015	<0.00015	<0.00015	**0.00029 J**	<0.00015	<0.00015
2,4-Dimethylphenol	0.489	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031
2,4-Dinitrophenol	0.049	<0.00038	<0.00039	<0.00038 J	<0.00039	<0.00039	<0.00038 J	<0.00038 J
2,4-Dinitrotoluene	0.0013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2,6-Dinitrotoluene	0.0013	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	<0.000079	<0.000079
2-Chloronaphthalene	1.96	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	<0.000079	<0.000079
2-Chlorophenol	0.12	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Methylnaphthalene	0.098	<0.000069	<0.000069	<0.000069	<0.00007	<0.00007	**0.00011 J**	<0.000069
2-Nitroaniline	0.0073	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
2-Nitrophenol	0.049	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
3 & 4 Methylphenol	0.12	<0.0002 J	<0.0002 J	<0.0002	<0.0002 J	<0.0002 J	<0.0002	<0.0002
3,3'-Dichlorobenzidine	0.0020	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J
3-Nitroaniline	0.0073	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
4,6-Dinitro-2-methylphenol	0.0024	<0.00082	<0.00082	<0.00082	<0.00083	<0.00083	<0.00082	<0.00082
4-Bromophenyl phenyl ether	0.000061	<0.000099	<0.000099	<0.000099	<0.0001	<0.0001	<0.000099	<0.000099
4-Chloro-3-methylphenol	0.12	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
4-Chloroaniline	0.0046	<0.00021 J	<0.00021 J	<0.00021	<0.00021 J	<0.00021 J	<0.00021	<0.00021
4-Chlorophenyl phenyl ether	0.000061	<0.000099	<0.000099	<0.000099	<0.0001	<0.0001	<0.000099	<0.000099

TABLE 32
OFF-SITE GROUNDWATER SAMPLING RESULTS - MAY 2012
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:		MW-7	MW-8	MW-9	MW-10	MW-11	MW-21	MW-22
Sample Date:	Extent Evaluation	5/11/2012	5/11/2012	5/9/2012	5/11/2012	5/11/2012	5/9/2012	5/9/2012
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40	8-23	10-25
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Semi-volatile Organic Compounds (SVOCs) by US EPA Method 8270C - continued								
4-Nitroaniline	0.046	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
4-Nitrophenol	0.049	<0.00055 J	<0.00055 J	<0.00055	<0.00056 J	<0.00056 J	<0.00055	<0.00055
Acenaphthene	1.47	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	<0.000079	<0.000079
Acenaphthylene	1.47	<0.000059	<0.000059	<0.000059	<0.00006	<0.00006	<0.000059	<0.000059
Aniline	0.16	<0.000079 J	<0.000079 J	<0.000079	<0.00008 J	<0.00008 J	<0.000079	<0.000079
Anthracene	7.33	<0.000049	<0.00005	<0.000049	<0.00005	<0.00005	<0.000049	<0.000049
Benzo[a]anthracene	0.0013	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	<0.000079	<0.000079
Benzo[a]pyrene	0.0002	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	<0.000079	<0.000079
Benzo[b]fluoranthene	0.0013	<0.000069	<0.000069	<0.000069	<0.00007	<0.00007	<0.000069	<0.000069
Benzo[g,h,i]perylene	0.73	<0.000079 J	<0.000079 J	<0.000079	<0.00008 J	<0.00008 J	<0.000079	<0.000079
Benzo[k]fluoranthene	0.013	<0.000089	<0.000089	<0.000089	<0.00009	<0.00009	<0.000089	<0.000089
Benzyl alcohol	2.44	<0.00017 J	<0.00017 J	<0.00017	<0.00017 J	<0.00017 J	<0.00017	<0.00017
Bis(2-chloroethoxy)methane	0.00083	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Bis(2-chloroethyl)ether	0.00083	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Bis(2-chloroisopropyl) ether	0.013	<0.00039	<0.0004	<0.00039	<0.0004	<0.0004	<0.00039	<0.00039
Bis(2-ethylhexyl) phthalate	0.006	<0.00036	<0.00037	**0.00042 J**	<0.00037	<0.00037	**0.00039 J**	**0.00046 J**
Butyl benzyl phthalate	0.48	<0.0002	<0.00012	**0.00028 J**	<0.00018	<0.00012	**0.00027 J**	**0.00027 J**
Chrysene	0.13	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	<0.000079	<0.000079
Dibenz(a,h)anthracene	0.00013	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	<0.000079	<0.000079
Dibenzofuran	0.098	<0.000079	<0.000079	<0.000079	<0.00008	<0.00008	**0.00013 J**	<0.000079
Diethyl phthalate	19.55	<0.0015	<0.0015	**0.0015 J**	<0.0015	<0.0015	<0.0015	<0.0015
Dimethyl phthalate	19.55	<0.000069	<0.000069	<0.000069	<0.00007	<0.00007	<0.000069	<0.000069
Di-n-butyl phthalate	2.44	**0.00019 J**	**0.0015 J**	**0.00029 J**	**0.00017 J**	<0.00011	**0.00014 J**	<0.00011
Di-n-octyl phthalate	0.24	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Fluoranthene	0.98	<0.000069	<0.000069	<0.000069	<0.00007	<0.00007	<0.000069	<0.000069
Fluorene	0.98	<0.000069	<0.000069	<0.000069	<0.00007	<0.00007	**0.00031 J**	<0.000069
Hexachlorobenzene	0.001	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Hexachlorocyclopentadiene	0.05	<0.00013	<0.00013	<0.00013 J	<0.00013	<0.00013	<0.00013	<0.00013
Hexachloroethane	0.017	<0.000099	<0.000099	<0.000099	<0.0001	<0.0001	<0.000099	<0.000099
Indeno[1,2,3-cd]pyrene	0.00125	<0.000069	<0.000069	<0.000069	<0.00007	<0.00007	<0.000069	<0.000069
Isophorone	0.96	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Nitrobenzene	0.049	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
N-Nitrosodi-n-propylamine	0.00013	<0.000099	<0.000099	<0.000099	<0.0001	<0.0001	<0.000099	<0.000099
Pentachlorophenol	0.001	<0.0006	<0.0006	<0.0006	<0.00061	<0.00061	<0.0006	<0.0006
Phenanthrene	0.73	<0.000059	<0.000059	<0.000059	<0.00006	<0.00006	**0.00016 J**	<0.000059
Phenol	7.33	<0.000039 J	<0.00004 J	<0.000039	<0.00004 J	<0.00004 J	<0.000039	<0.000039
Pyrene	0.73	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011

NOTES:
1. Extent Evaluation Values provided on Table 3.
2. Detected compounds are presented in **bold** type.
3. Shading = Detected compound exceeds the Extent Evaluation Value.
4. < = Compound not detected at indicated detection limit. J = Estimated value.

TABLE 33
OFF-SITE GROUNDWATER SAMPLING RESULTS - APRIL 2014
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		Downgradient wells							Kelly Air Force Base wells	
Location ID:		MW-7	MW-8	MW-9	MW-10	MW-11	MW-21	MW-22	SS052MW097	SS052MW125
Sample Date:	Extent Evaluation	4/23/2014	4/23/2014	4/23/2014	4/23/2014	4/23/2014	4/22/2014	4/22/2014	4/22/2014	4/22/2014
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40	8-23	10-25	25-30	28.5-43.5
Constituent	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1,1,1,2-Tetrachloroethane	0.035	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.0009	<0.00018
1,1,1-Trichloroethane	0.20	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00075	<0.00015
1,1,2,2-Tetrachloroethane	0.0046	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.0011	<0.00022
1,1,2-Trichloroethane	0.005	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.0014	<0.00028
1,1-Dichloroethane	4.9	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00055	<0.00011
1,1-Dichloroethene	0.007	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00095	<0.00019
1,1-Dichloropropene	0.0091	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.0011	<0.00021
1,2,3-Trichloropropane	0.00003	<0.00029	<0.00029	<0.00029	<0.00029	<0.00029	<0.00029	<0.00029	<0.0015	<0.00029
1,2,4-Trichlorobenzene	0.07	<0.00031 J	<0.00031 J	<0.00031 J	<0.00031 J	<0.00031 J	<0.00031	<0.00031	<0.0016	<0.00031
1,2,4-Trimethylbenzene	1.2	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	**0.77**	<0.00014
1,2-Dibromo-3-Chloropropane	0.0002	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J	<0.0041	<0.00081
1,2-Dibromoethane	0.00005	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.0009	<0.00018
1,2-Dichlorobenzene	0.60	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
1,2-Dichloroethane	0.005	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.0007	<0.00014
1,2-Dichloropropane	0.005	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.0008	<0.00016
1,3,5-Trimethylbenzene	1.20	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**0.37**	<0.0001
1,3-Dichlorobenzene	0.73	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00065	<0.00013
1,3-Dichloropropane	0.0091	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.0011	<0.00022
1,4-Dichlorobenzene	0.075	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	<0.00055	<0.00011
2,2-Dichloropropane	0.013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00065	<0.00013
2-Butanone (MEK)	15	<0.00076	<0.00076	<0.00076	<0.00076	<0.00076	<0.00076 J	<0.00076 J	<0.0038 J	<0.00076 J
2-Chlorotoluene	0.49	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00065	<0.00013
2-Hexanone	0.12	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035	<0.0018	<0.00035
4-Chlorotoluene	0.49	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.0007	<0.00014
4-Isopropyltoluene	2.4	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**0.0053**	<0.0001
4-Methyl-2-pentanone (MIBK)	2	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.0023	<0.00045
Acetone	22	<0.00099	<0.00099	<0.00099	<0.00099	<0.00099	<0.00099 J	<0.00099 J	<0.005 J	<0.00099 J
Benzene	0.005	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	**0.0012**	<0.00008	**0.32**	<0.00008
Bromobenzene	0.20	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00095	<0.00019
Bromodichloromethane	0.015	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.0008	<0.00016
Bromoform	0.12	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00095	<0.00019
Bromomethane	0.034	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.0013	<0.00025
Carbon disulfide	2.4	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.0012	<0.00024
Carbon tetrachloride	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00075	<0.00015
Chlorobenzene	0.1	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.0006	<0.00012
Chloroethane	9.8	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.0004	<0.00008
Chloroform	0.24	<0.00013	<0.00013	**0.00019 J**	**0.00028 J**	**0.00037 J**	<0.00013	<0.00013	<0.00065	**0.0005 J**
Chloromethane	0.07	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.0009	<0.00018
cis-1,2-Dichloroethene	0.07	<0.00006	**0.00038 J**	<0.00006	**0.00041 J**	**0.00071 J**	**0.00042 J**	<0.00006	**0.0021 J**	**0.00066 J**
cis-1,3-Dichloropropene	0.0017	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.0009	<0.00018
Dibromochloromethane	0.011	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00075	<0.00015
Dibromomethane	0.12	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052	<0.0026	<0.00052
Dichlorodifluoromethane	4.9	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.0006 J	<0.00012 J
Ethylbenzene	0.7	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	**0.0015**	<0.00011	**0.31**	<0.00011
Hexachlorobutadiene	0.012	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00085	<0.00017
Iodomethane	0.034	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00079	<0.00016
Isopropylbenzene	2.4	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	**0.0097**	<0.00018	**0.02**	<0.00018
Methyl tert-butyl ether	0.24	**0.00084 J**	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J	**0.00036 J**	<0.00012 J	<0.0006 J	<0.00012 J
Methylene Chloride	0.005	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015 J	<0.00015 J	<0.00075 J	<0.00015 J
Naphthalene	0.49	<0.00032 J	<0.00032 J	<0.00032 J	<0.00032 J	<0.00032 J	**0.042 J-**	**0.00086 J**	**0.28**	**0.00035 J**
n-Butylbenzene	1.2	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	**0.00095 J**	<0.00016	**0.017**	<0.00016
N-Propylbenzene	1.0	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	**0.014**	<0.00015	**0.034**	<0.00015
sec-Butylbenzene	0.98	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	**0.00089 J**	<0.00012	<0.0006	<0.00012
Styrene	0.10	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	**0.014**	<0.00007
tert-Butylbenzene	0.98	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	**0.00063 J**	<0.00008	**0.0011 J**	<0.00008
Tetrachloroethene	0.005	<0.00013	**0.0002 J**	**0.00044 J**	**0.0018**	**0.0023**	**0.00026 J**	**0.00049 J**	<0.00065	**0.0006 J**
Toluene	1	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	**0.00018 J**	<0.00015	**0.02**	<0.00015
trans-1,2-Dichloroethene	0.1	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00045	<0.00009
trans-1,3-Dichloropropene	0.0091	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.0011	<0.00021
Trichloroethene	0.005	**0.00026 J**	**0.00033 J**	**0.0006 J**	**0.0013**	**0.0017**	**0.00029 J**	**0.00055 J**	<0.0009	**0.00091 J**
Trichlorofluoromethane	7.3	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.0004	<0.00008
Vinyl chloride	0.002	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	**0.00012 J**	<0.00011	<0.00055	<0.00011
Xylenes, Total	10	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	**2**	<0.00026

NOTES:
1. Extent Evaluation Values provided on Table 3.
2. Detected compounds are presented in **bold** type.
3. Shading = Detected compound exceeds the Extent Evaluation Value.
4. < = Compound not detected at indicated detection limit. J = Estimated value.

TABLE 34
OFF-SITE GROUNDWATER SAMPLING RESULTS - MAY 2015
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:		Downgradient wells							Upgradient wells			Kelly Air Force Base wells	
Location ID:		MW-7	MW-8	MW-9	MW-10	MW-11	MW-21	MW-22	MW-25	MW-26	MW-27	SS052MW097	SS052MW125
Sample Date:	Extent Evaluation	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/4/2015	5/5/2015	5/5/2015
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40	8-23	10-25	10-25	10-25	10-30	25-30	28.5-43.5
Constituent	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1,1,1,2-Tetrachloroethane	0.035	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	<0.021	<0.021	<0.00021	<0.0021	<0.00021
1,1,1-Trichloroethane	0.20	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.03	<0.03	<0.0003	<0.003	<0.0003
1,1,2,2-Tetrachloroethane	0.0046	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.019	<0.019	<0.00019	<0.0019	<0.00019
1,1,2-Trichloroethane	0.005	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	<0.00017
1,1-Dichloroethane	4.9	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	<0.00017
1,1-Dichloroethene	0.007	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.03	<0.03	<0.0003	<0.003	<0.0003
1,1-Dichloropropene	0.0091	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.019	<0.019	<0.00019	<0.0019	<0.00019
1,2,3-Trichloropropane	0.00003	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	<0.019	<0.019	<0.00019	<0.0019	<0.00019
1,2,4-Trichlorobenzene	0.07	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	<0.00017
1,2,4-Trimethylbenzene	1.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.46**	**0.14 J**	**0.0005 J**	**0.43**	<0.0002
1,2-Dibromo-3-Chloropropane	0.0002	<0.00035 J	<0.00035 J	<0.00035 J	<0.00035 J	<0.00035 J	<0.00035 J	<0.00035 J	<0.035	<0.035	<0.00035	<0.0035	<0.00035 J
1,2-Dibromoethane	0.00005	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.018	<0.018	<0.00018	<0.0018	<0.00018
1,2-Dichlorobenzene	0.60	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	<0.00017
1,2-Dichloroethane	0.005	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	<0.00017
1,2-Dichloropropane	0.005	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	<0.00017
1,3,5-Trimethylbenzene	1.20	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.24**	**0.12 J**	<0.0002	**0.2**	<0.0002
1,3-Dichlorobenzene	0.73	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.013	<0.013	<0.00013	<0.0013	<0.00013
1,3-Dichloropropane	0.0091	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.015	<0.015	<0.00015	<0.0015	<0.00015
1,4-Dichlorobenzene	0.075	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.02	<0.02	<0.0002	<0.002	<0.0002
2,2-Dichloropropane	0.013	<0.00034	<0.00034	<0.00034	<0.00034	<0.00034	<0.00034	<0.00034	<0.034	<0.034	<0.00034	<0.0034	<0.00034
2-Butanone (MEK)	15	<0.001 J	<0.001 J	<0.001 J	<0.001 J	<0.001 J	<0.001 J	<0.001 J	<0.1	<0.1	<0.001	<0.01	<0.001 J
2-Chlorotoluene	0.49	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	<0.016	<0.016	<0.00016	<0.0016	<0.00016
2-Hexanone	0.12	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.05	<0.05	<0.0005	<0.005	<0.0005
4-Chlorotoluene	0.49	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.024	<0.024	<0.00024	<0.0024	<0.00024
4-Isopropyltoluene	2.4	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.015	<0.015	<0.00015	**0.0031 J**	<0.00015
4-Methyl-2-pentanone (MIBK)	2	<0.00051	<0.00051	<0.00051	<0.00051	<0.00051	<0.00051	<0.00051	<0.051	<0.051	<0.00051	<0.0051	<0.00051
Acetone	22	<0.005 J	<0.005 J	<0.005 J	<0.005 J	<0.005 J	**0.027 J-**	<0.005 J	<0.5	<0.5	**0.05**	<0.05	<0.005 J
Benzene	0.005	<0.00033	<0.00033	<0.00033	<0.00033	<0.00033	**0.0015**	<0.00033	**14**	**7.6**	**0.0055**	**0.16**	<0.00033
Bromobenzene	0.20	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.013	<0.013	<0.00013	<0.0013	<0.00013
Bromodichloromethane	0.015	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	<0.018	<0.018	<0.00018	<0.0018	<0.00018
Bromoform	0.12	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.05	<0.05	<0.0005	<0.005	<0.0005
Bromomethane	0.034	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.039	<0.039	<0.00039	<0.0039	<0.00039
Carbon disulfide	2.4	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.05	<0.05	<0.0005	<0.005	<0.0005
Carbon tetrachloride	0.005	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.025	<0.025	<0.00025	<0.0025	<0.00025
Chlorobenzene	0.1	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	<0.014	<0.014	<0.00014	<0.0014	<0.00014

TABLE 34
OFF-SITE GROUNDWATER SAMPLING RESULTS - MAY 2015
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

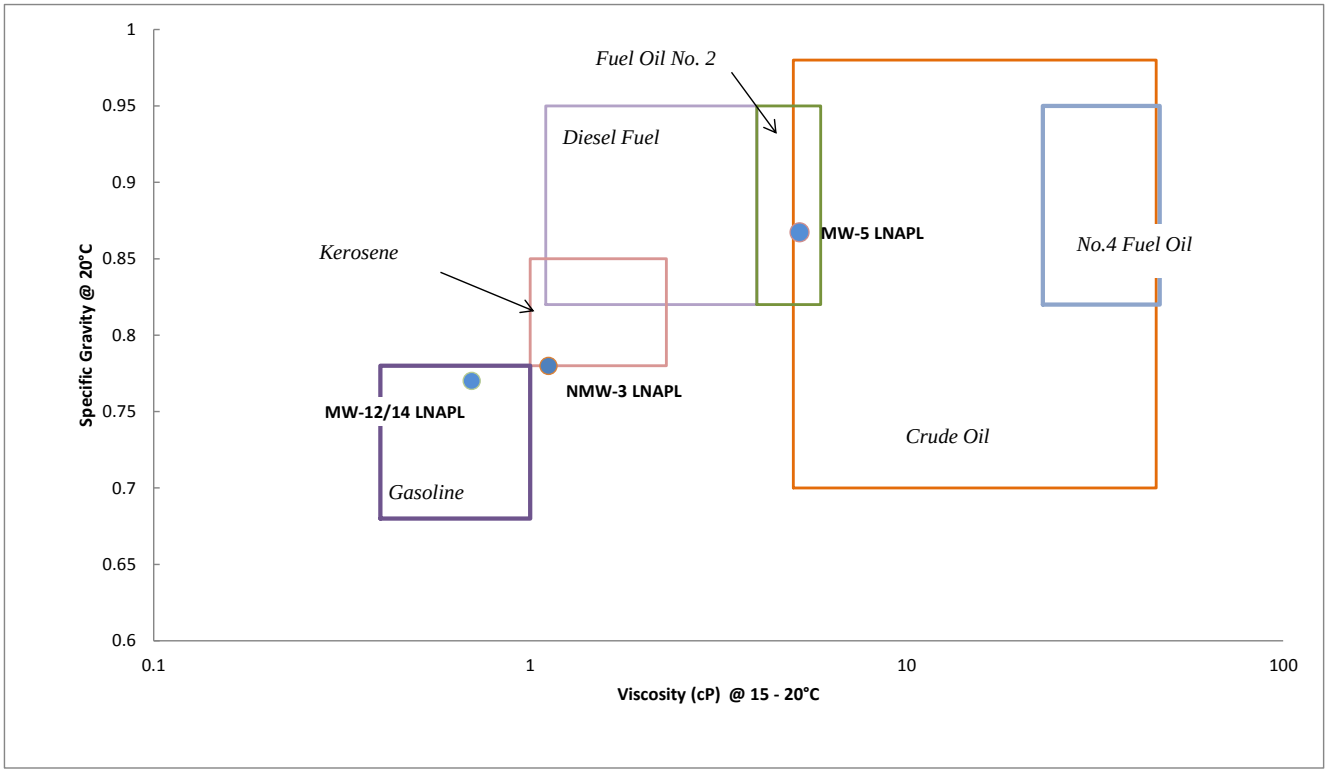
Sample Area:		Downgradient wells							Upgradient wells			Kelly Air Force Base wells	
Location ID:		MW-7	MW-8	MW-9	MW-10	MW-11	MW-21	MW-22	MW-25	MW-26	MW-27	SS052MW097	SS052MW125
Sample Date:	Extent Evaluation	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/5/2015	5/4/2015	5/5/2015	5/5/2015
Screen Interval (ft bgs):	Comparison Value	30-45	30-45	25-40	23-38	25-40	8-23	10-25	10-25	10-25	10-30	25-30	28.5-43.5
Constituent	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Chloroethane	9.8	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.04	<0.04	<0.0004	<0.004	<0.0004
Chloroform	0.24	<0.00017	<0.00017	**0.00024 J**	<0.00017	**0.0003 J**	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	**0.00046 J**
Chloromethane	0.07	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	0.039 J-	0.039 J-	<0.00039	0.0039 J-	<0.00039
cis-1,2-Dichloroethene	0.07	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	<0.012	<0.012	<0.00012	<0.0012	**0.00072 J**
cis-1,3-Dichloropropene	0.0017	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	<0.015	<0.015	<0.00015	<0.0015	<0.00015
Dibromochloromethane	0.011	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.022	<0.022	<0.00022	<0.0022	<0.00022
Dibromomethane	0.12	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.017	<0.017	<0.00017	<0.0017	<0.00017
Dichlorodifluoromethane	4.9	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.043 J	<0.043 J	<0.00043 J	<0.0043 J	<0.00043
Ethylbenzene	0.7	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.00057 J**	<0.0002	**2.2**	**0.69**	**0.001**	**0.15**	<0.0002
Hexachlorobutadiene	0.012	<0.00086	<0.00086	<0.00086	<0.00086	<0.00086	<0.00086	<0.00086	<0.086 J	<0.086 J	<0.00086 J	<0.0086 J	<0.00086
Iodomethane	0.034	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	<0.022	<0.022	<0.00022	<0.0022	<0.00022
Isopropylbenzene	2.4	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.013**	<0.0002	**0.081 J**	**0.084 J**	**0.032**	**0.01 J**	<0.0002
Methyl tert-butyl ether	0.24	**0.0029**	<0.0002	<0.0002	<0.0002	<0.0002	**0.00039 J**	<0.0002	<0.02	<0.02	**0.024**	<0.002	<0.0002
Methylene Chloride	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.2	<0.2	<0.002	<0.02	<0.002
Naphthalene	0.49	<0.0002 J	<0.0002 J	<0.0002 J	<0.0002 J	<0.0002 J	**0.033 J-**	<0.0002 J	**0.56 J-**	**0.29 J**	**0.12 J-**	**0.16 J-**	**0.0025 J**
n-Butylbenzene	1.2	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.02	<0.02	<0.0002	<0.002	<0.0002
N-Propylbenzene	1.0	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	**0.015**	<0.00011	**0.16**	**0.11**	**0.057**	**0.016**	<0.00011
sec-Butylbenzene	0.98	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.03	<0.03	<0.0003	<0.003	<0.0003
Styrene	0.10	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.02	<0.02	<0.0002	<0.002	<0.0002
tert-Butylbenzene	0.98	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	**0.00057 J**	<0.0002	<0.02	<0.02	**0.0014 J**	<0.002	<0.0002
Tetrachloroethene	0.005	<0.00019	<0.00019	**0.00063 J**	<0.00019	**0.0021**	<0.00019	<0.00019	<0.019	<0.019	<0.00019	<0.0019	**0.0006 J**
Toluene	1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.05	<0.05	**0.0011**	**0.018**	<0.0005
trans-1,2-Dichloroethene	0.1	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.02	<0.02	<0.0002	<0.002	<0.0002
trans-1,3-Dichloropropene	0.0091	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.02	<0.02	<0.0002	<0.002	<0.0002
Trichloroethene	0.005	<0.00032	<0.00032	**0.001**	<0.00032	**0.0017**	<0.00032	<0.00032	<0.032	<0.032	<0.00032	<0.0032	**0.00094 J**
Trichlorofluoromethane	7.3	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	<0.024	<0.024	<0.00024	<0.0024	<0.00024
Vinyl chloride	0.002	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.03	<0.03	<0.0003	<0.003	<0.0003
Xylenes, Total	10	<0.00023	<0.00023	<0.00023	<0.00023	<0.00023	<0.00023	<0.00023	**1.8**	**1.3**	**0.0011 J**	**1.1**	<0.00023

NOTES:
1. Extent Evaluation Values provided on Table 3.
2. Detected compounds are presented in **bold** type.
3. Shading = Detected compound exceeds the Extent Evaluation Value.
4. < = Compound not detected at indicated detection limit. J = Estimated value.

TABLE 35
LIGHT NON-AQUEOUS PHASE LIQUID ANALYSIS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Parameter	MW-12 *NW Corner R&H*	MW-14 *NW Corner R&H*	NMW-3 *SW Corner R&H*	MW-15 *Central R&H*	MW-5 *Central Tropicana*
Physical Properties					
Specific Gravity @ 70°	0.7635	0.7705	0.7798	NA	0.8672
Density @ 70°(g/cc)	0.762	0.7689	0.7783	NA	0.8655
Viscosity (centipoise)	0.712	0.703	1.12	NA	5.2
Viscosity (centistokes)	0.934	0.914	0.871	NA	4.5
Interfacial Tension					
Water - Air (Dynes/cm)	66.8	58.9	64.8	NA	56
NAPL - Air (Dynes/cm)	22.7	22.7	22.9	NA	28.1
Water - NAPL (Dynes/cm)	12.3	10.27	8.5	NA	14.2
Chemical Analysis - Selected Analytes					
TPH C6-C12 (mg/kg)	780,000 (78%)	760,000 (76%)	550,000 (55%)	230,000 (23%)	400,000 (40%)
TPH >C12-C28 (mg/kg)	81,000 (8.1%)	59,000 (5.9%)	56,000 (5.6 %)	630,000 (63%)	590,000 (59%)
TPH >C28-C35 (mg/kg)	<9,600	<19,000	<9600	170,000 (17%)	<9600
Total TPH (mg/kg)	860,000 (86%)	820,000 (82%)	600,000 (60%)	1,000,000 (100%)	980,000 (98%)
Benzene (mg/kg)	6,800	8,300	7,200	3,100	12 J
Ethylbenzene (mg/kg)	5,900	4,900	5,000	2,000	<10
Toluene (mg/kg)	140	45,000	300	88	<14
Xylene (mg/kg)	27,000	38,000	42,000	10,000	<11
Methyl tert-butyl ether (MTBE) (mg/kg)	<23	<23	<92	<23	<18

PETROLEUM PROPERTIES



NOTES:
1. Petroleum product properties from API Interactive LNAPL Guide Version 2.0, Aqui-Ver, Inc., Park City, UT, 2004
2. NA = Not analyzed.

TABLE 36
SOIL GAS SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Building Sub-Slab				R&H Oil						Tropicana Energy		
Sample Location:	SS-1	SS-2	SS-2	SS-3	SG-12*	SG-13	SG-14*	SG-15*	SG-16	SG-17*	SG-18*	SG-19*	SG-20
Sample Depth (ft):	1	1	1	1	5-6	3.5-4.5	5-6	5-6	5-6	5-6	3-4	5-6	5-6
Sample Date:	10/10/2011	10/10/2011	10/24/2012	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011
Units:	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
1,1,1-Trichloroethane	<11	<11	<11	<13	<100	<110	<190	<220	<620	<28	<51	<11	<24
1,1,2,2-Tetrachloroethane	<14	<14	<14	<16	<130	<140	<240	<280	<780	<36	<65	<14	<31
1,1,2-Trichloro-1,2,2-trifluoroethane	<15	<15	<15	<18	<140	<150	<270	<310	<870	<40	<72	<15	<34
1,1,2-Trichloroethane	<11	<11	<11	<13	<100	<110	<190	<220	<620	<28	<51	<11	<24
1,1-Dichloroethane	<8.1	<8.1	<8.1	<9.4	<74	<80	<140	<170	<460	<21	<38	<8.1	<18
1,1-Dichloroethene	<7.9	<7.9	<7.9	<9.2	<73	<78	<140	<160	<450	<21	<37	<7.9	<18
1,2,4-Trichlorobenzene	<19	<19	<19	<21	<170	<180	<320	<380	<1,100	<48	<87	<19	<41
1,2,4-Trimethylbenzene	<9.8	<9.8	<9.8	<11	<90	<970	<170	<200	<560	<25	<46	**10 J**	<22
1,2-Dibromoethane (EDB)	<15	<15	<15	<18	<140	<150	<270	<310	<870	<40	<72	<15	<34
1,2-Dichloro-1,1,2,2-tetrafluoroethane	<14	<14	<14	<16	<130	<140	<240	<290	<800	<36	<66	<14	<31
1,2-Dichlorobenzene	<12	<12	<12	<14	<110	<120	<210	<250	<680	<31	<57	<12	<27
1,2-Dichloroethane	<8.1	<8.1	<8.1	<9.4	<74	<80	<140	<170	<460	<21	<38	<8.1	<18
1,2-Dichloropropane	<9.2	<9.2	<9.2	<11	<85	<91	<160	<190	<530	<24	<44	<9.2	<21
1,3,5-Trimethylbenzene	<9.8	<9.8	<9.8	<11	<90	<970	<170	<200	<560	<25	<46	<9.8	<22
1,3-Dichlorobenzene	<12	<12	<12	<14	<110	<120	<210	<250	<680	<31	<57	<12	<27
1,4-Dichlorobenzene	<12	<12	<12	<14	<110	<120	<210	<250	<680	<31	<57	<12	<27
2-Butanone (MEK)	<12	<12	<12	<14	<110	**16,000**	<200	<240	<670	**460**	**670**	**320**	**640**
2-Hexanone	<8.2	<8.2	<8.2	<9.5	<75	<810	<140	<170	<470	**65 J**	**120 J**	**9.7 J**	**79**
4-Ethyltoluene	<9.8	<9.8	<9.8	<11	<90	<970	<170	**310 J**	<560	<25	<46	**16 J**	<22
4-Methyl-2-pentanone (MIBK)	<8.2	<8.2	<8.2	<9.5	<75	**1,600 J**	<140	<170	<470	<21	<39	<8.2	<18
Acetone	**46**	**72**	**17 J**	**26 J**	<87	**59,000**	<160	<190	<540	<25	**3,800**	**2,500 J**	**220**
Benzene	<6.4	<6.4	<6.4	<7.4	**270**	**14,000**	**150,000**	**620,000**	**38,000**	**250**	**33 J**	**79**	**170**
Benzyl chloride	<21	<21	<21	<24	<1,200	<2,000	<1,800	<1,100	<2,900	<54	<97	<21	<46
Bromodichloromethane	<13	<13	<13	<16	<120	<130	<230	<270	<760	<35	<63	<13	<30
Bromoform	<21	<21	<21	<24	<190	<200	<360	<420	<1,200	<54	<97	<21	<46
Bromomethane	<7.8	<7.8	<7.8	<9	<71	<760	<130	<160	<440	<20	<37	<7.8	<17
Carbon disulfide	<6.2	<6.2	<6.2	<7.2	<57	**1,000 J**	**620 J**	**1,100**	<350	**82**	<29	**19 J**	**120**
Carbon tetrachloride	<25	<25	<25	<29	<1,400	<2,500	<2,200	<1,300	<3,600	<65	<120	<25	<56
Chlorobenzene	<9.2	<9.2	<9.2	<11	<84	<91	<160	<190	<520	<24	<43	<9.2	<20
Chloroethane	<5.3	<5.3	<5.3	<6.1	<48	**1,100**	<92	<110	<300	<14	<25	<5.3	<12
Chloroform	<9.8	<9.8	<9.8	<11	**2,000 J+**	<960	<170	<500	<1,400	<25	<46	<9.8	<22
Chloromethane	<4.1	<4.1	<4.1	<4.8	<38	<41	<72	<84	<230	<11	<19	<4.1	<9.2
cis-1,2-Dichloroethene	<7.9	<7.9	<7.9	<9.2	<73	<78	<140	<160	<450	<21	<37	<7.9	<18
cis-1,3-Dichloropropene	<9.1	<9.1	<9.1	<11	<83	<89	<160	<190	<520	<24	<43	<9.1	<20
Dibromochloromethane	<17	<17	<17	<20	<160	<170	<300	<350	<970	<44	<80	<17	<38
Dichlorodifluoromethane	<9.9	<9.9	<9.9	<11	<570	<970	<860	<500	<1,400	<26	<47	<9.9	<22
Ethylbenzene	<8.7	<8.7	<8.7	<10	<80	<85	**290 J**	**8,500**	<490	**23 J**	<41	**23**	<19
Hexachlorobutadiene	<21	<21	<21	<25	<200	<210	<370	<440	<1,200	<55	<100	<21	<47
m,p-Xylene	<8.7	<8.7	**14 J**	<10	<80	**11,000**	**600**	**17,000**	<490	**53**	**88**	**76**	**40**
Methylene chloride	<6.9	<6.9	<6.9	<8	<64	<68	<120	<140	<400	<18	<33	<6.9	<15
Naphthalene	<16	<16	<16 J	<18	<900	<1,500	<1,400	<800	<2,200	<41	<74	<16	<35
o-Xylene	<8.7	<8.7	<8.7	<10	<80	**1,200 J**	<150	**6,900**	<490	<23	<41	**18**	<19
Styrene	<8.5	<8.5	<8.5	<9.9	<78	<84	<150	<170	<480	<22	<40	<8.5	<19
Tetrachloroethene	<14	<14	<14	<16	<120	<130	<240	<280	<770	<35	<64	<14	<30
Toluene	<7.5	<7.5	<7.5	<8.7	**690**	**7,700**	**2,100**	**16,000**	**650 J**	**640**	**50 J**	**360**	**510**
trans-1,2-Dichloroethene	<7.9	<7.9	<7.9	<9.2	<73	<78	<140	<160	<450	<21	<37	<7.9	<18
trans-1,3-Dichloropropene	<18	<18	<18	<21	<170	<180	<310	<370	<1,000	<47	<85	<18	<40
Trichloroethene	<11	<11	<11	<12	<99	<110	<190	<220	<610	<28	<51	<11	<24
Trichlorofluoromethane	<11	<11	<11	<13	<100	<110	<190	<230	<640	<29	<53	<11	<25
Vinyl acetate	<14	<14	<14	<16	<130	<140	<240	<290	<800	<37	<66	<14	<31
Vinyl chloride	<5.1	<5.1	<5.1	<5.9	<47	<50	<89	<100	<290	<13	<24	<5.1	<11
Xylenes, total	<8.7	<8.7	**19**	<10	<80	**12,000**	**600**	**24,000**	<490	**53**	**88**	**95**	**40**

Notes:
1. * = LNAPL present in adjacent monitoring well during soil gas sampling event.
2. < = Compound not detected at the indicated detection limit. J = Estimated value. J+ = Estimated value with a potentially high bias. ug/m^3 = micrograms per cubic meter.
3. NR = Not reported.

TABLE 36
SOIL GAS SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Downgradient Site Boundary			Off-Site					
Sample Location:	SG-23	SG-24	SG-25	SG-21	SG-21	SG-22	SG-26	SG-27	SG-28
Sample Depth (ft):	4-5	4-5	4-5	5-6	5-6	5-6	1.5	1.5	1.5
Sample Date:	2/21/2014	2/21/2014	2/21/2014	10/24/2012	1/16/2013	10/24/2012	5/26/2015	5/26/2015	5/26/2015
Units:	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3	ug/m3
1,1,1-Trichloroethane	<140	<5.9	<1.8	<21	<85	<11	<15	<44	<1.1
1,1,2,2-Tetrachloroethane	<190	<7.9	<2.4	<27	<71	<14	<20	<58	<1.5
1,1,2-Trichloro-1,2,2-trifluoroethane	<500	<21	<6.2	<30	<160	<15	<53	<150	<3.8
1,1,2-Trichloroethane	<150	<6.1	<1.8	<21	<85	<11	<16	<45	<1.1
1,1-Dichloroethane	<120	<4.9	<1.5	<16	<63	<8.1	<12	<36	<0.89
1,1-Dichloroethene	<110	<4.8	<1.4	<16	<82	<7.9	<22	<63	<1.6
1,2,4-Trichlorobenzene	<1300	<140	<44 J	<37	<540	<19	<140	<400	<9.9
1,2,4-Trimethylbenzene	<320	**59 J**	**57**	**500 J+**	<100	<9.8	<34	<98	**16**
1,2-Dibromoethane (EDB)	<230	<9.6	<2.9	<30	<160	<15	<25	<71	<1.8
1,2-Dichloro-1,1,2,2-tetrafluoroethane	<430	<18	<5.4	<28	<110	<14	<46	<130	<3.3
1,2-Dichlorobenzene	<310	<13	<3.9	<24	<94	<12	<33	<96	<2.4
1,2-Dichloroethane	<140	<5.9	<1.8	**40 J+**	<84	<8.1	<15	<44	<1.1
1,2-Dichloropropane	<440	<18	<5.5	<18	<72	<9.2	<47	<140	<3.4
1,3,5-Trimethylbenzene	<250	**14 J**	**19**	**60 J+**	<77	<9.8	<26	<76	**4.6**
1,3-Dichlorobenzene	<260	<11	<3.3	<24	<94	<12	<28	<81	<2
1,4-Dichlorobenzene	<360	<15	<4.5	<24	<94	<12	<38	<110	<2.8
2-Butanone (MEK)	**520 J**	**11 J**	**15**	<23	<120	<12	**53 J**	<72	**3.3**
2-Hexanone	<140	<5.9	<1.8	**250 J+**	<85	<8.2	<15	<44	<1.1
4-Ethyltoluene	<370	**41**	**58**	<19	<77	<9.8	<39	<110	<2.8
4-Methyl-2-pentanone (MIBK)	<220	<9.2	<2.8	<16	<64	<8.2	<24	<68	<1.7
Acetone	**6,400**	**84**	**140**	**580 J+**	<150	**45**	**4,000**	**620**	**51**
Benzene	**170,000**	**2,100**	**230**	**430 J+**	**610**	<6.4	<11	<31	<0.77
Benzyl chloride	<340	<14	<4.2	<41	<110	<21	<36	<100	<2.6
Bromodichloromethane	<180	<7.4	<2.2	<26	<100	<13	<19	<54	<1.4
Bromoform	<290	<12	<3.6	<41	<220	<21	<31	<89	<2.2
Bromomethane	<520	<22	<6.5	<15	<81	<7.8	<56	<160	<4
Carbon disulfide	<97	**7.9 J**	**22**	<12	<65	<6.2	**50 J**	<30	**5.8**
Carbon tetrachloride	<160	<6.7	<2	<50	<130	<25	<17	<50	<1.2
Chlorobenzene	<120	<4.9	<1.5	<18	<48	<9.2	<13	<36	<0.9
Chloroethane	<320	<14	<4.1	<10	<190	<5.3	<35	<100	<2.5
Chloroform	<190	<7.7	<2.3	<19	<51	<9.8	<20	<57	<1.4
Chloromethane	<160	<6.8	<2	<8.1	<86	<4.1	<17	<50	<1.2
cis-1,2-Dichloroethene	<140	<5.9	<1.8	**61 J+**	<82	<7.9	<15	<43	<1.1
cis-1,3-Dichloropropene	<190	<7.9	<2.4	<18	<71	<9.1	<20	<58	<1.4
Dibromochloromethane	<270	<11	<3.4	<34	<89	<17	<29	<83	<2.1
Dichlorodifluoromethane	<290	<12	<3.6	<19	<77	<9.9	<31	<88	<2.2
Ethylbenzene	**7,900**	**460**	**92**	**2,300**	**520**	<8.7	<12 J	**46**	**10**
Hexachlorobutadiene	<1800	<77	<23	<42	<220	<21	<200	<570	<14
m,p-Xylene	**2,100**	**89**	**110**	**440 J+**	**110J**	<8.7	**39 J**	**95**	**15**
Methylene chloride	<100	<4.2	<1.3	<14	<72	<6.9	**33 J**	<31	<0.77
Naphthalene	<1200 J	<49 J	**36 J-**	<31 J	<380	<16 J	<130	<360	<9
o-Xylene	**730**	**28 J**	**39**	**130 J+**	**70J**	<8.7	**28 J**	<29	**6.4**
Styrene	<100	<4.2	<1.3	<17	<66	<8.5	<11	**33**	<0.77
Tetrachloroethene	<140	<5.8	<1.7	<27	<110	<14	**79 J**	<43	<1.1
Toluene	**2,200**	**58**	**67**	<15	**100J**	<7.5	**100**	**210**	**4.1**
trans-1,2-Dichloroethene	<160	<6.6	<2	<16	<82	<7.9	<17	<49	<1.2
trans-1,3-Dichloropropene	<160	<6.7	<2	<36	<71	<18	<17	<49	<1.2
Trichloroethene	<230	<9.4	<2.8	<21	<84	<11	<24	<69	<1.7
Trichlorofluoromethane	<440	<18	<5.5	<22	<88	<11	<47	<140	**35**
Vinyl acetate	<200	<8.5	<2.6	<28	<73	<14	<22	<63	<1.6
Vinyl chloride	<120	<5.1	<1.5	<10	<40	<5.1	<13	<38	<0.94
Xylenes, total	NR	NR	NR	**570 J+**	**180J**	<8.7	**67**	**95**	**21.4**

Notes:
1. * = LNAPL present in adjacent monitoring we
2. < = Compound not detected at the indicated d
3. NR = Not reported.

TABLE 36
SOIL GAS SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Sample Area:	R&H Oil						Tropicana Energy			Subslab	Downgradient Site Boundary		
Sample Location:	SG-12	SG-13	SG-14	SG-15	SG-16	SG-17	SG-18	SG-19	SG-20	SS-2	SG-23	SG-24	SG-25
Sample Depth (ft):	5-6	3.5-4.5	5-6	5-6	5-6	5-6	3-4	5-6	5-6	1	4-5	4-5	4-5
Sample Date:	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/10/2011	10/24/2012	2/21/2014	2/21/2014	2/21/2014
Units:	%	%	%	%	%	%	%	%	%	%	%	%	%
Carbon dioxide	**8.1**	**72**	**1.1**	**1.4**	**5.8**	**0.8**	**14**	**8.7**	**3**	**4.2**	**2**	**3.2**	**0.74J**
Carbon monoxide	<0.00046	**0.013**	**0.0051**	**0.015**	<0.0016	<0.00052	<0.00047	<0.0011	<0.0014	<0.0004	<0.0016	<0.0017	<0.0017
Ethane	<0.00028	<0.00024	**0.0011**	**0.0011**	<0.00095	<0.00031	<0.00028	<0.00067	<0.00085	<0.00024	<0.0017	<0.000018	<0.000018
Ethene	<0.00023	<0.0002	<0.00051	**0.0003**	<0.00079	<0.00026	<0.00023	<0.00056	<0.00071	<0.0003	<0.0018	<0.000019	<0.000019
Hydrogen	<0.011	**0.048**	<0.026	<0.01	<0.04	<0.013	<0.012	<0.028	<0.035	<0.016	**0.034**	<0.0048	<0.0048
Methane	**1.3**	**0.42**	**3.7**	**2.4**	**0.44**	**0.06**	**1.4**	**0.0026**	<0.00043	<0.00024	**15**	**0.018**	**0.00047**
Nitrogen	**88**	**25**	**83**	**90**	**68**	**92**	**83**	**86**	**89**	**73**	**67**	**76**	**75**
Oxygen	**1.9**	**0.77**	**11**	**5.9**	**17**	**7.4**	**1.5**	**7.5**	**12**	**18**	**11**	**16**	**19**

Sample Area:	Off-Site				
Sample Location:	SG-21	SG-22	SG-26	SG-27	SG-28
Sample Depth (ft):	5-6	5-6	1.5	1.5	1.5
Sample Date:	10/24/2012	10/24/2012	5/29/2015	5/26/2015	5/29/2015
Units:	%	%	%	%	%
Carbon dioxide	**3.5**	**1.1**	**12**	**6.4**	**5.7**
Carbon monoxide	<0.00039	<0.0004	<0.0048	<0.019	<0.018
Ethane	<0.00024	<0.00024	<0.017	<0.0031	<0.00018
Ethene	<0.0003	<0.0003	<0.0017	<0.0031	<0.00018
Hydrogen	<0.016	<0.016	<0.0017	<0.019	<0.018
Methane	**0.0014**	<0.00024	**0.44**	**0.95**	**0.016**
Nitrogen	**73**	**75**	**85**	**84**	**82**
Oxygen	**20**	**20**	**3.7**	**12**	**15**

TABLE 37
SURFACE WATER SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:	SW-1	SW-2	SW-3	SW-4	SW-5	Screening
Sample Date:	10/11/2011	10/11/2011	10/11/2011	10/11/2011	10/11/2011	Value[1]
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Physical Properties						
pH	5.9	6.3	6.3	6.6	6.7	--
Dissolved Oxygen (mg/L)	2.7	3.6	2.9	3.2	3.4	--
Conductivity (umhos/cm)	390	310	330	300	320	--
Total Metals by US EPA Method 6010B/7471A						
Aluminum	0.031 J	0.025 J	0.029 J	0.022 J	0.022 J	6.95
Arsenic	0.0065 J	0.0055 J	0.0046 J	0.0044 J	0.0047 J	0.45
Barium	0.066	0.064	0.063	0.057	0.065	35.8
Chromium	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016	7.26
Cobalt	0.00067 J	0.00069 J	<0.00063	<0.00063	0.00074 J	--
Copper	0.0086 J	0.008 J	0.0088 J	0.0063 J	0.008 J	101
Lead	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029	8.21
Manganese	0.044	0.051	0.025	0.011	0.07	586
Mercury	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026	3.27
Nickel	<0.0018	0.0018 J	0.0026 J	0.0021 J	<0.0018	266
Selenium	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	1.33
Thallium	0.0078	<0.0078	<0.0078	<0.0078	<0.0078	0.05
Vanadium	0.0034 J	0.004 J	0.0056 J	0.0035 J	0.0043 J	1.3
Zinc	0.066	0.072	0.081	0.064	0.061	105
Volatile Organic Compounds (VOCs) by US EPA Method 8260B						
1,1,1,2-Tetrachloroethane	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	--
1,1,1-Trichloroethane	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	3,744
1,1,2,2-Tetrachloroethane	<0.00022 J	<0.00022 J	<0.00022 J	<0.00022 J	<0.00022 J	--
1,1,2-Trichloroethane	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	--
1,1-Dichloroethane	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	--
1,1-Dichloroethene	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	200
1,1-Dichloropropene	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	--
1,2,3-Trichloropropane	<0.00029 J	<0.00029 J	<0.00029 J	<0.00029 J	<0.00029 J	--
1,2,4-Trichlorobenzene	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031	--
1,2,4-Trimethylbenzene	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	--
1,2-Dibromo-3-Chloropropane	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J	--
1,2-Dibromoethane	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	--
1,2-Dichlorobenzene	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	--
1,2-Dichloroethane	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	125
1,2-Dichloropropane	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	--
1,3,5-Trimethylbenzene	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	--
1,3-Dichlorobenzene	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	--
1,3-Dichloropropane	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022	--
1,4-Dichlorobenzene	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	--
2,2-Dichloropropane	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	--
2-Butanone (MEK)	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J	11,790
2-Chlorotoluene	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	--
2-Hexanone	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035	--
4-Chlorotoluene	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014	--
4-Isopropyltoluene	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	--
4-Methyl-2-pentanone (MIBK)	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	166
Acetone	0.0084 J-	0.0087 J-	0.0067 J-	0.0071 J-	0.0052 J-	66.6
Benzene	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	95
Bromobenzene	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	--
Bromodichloromethane	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	--
Bromoform	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019	--
Bromomethane	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	--

TABLE 37
SURFACE WATER SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

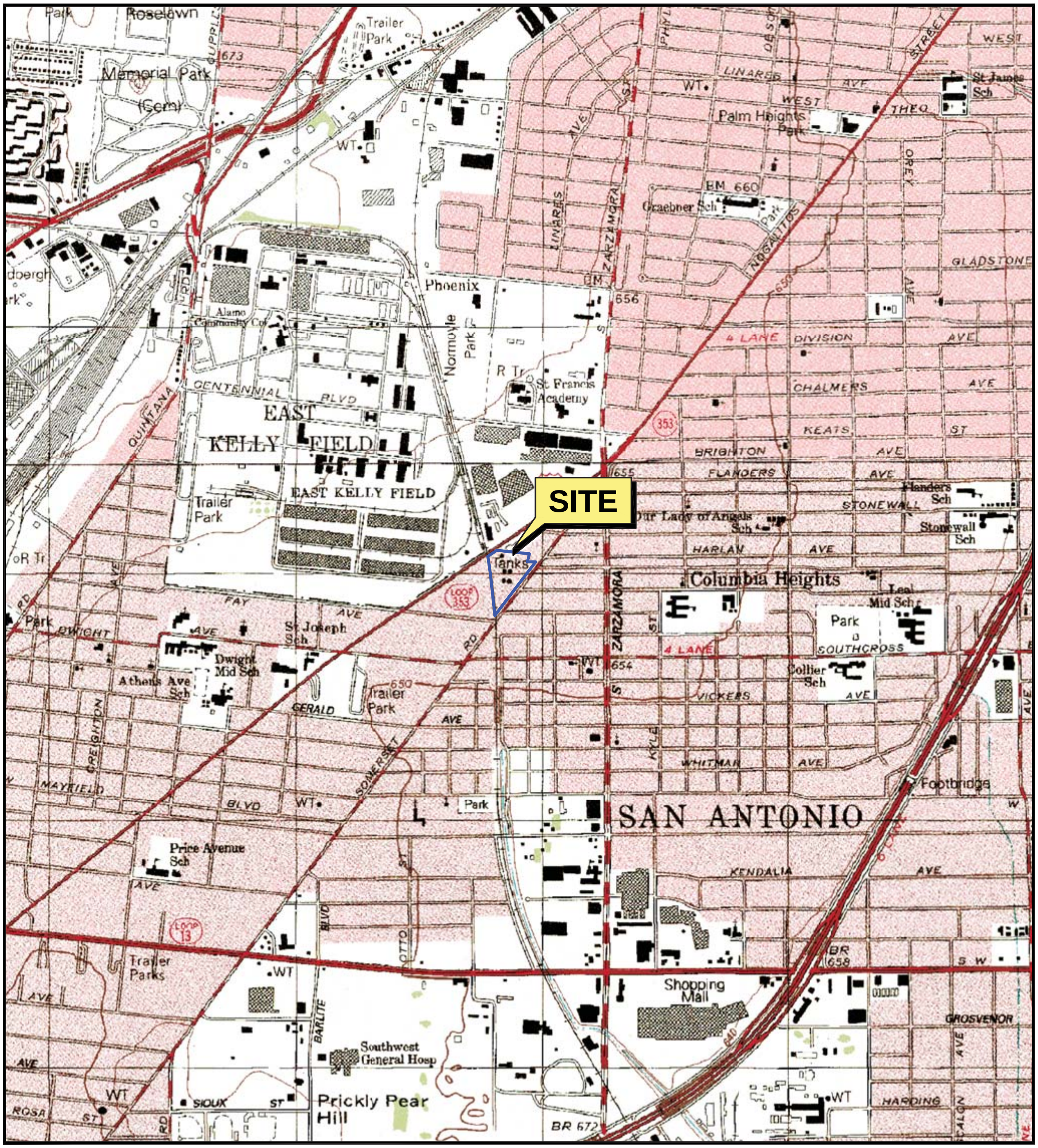
Location ID:	SW-1	SW-2	SW-3	SW-4	SW-5	Screening
Sample Date:	10/11/2011	10/11/2011	10/11/2011	10/11/2011	10/11/2011	Value[1]
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Volatile Organic Compounds (VOCs) by US EPA Method 8260B continued						
Carbon disulfide	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024	--
Carbon tetrachloride	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	107
Chlorobenzene	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	--
Chloroethane	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	--
Chloroform	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	100
Chloromethane	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	--
cis-1,2-Dichloroethene	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	--
cis-1,3-Dichloropropene	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	--
Dibromochloromethane	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	--
Dibromomethane	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052	--
Dichlorodifluoromethane	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J	--
Ethylbenzene	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	--
Hexachlorobutadiene	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	--
Iodomethane	<0.002	<0.002	<0.002	<0.002	<0.002	--
Isopropylbenzene	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	--
Methyl tert-butyl ether	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	--
Methylene Chloride	<0.00015 J	<0.00015 J	<0.00015 J	<0.00015 J	<0.00015 J	38.9
Naphthalene	<0.00032	<0.00032	<0.00032	<0.00032	<0.00032	--
n-Butylbenzene	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016	--
N-Propylbenzene	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	--
sec-Butylbenzene	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012	--
Styrene	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	--
tert-Butylbenzene	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	--
Tetrachloroethene	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	--
Toluene	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015	93.7
trans-1,2-Dichloroethene	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	--
trans-1,3-Dichloropropene	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021	--
Trichloroethene	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018	2.52
Trichlorofluoromethane	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	--
Vinyl chloride	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	1.13
Xylenes, Total	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	7.56
Semivolatile Organic Compounds (SVOCs) by US EPA Method 8270C						
2,4,5-Trichlorophenol	<0.00025	<0.00025	<0.00025	<0.00042 J	<0.00025	--
2,4,6-Trichlorophenol	<0.00018	<0.00018	<0.00018	<0.0003	<0.00018	--
2,4-Dichlorophenol	<0.00015	<0.00015	<0.00015	<0.00025 J	<0.00015	--
2,4-Dimethylphenol	<0.00031	<0.00031	<0.00031	<0.00052	<0.00031	--
2,4-Dinitrophenol	<0.00038	<0.00038	<0.00038	<0.00065 J	<0.00038	--
2,4-Dinitrotoluene	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013	--
2,6-Dinitrotoluene	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079	--
2-Chloronaphthalene	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079	--
2-Chlorophenol	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013	--
2-Methylnaphthalene	<0.000069	<0.000069	<0.000069	<0.00012 J	<0.000069	--
2-Nitroaniline	<0.00019	<0.00019	<0.00019	<0.00032 J	<0.00019	--
2-Nitrophenol	<0.00022	<0.00022	<0.00022	<0.00037 J	<0.00022	--
3 & 4 Methylphenol	<0.0002	<0.0002	<0.0002	<0.00033 J	<0.0002	--
3,3'-Dichlorobenzidine	<0.00018	<0.00018	<0.00018	<0.0003 J	<0.00018	--
3-Nitroaniline	<0.00016	<0.00016	<0.00016	<0.00027 J	<0.00016	--
4,6-Dinitro-2-methylphenol	<0.00082 J	<0.00082 J	<0.00082 J	<0.0014 J	<0.00082 J	--
4-Bromophenyl phenyl ether	<0.000099	<0.000099	<0.000099	<0.00017	<0.000099	--
4-Chloro-3-methylphenol	<0.00017	<0.00017	<0.00017	<0.00028 J	<0.00017	--
4-Chloroaniline	<0.00021	<0.00021	<0.00021	<0.00035 J	<0.00021	--
4-Chlorophenyl phenyl ether	<0.000099	<0.000099	<0.000099	<0.00017	<0.000099	--

TABLE 37
SURFACE WATER SAMPLING RESULTS
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Location ID:	SW-1	SW-2	SW-3	SW-4	SW-5	Screening
Sample Date:	10/11/2011	10/11/2011	10/11/2011	10/11/2011	10/11/2011	Value[1]
Constituent	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Semivolatile Organic Compounds (SVOCs) by US EPA Method 8270C continued						
4-Nitroaniline	<0.00025	<0.00025	<0.00025	<0.00042 J	<0.00025	--
4-Nitrophenol	<0.00055 J	<0.00055 J	<0.00055 J	<0.00093 J	<0.00055 J	--
Acenaphthene	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079	--
Acenaphthylene	<0.000059	<0.000059	<0.000059	<0.0001 J	<0.000059	--
Aniline	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079	--
Anthracene	<0.000049	<0.000049	<0.000049	<0.000083 J	<0.000049	--
Benzo[a]anthracene	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079	--
Benzo[a]pyrene	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079	3.6
Benzo[b]fluoranthene	<0.000069	<0.000069	<0.000069	<0.00012 J	<0.000069	--
Benzo[g,h,i]perylene	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079	--
Benzo[k]fluoranthene	<0.000089	<0.000089	<0.000089	<0.00015 J	<0.000089	--
Benzyl alcohol	<0.00017	<0.00017	<0.00017	<0.00028 J	<0.00017	--
Bis(2-chloroethoxy)methane	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013	--
Bis(2-chloroethyl)ether	<0.00015	<0.00015	<0.00015	<0.00025 J	<0.00015	--
Bis(2-chloroisopropyl) ether	<0.00039	<0.00039	<0.00039	<0.00067 J	<0.00039	--
Bis(2-ethylhexyl) phthalate	<0.00036	<0.00036	<0.00036	<0.00062 J	<0.0028	7.99
Butyl benzyl phthalate	<0.00012	<0.00012	<0.00012	<0.00059	<0.00012	--
Chrysene	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079	--
Dibenz(a,h)anthracene	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079	--
Dibenzofuran	<0.000079	<0.000079	0.00024 J	<0.00013	<0.000079	--
Diethyl phthalate	<0.0015	<0.0015	<0.0015	<0.0025	<0.0015	16,508
Dimethyl phthalate	<0.000069	<0.000069	<0.000069	<0.00012	<0.000069	--
Di-n-butyl phthalate	<0.00011	<0.00011	<0.00011	<0.00018	<0.00011	0.8
Di-n-octyl phthalate	<0.00016	<0.00016	<0.00016	<0.00027 J	<0.00016	--
Fluoranthene	<0.000069	<0.000069	<0.000069	<0.00012	<0.000069	--
Fluorene	<0.000069	<0.000069	<0.000069	<0.00012	<0.000069	--
Hexachlorobenzene	<0.00011	<0.00011	<0.00011	<0.00018	<0.00011	--
Hexachlorocyclopentadiene	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013	--
Hexachloroethane	<0.000099	<0.000099	<0.000099	<0.00017 J	<0.000099	--
Indeno[1,2,3-cd]pyrene	<0.000069	<0.000069	<0.000069	<0.00012 J	<0.000069	--
Isophorone	<0.00011	<0.00011	<0.00011	<0.00018 J	<0.00011	--
Nitrobenzene	<0.00011	<0.00011	<0.00011	<0.00018 J	<0.00011	--
N-Nitrosodi-n-propylamine	<0.000099	<0.000099	<0.000099	<0.00017 J	<0.000099	--
Pentachlorophenol	<0.0006 J	<0.0006 J	<0.0006 J	<0.001	<0.0006 J	1.6
Phenanthrene	<0.000059	<0.000059	<0.000059	<0.0001	<0.000059	--
Phenol	<0.000039 J	<0.000039 J	<0.000039 J	<0.000067 J	<0.000039 J	--
Pyrene	<0.00011	<0.00011	<0.00011	<0.00018	<0.00011	--

NOTES:
1. Screening Values for white-footed mouse via surface water exposure from Sample, et al, 1996 Appendix D, Table 12.
(Sample, B.E., D.M. Opresko, and G.W. Suter, II. Toxicological Benchmarks for Wildlife: 1996 Revision.
Health Sciences Research Division. Oak Ridge National Laboratory. ES/ER/TM-86/R3. June.)
2. Concentrations exceeding the Screening Levels are presented in **bold** type (not applicable).
3. < = Compound not detected at indicated detection limit. J = Estimated value. J- = Estimated value with potential low bias.
4. -- = Screening Level not established.

FIGURES



QUADRANGLE LOCATIONS

N

Scale in Feet

0 1000 2000

Source:
http://www.tnris.state.tx.us Terrell Wells and San Antonio West, TX
7.5 min. U.S.G.S. quadrangles, 1992 and 1993.

R&H OIL/TROPICANA ENERGY SITE

Figure 1

SITE LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Drainage Ditch

N

Approx. Scale in Feet

0 75 150

Source:
Google Earth, imagery dated 1/19/15. Sample locations from Removal Site Evaluation Reports (E&E, August 1998) and ERM Site Investigation Report (September 2004).

R&H OIL/TROPICANA ENERGY SITE

Figure 2

SITE MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Site Boundary Fence
- Soil Boring/Temporary Well (ERM, 2004)
- Groundwater Monitoring Well (RK, 1990-91)
- Composite Soil Sample (E&E, 1998)
- Composite Soil Area (E&E, 1998)
- Grab Soil Sample (E&E, 1998)

N

Approx. Scale in Feet

0 75 150

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03. Sample locations from Removal Site Evaluation Reports (E&E, August 1998) and ERM Site Investigation Report (September 2004).

R&H OIL/TROPICANA ENERGY SITE

Figure 3

SITE MAP - PREVIOUS INVESTIGATION LOCATIONS

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well

N

Approx. Scale in Feet

0 75 150

Source of photo:
Google Maps accessed January 12, 2016. Imagery date: January 19, 2015.

R&H OIL/TROPICANA ENERGY SITE

Figure 4

MONITORING WELL LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Sample Location
- Soil Boring Only Location

N

Approx. Scale in Feet

0 75 150

Source of photo:
Google Maps accessed January 12, 2016. Imagery date: January 19, 2015.

R&H OIL/TROPICANA ENERGY SITE

Figure 5

SOIL SAMPLE/BORING LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Drainage Ditch
- Ditch Surface Water Sample Location

N

Approx. Scale in Feet

0 75 150

Source of photo:
Google Maps accessed January 9, 2015. Imagery date: February 7, 2014.

R&H OIL/TROPICANA ENERGY SITE

Figure 6

DRAINAGE DITCH AND SURFACE WATER SAMPLE LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Gas Sample Location
- Sub Slab Sample Location

Notes:
1. Soil gas locations are co-located with well locations MW-12 through MW-20.
2. Soil gas sample points installed at 5-6 feet below ground surface (bgs) except for SG-13 (3.5-4.5 ft bgs) and SG-18 (3-4 ft bgs).

N

Approx. Scale in Feet

0 60 120

Source of photo:
Google Maps accessed January 12, 2016. Imagery date: January 19, 2015.

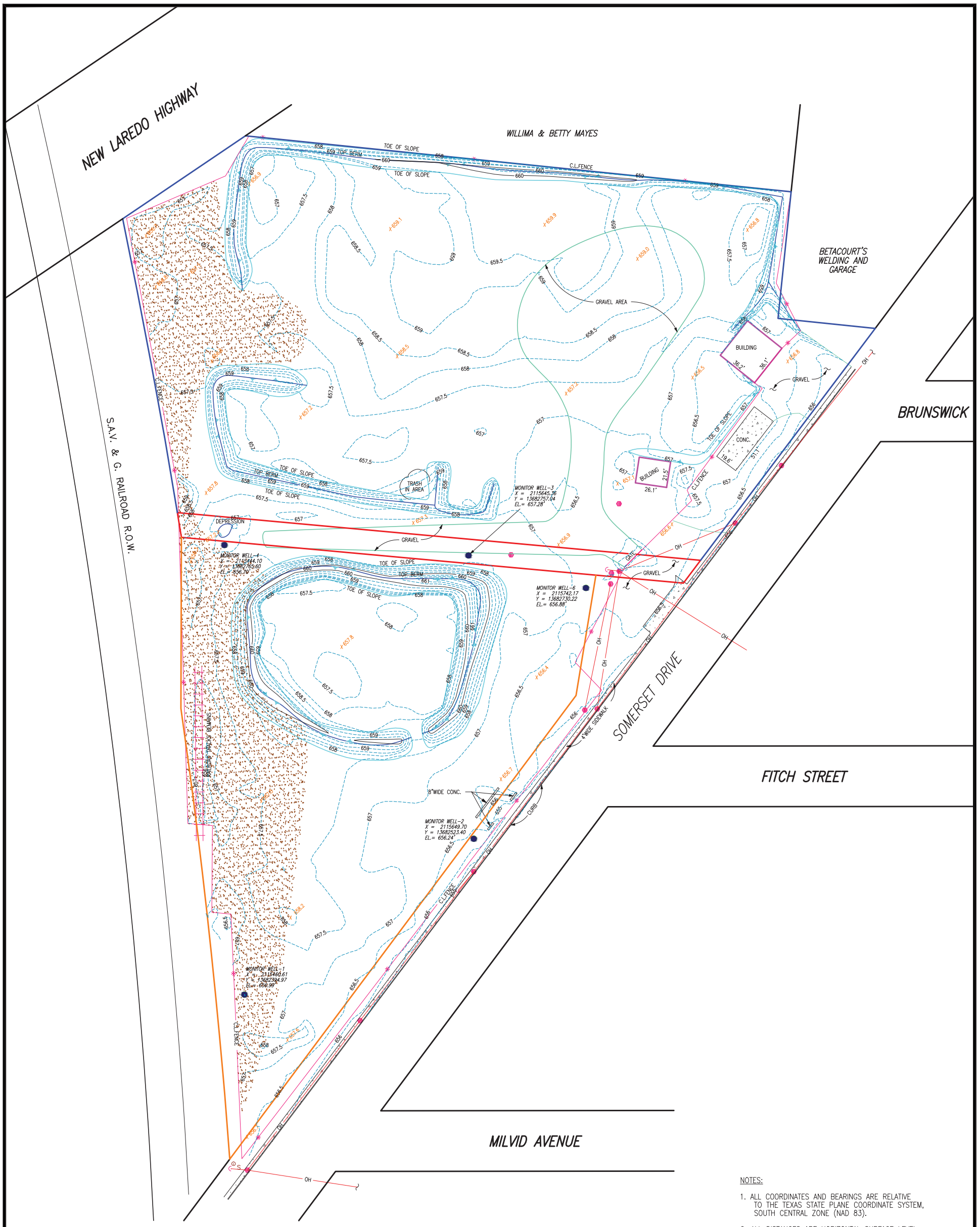
R&H OIL/TROPICANA ENERGY SITE

Figure 7

SOIL GAS SAMPLE LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- 657.5 — Ground Surface Elevation Contour (Ft MSL)
- Power Pole
- OH — Overhead Wire
- Guy Anchor
- Top Bank Berm
- Toe of Slope
- Chain-link Fence
- S — Utility Sign
- Projected Portion of Site with Direct Surface Water Runoff to Drainage Ditch West of Site

Source:
Topographic map develop by Doyle & Wachtstetter, Inc. based on survey performed September 20, 2007.

N

Scale in Feet

0 40 80

NOTES:

1. ALL COORDINATES AND BEARINGS ARE RELATIVE TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).
2. ALL DISTANCES ARE HORIZONTAL SURFACE LEVEL LENGTHS (SF= 0.99983626426).
3. ELEVATIONS ARE RELATIVE TO THE NAVD 88 (AS DETERMINED BY GEOID99) AND ARE BASED ON THE NGS CORS STATION EZSA.

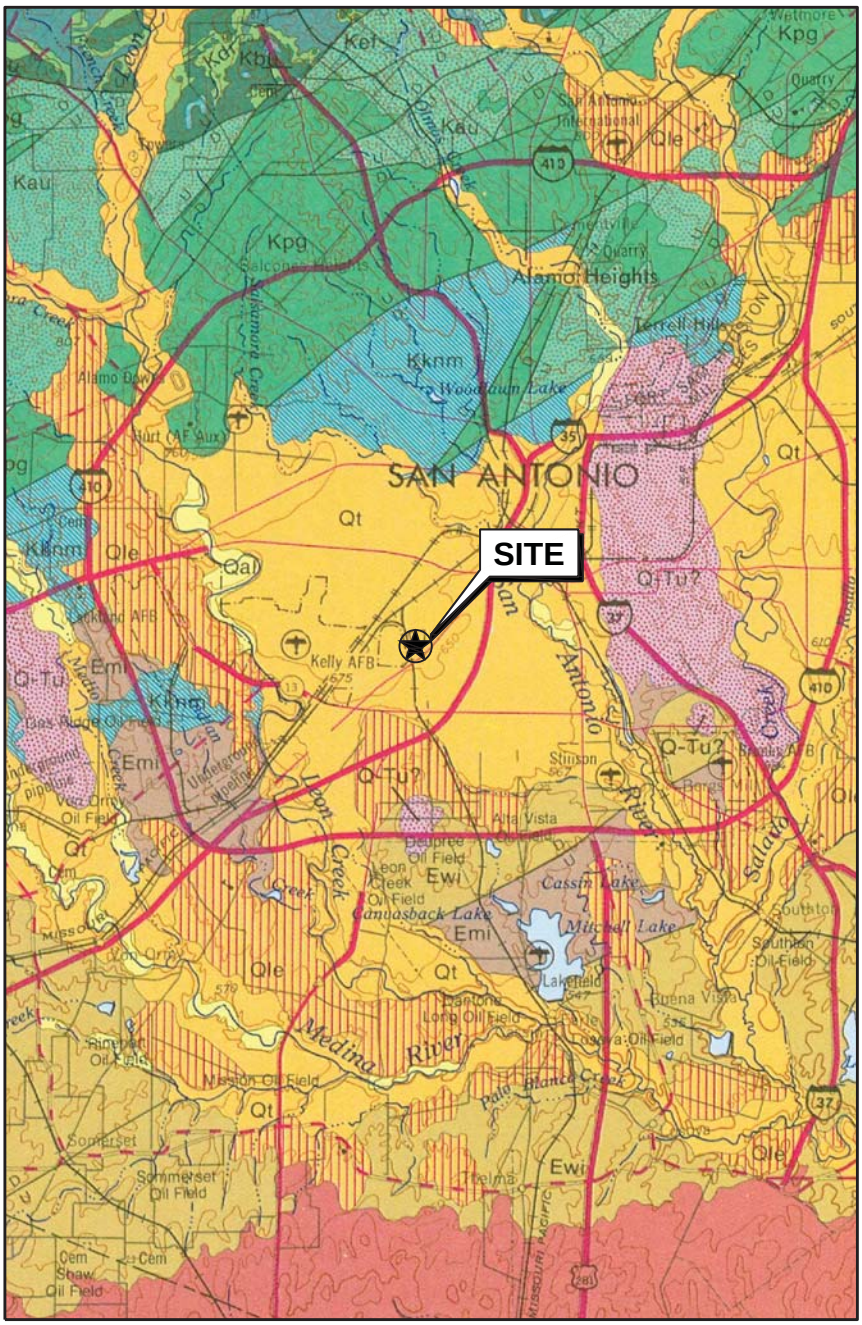
R&H OIL/TROPICANA ENERGY SITE

Figure 8

SITE TOPOGRAPHIC MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

(Formations Described in Separate Text)

Holocene	Qal	Alluvium	QUATERNARY
	Qt	Fluviatile terrace deposits	
Pleistocene	Qle	Leona Formation	
Pleistocene or Pliocene	Q-Tu	Uvalde Gravel	QUATERNARY OR TERTIARY
Eocene	Ec	Carrizo Sand	
	Ewi / Emi	Wilcox and Midway Groups Formations	TERTIARY
	Kknm	Navarro Group and Marlbrook Formations	
Upper Cretaceous	Kac / Kpg / Kau	Anacacho Limestone, Pecan Gap Chalk and Austin Chalk	CRETACEOUS
	Kbu	Buda Limestone	
	Kdr	Del Rio Clay	

N

Scale 1:250,000

0 5

Statute Miles

Source:
Bureau of Economic Geology. Geologic Atlas of Texas, San Antonio Sheet (Revised 1982).

R&H OIL/TROPICANA ENERGY SITE

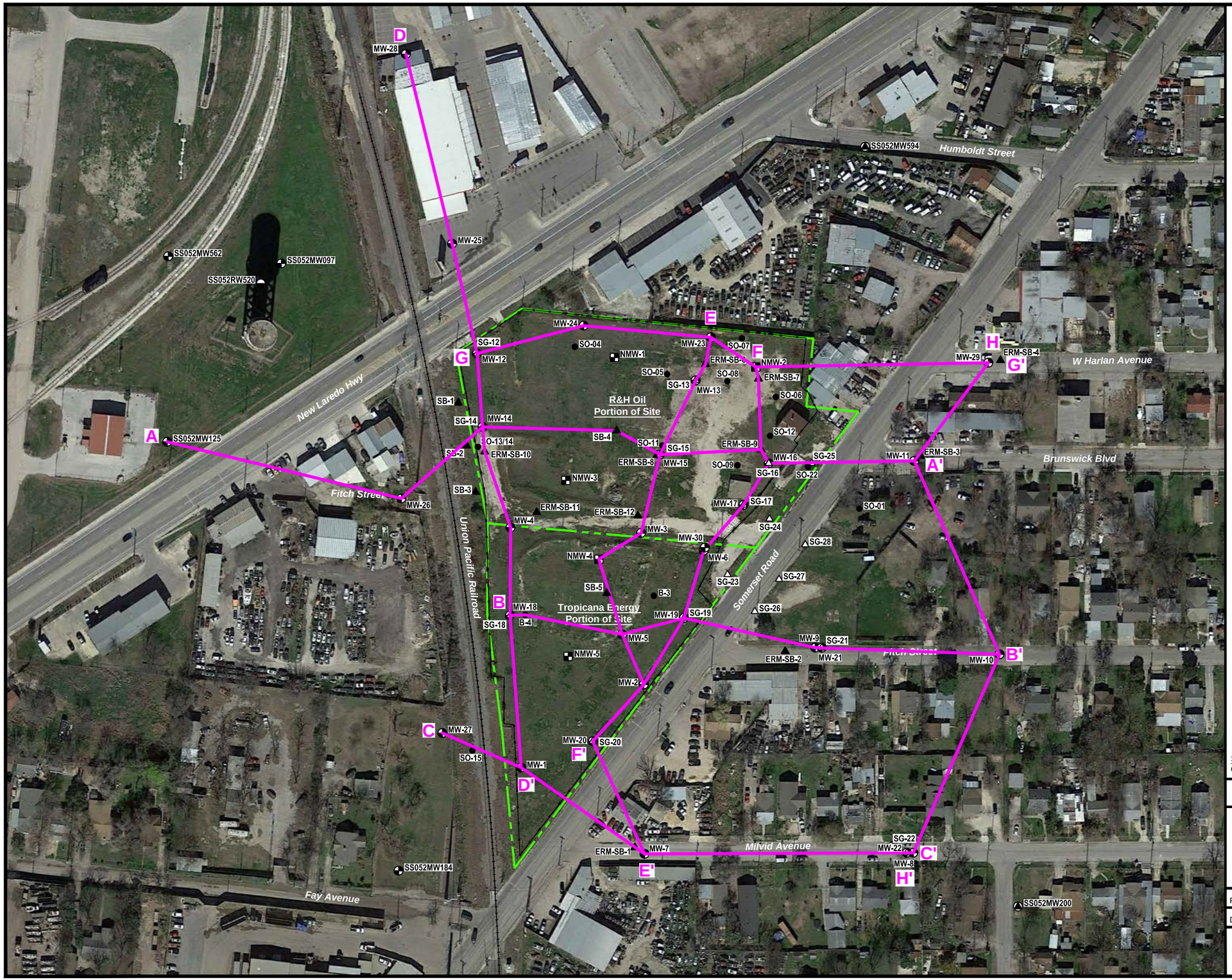
Figure 9

REGIONAL GEOLOGIC MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- Recovery Well
- Compliance Well
- Soil Boring/Temporary Well
- Grab Soil Sample
- Soil Gas Sample Location
- A A' Cross Section Location

N

Approx. Scale in Feet

0 75 150

Source of photo:
Google Maps accessed January 12, 2016. Imagery date: January 19, 2015.

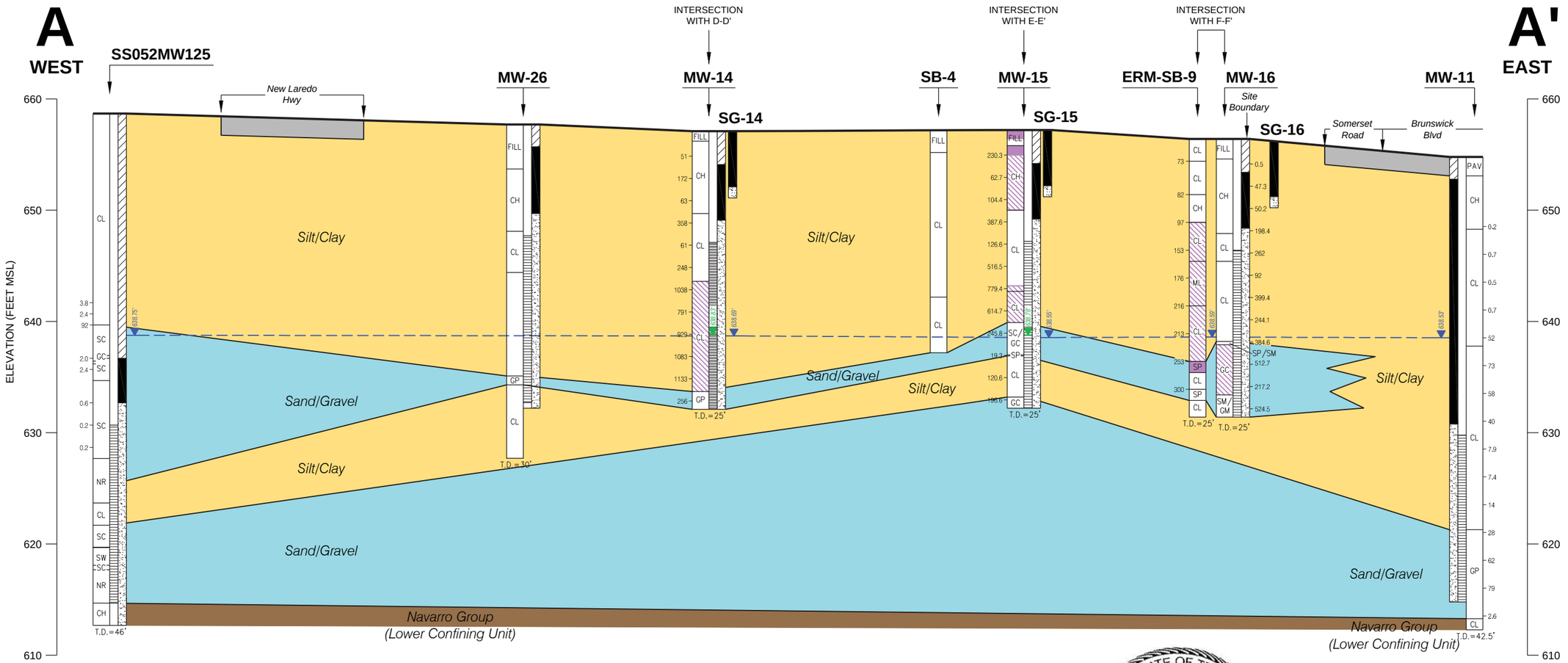
R&H OIL/TROPICANA ENERGY SITE

Figure 10

CROSS SECTION LOCATIONS

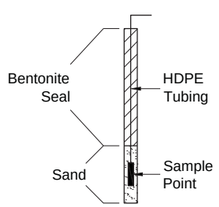
PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

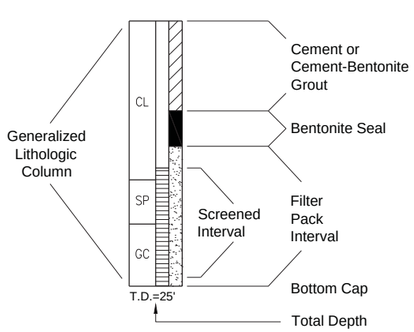


EXPLANATION

SOIL GAS POINT CONSTRUCTION



MONITORING WELL CONSTRUCTION



73 82 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Corrected Water Level (Ft MSL) Measured 4/21/14

LNAPL Level (Ft MSL) Measured 4/21/14

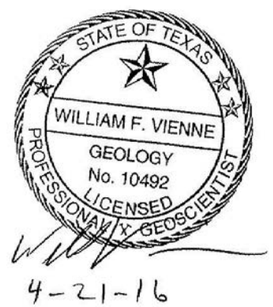
LNAPL OBSERVATION

Discoloration, Stain, Sheen

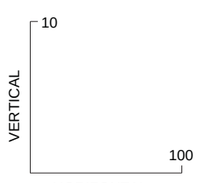
Saturated

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
OH	Organic Clay
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GM	Silty Gravel, Non-Plastic Fines(≥ 15% fines)
GP	Poorly Graded Gravel
GR	Gravel
SC	Clayey Sand, Plastic Fines (≥ 15% fines)
SM	Silty Sand, Non-Plastic Fines (≥ 15% fines)
SP	Poorly Graded Sand
SW	Well Graded Sand



SCALE IN FEET



10x Vertical Exaggeration

Notes:
1. See Figure 10 for cross section location.
2. Lithologic information for boring ERM-SB-9 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-125 from Kelly Air Force Base Zone 4 RI, CH2MHILL, 1994.

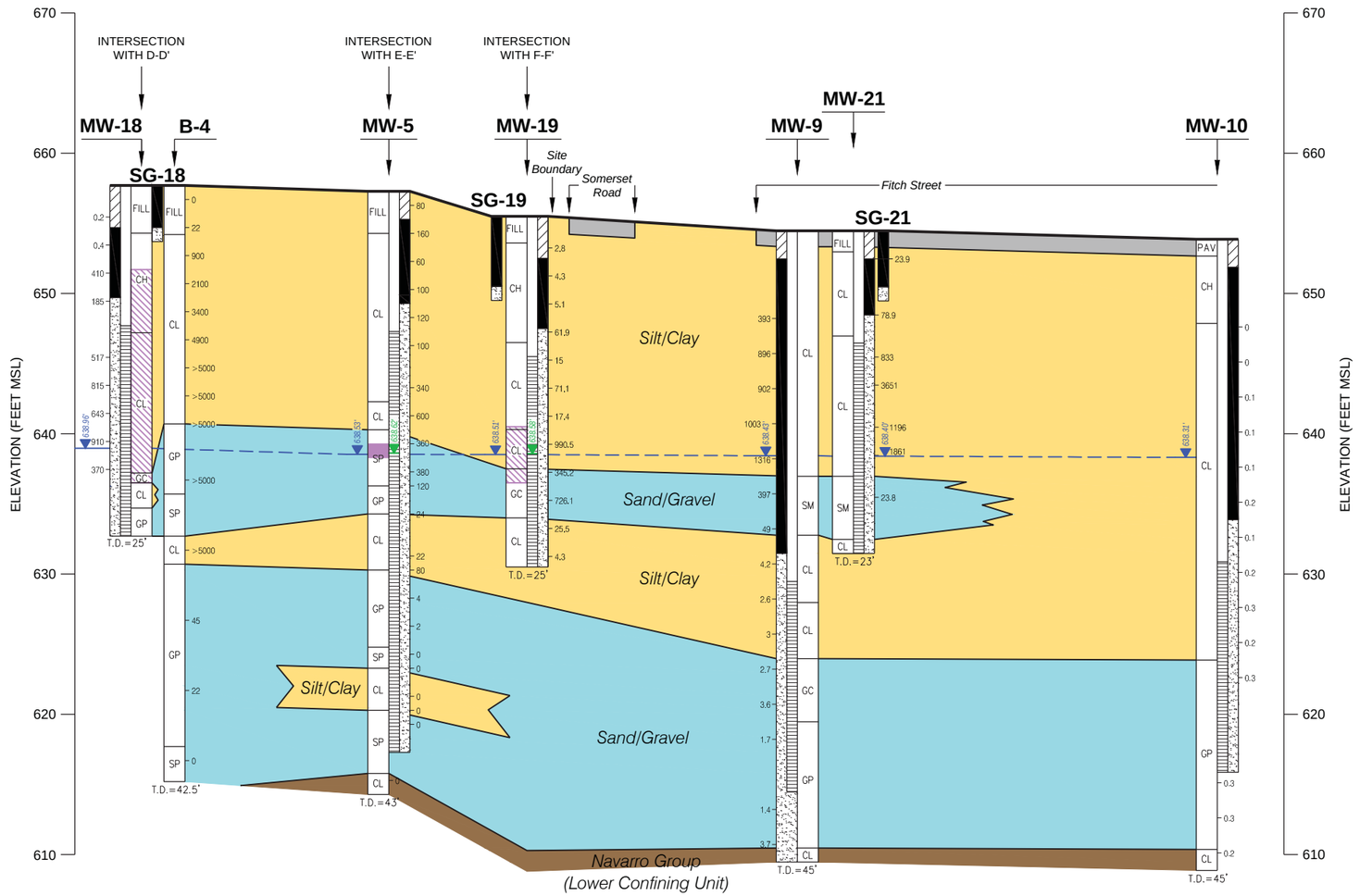
R&H OIL/TROPICANA ENERGY SITE

Figure 11

CROSS SECTION A-A'

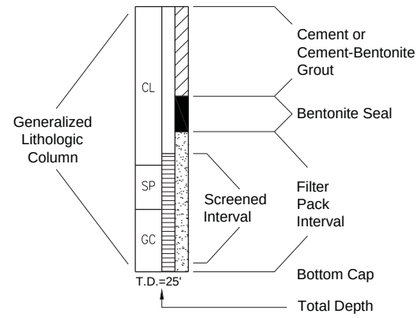
PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

MONITORING WELL CONSTRUCTION



STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

SCALE IN FEET

VERTICAL 10

HORIZONTAL 100

10x Vertical Exaggeration

R&H OIL/TROPICANA ENERGY SITE

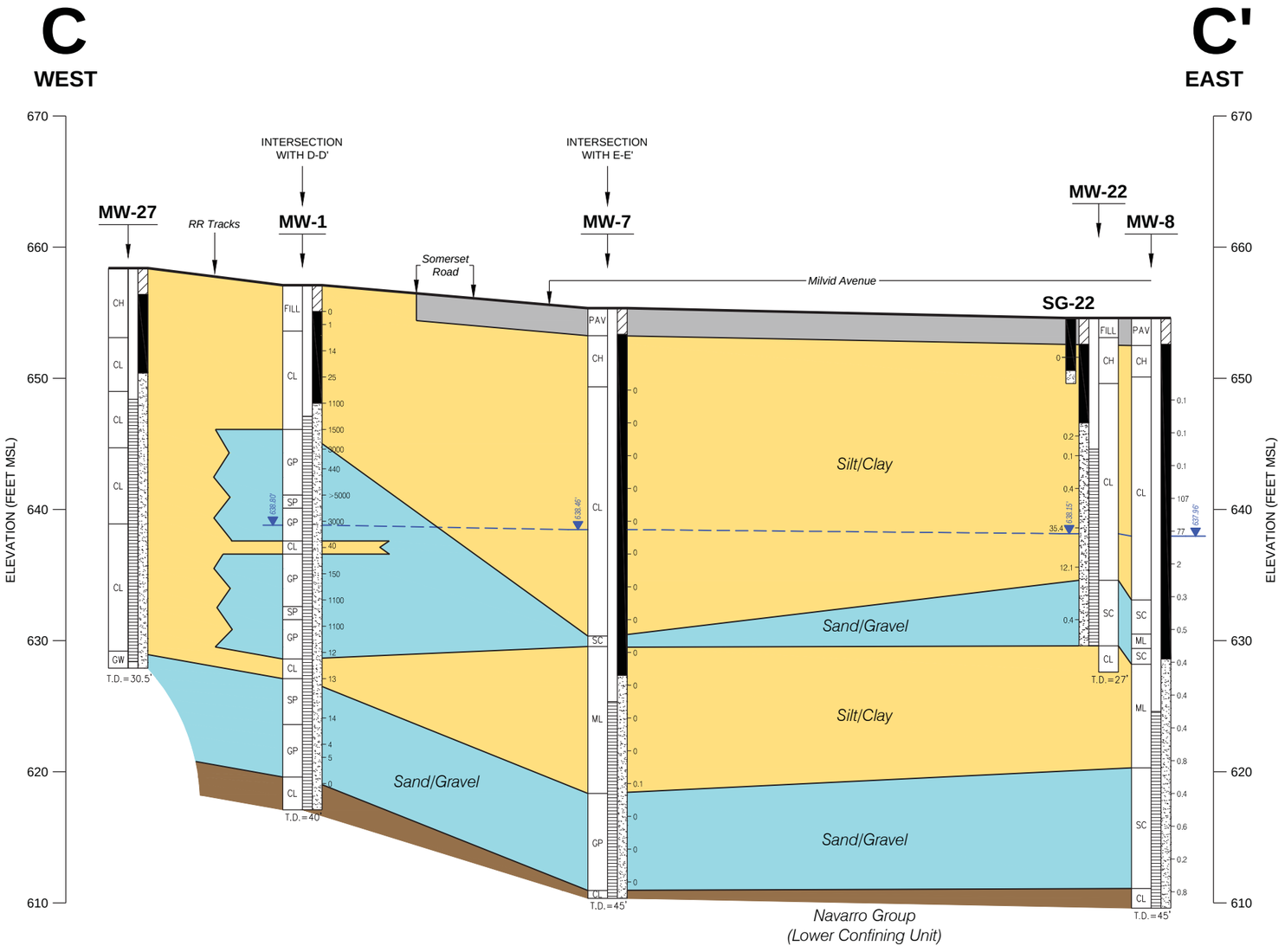
Figure 12

CROSS SECTION B-B'

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

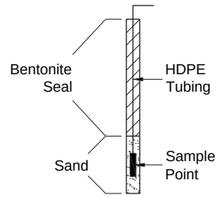
PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

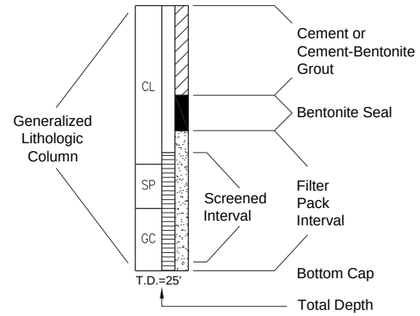


EXPLANATION

SOIL GAS POINT CONSTRUCTION



MONITORING WELL CONSTRUCTION



73 / 82 / 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Corrected Water Level (Ft MSL) Measured 4/21/14

LNAPL Level (Ft MSL) Measured 4/21/14

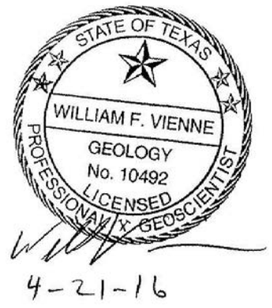
LNAPL OBSERVATION

Discoloration, Stain, Sheen

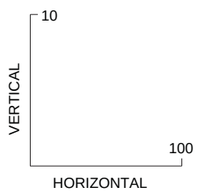
Saturated

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
OH	Organic Clay
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GM	Silty Gravel, Non-Plastic Fines(≥ 15% fines)
GP	Poorly Graded Gravel
GR	Gravel
SC	Clayey Sand, Plastic Fines (≥ 15% fines)
SM	Silty Sand, Non-Plastic Fines (≥ 15% fines)
SP	Poorly Graded Sand
SW	Well Graded Sand



SCALE IN FEET



10x Vertical Exaggeration

Notes:
1. See Figure 10 for cross section location.
2. Lithologic information for boring MW-1 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

R&H OIL/TROPICANA ENERGY SITE

Figure 13

CROSS SECTION C-C'

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

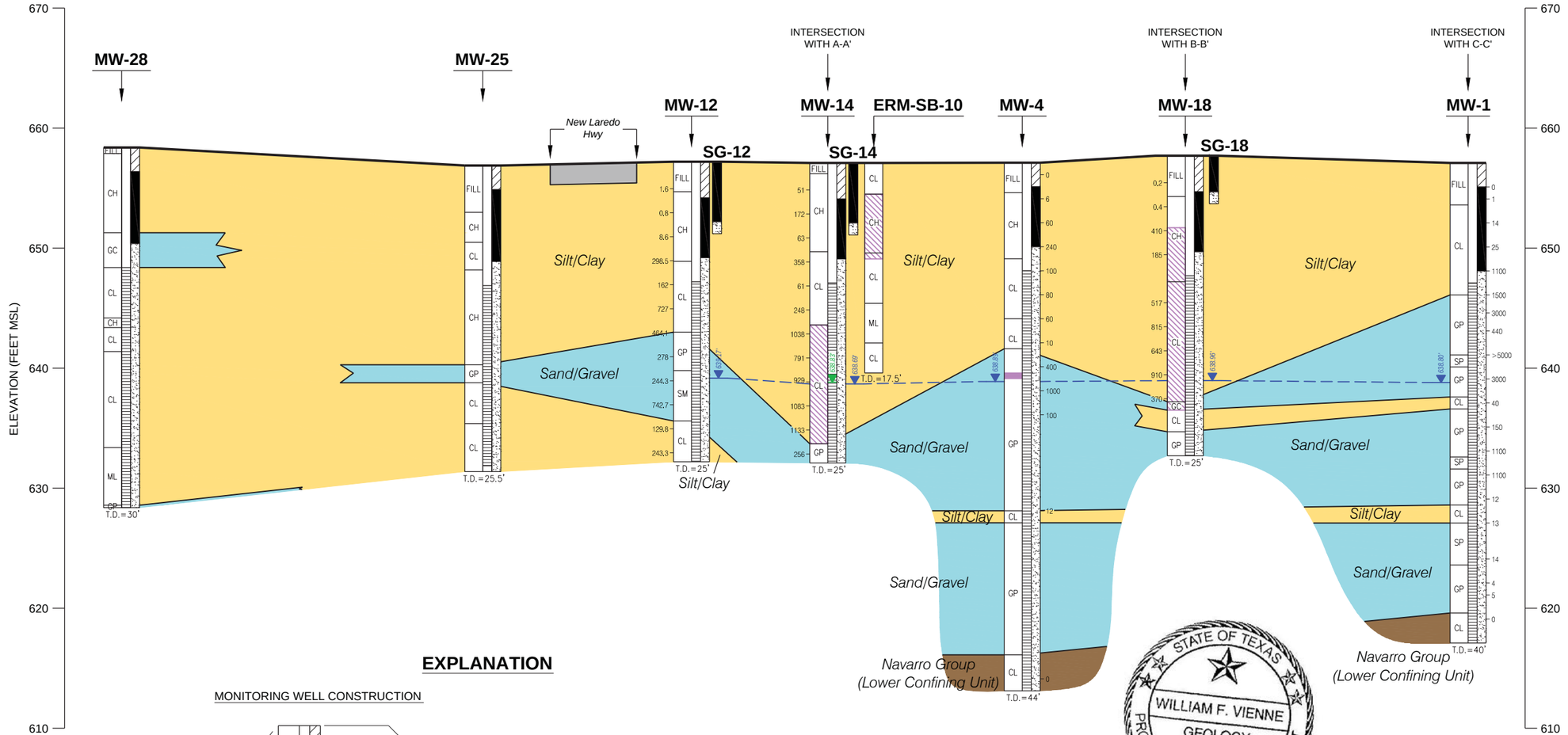
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

D

NORTH

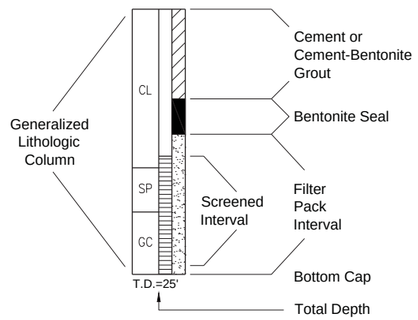
D'

SOUTH

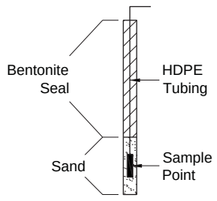


EXPLANATION

MONITORING WELL CONSTRUCTION



SOIL GAS POINT CONSTRUCTION



73 / 82 / 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Corrected Water Level (Ft MSL) Measured 4/21/14

LNAPL Level (Ft MSL) Measured 4/21/14

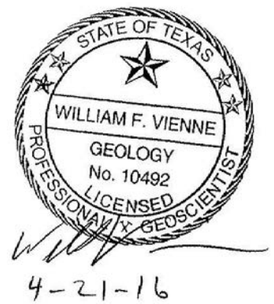
LNAPL OBSERVATION

Discoloration, Stain, Sheen

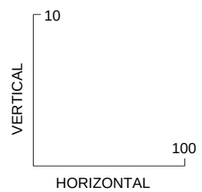
Saturated

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
OH	Organic Clay
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GM	Silty Gravel, Non-Plastic Fines(≥ 15% fines)
GP	Poorly Graded Gravel
GR	Gravel
SC	Clayey Sand, Plastic Fines (≥ 15% fines)
SM	Silty Sand, Non-Plastic Fines (≥ 15% fines)
SP	Poorly Graded Sand
SW	Well Graded Sand



SCALE IN FEET



10x Vertical Exaggeration

Notes:

1. See Figure 10 for cross section location.
2. Lithologic information for boring ERM-SB-10 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-1 and MW-4 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

R&H OIL/TROPICANA ENERGY SITE

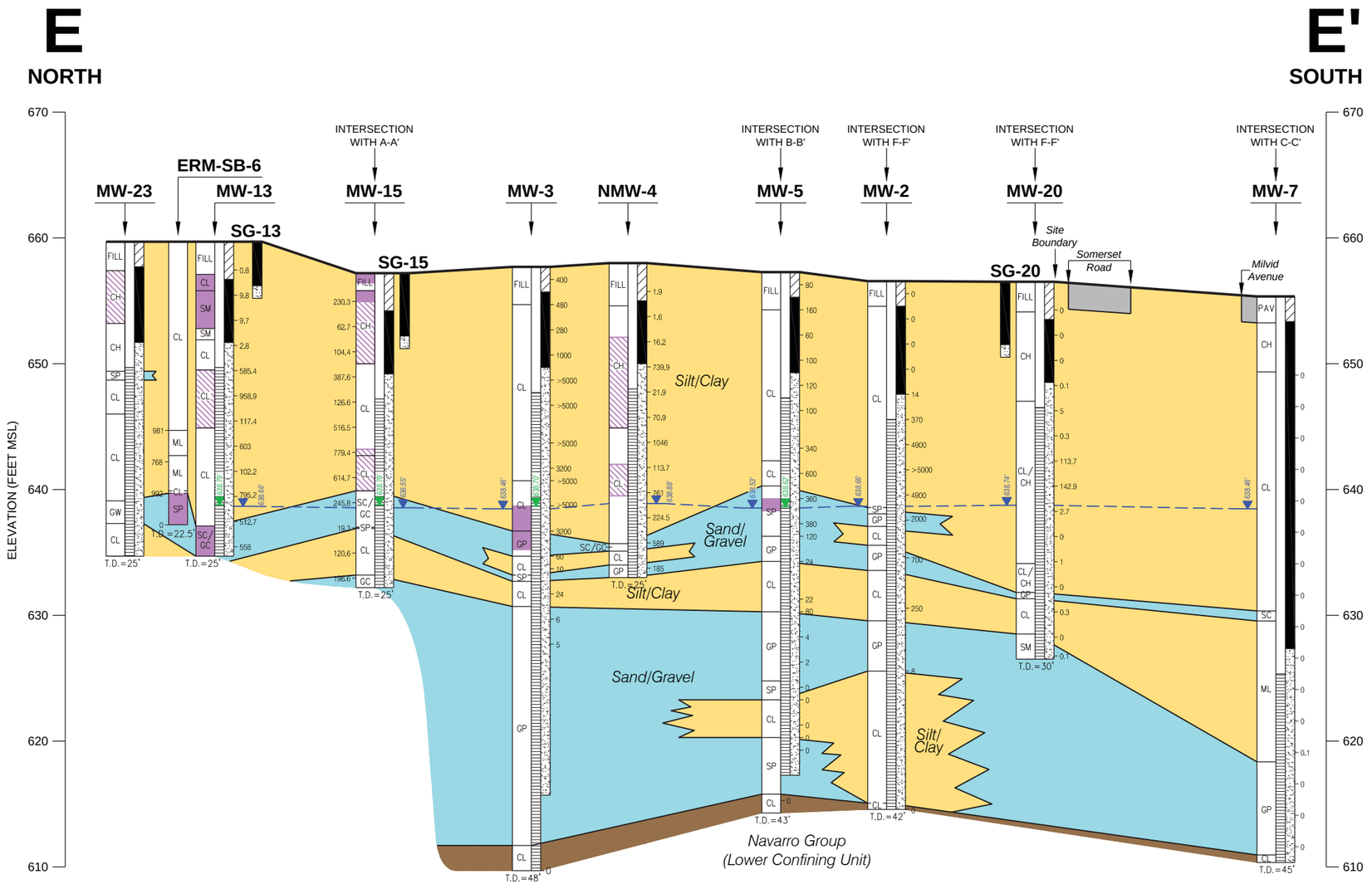
Figure 14

CROSS SECTION D-D'

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

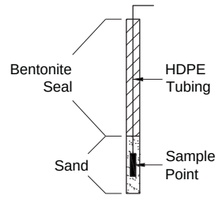
PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

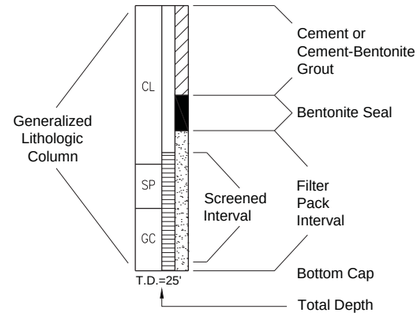


EXPLANATION

SOIL GAS POINT CONSTRUCTION



MONITORING WELL CONSTRUCTION



73 / 82 / 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Corrected Water Level (Ft MSL) Measured 4/21/14

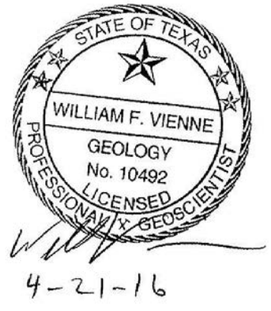
LNAPL Level (Ft MSL) Measured 4/21/14

LNAPL OBSERVATION

- Discoloration, Stain, Sheen
- Saturated

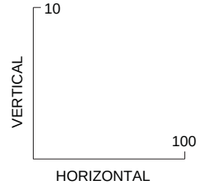
GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
OH	Organic Clay
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GM	Silty Gravel, Non-Plastic Fines(≥ 15% fines)
GP	Poorly Graded Gravel
GR	Gravel
SC	Clayey Sand, Plastic Fines (≥ 15% fines)
SM	Silty Sand, Non-Plastic Fines (≥ 15% fines)
SP	Poorly Graded Sand
SW	Well Graded Sand



Notes:
1. See Figure 10 for cross section location.
2. Lithologic information for borings ERM-SB-6 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-2, MW-3 and MW-5 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

SCALE IN FEET



10x Vertical Exaggeration

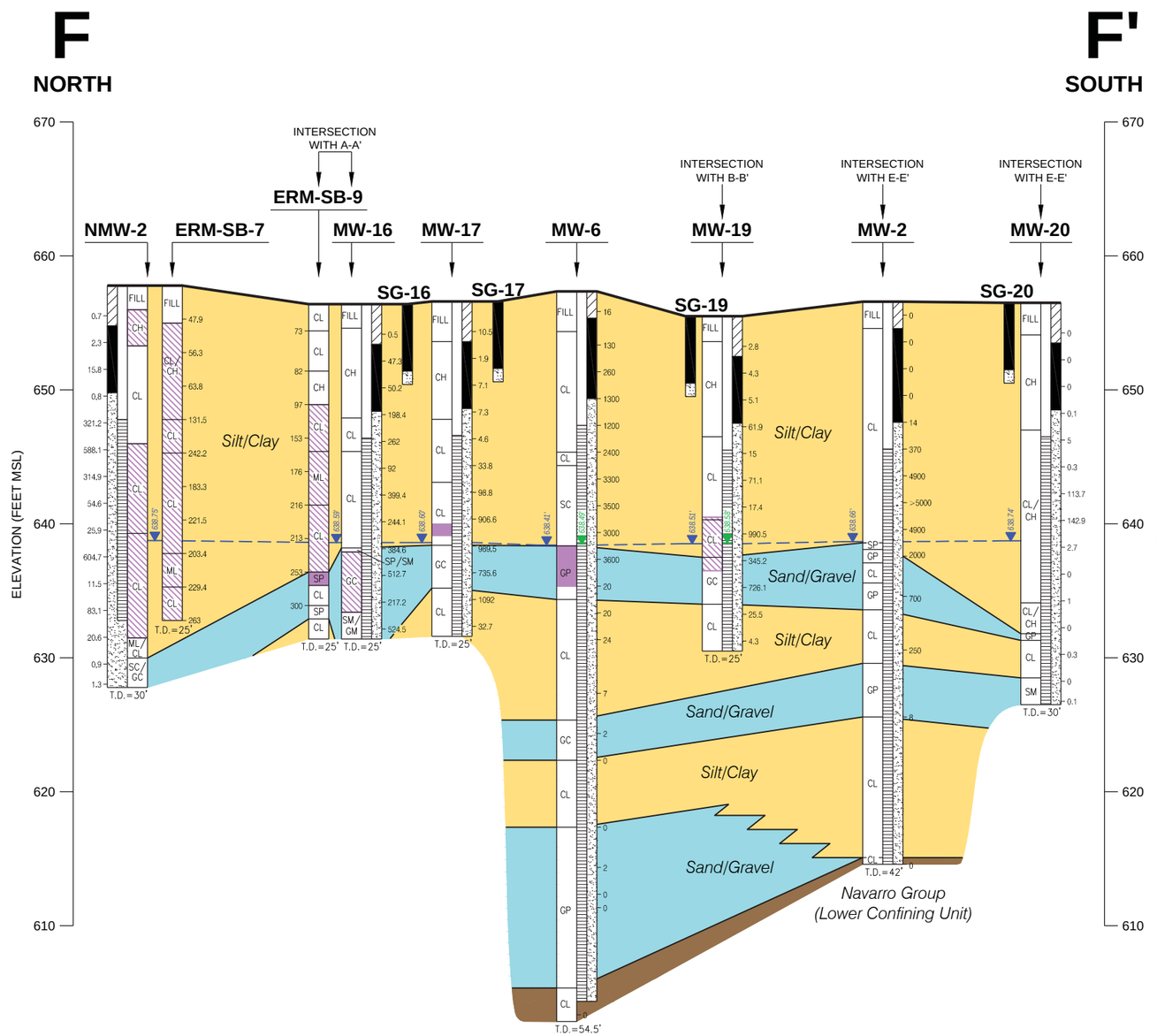
R&H OIL/TROPICANA ENERGY SITE

Figure 15

CROSS SECTION E-E'

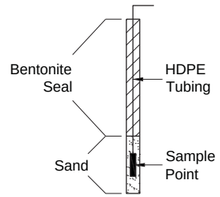
PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

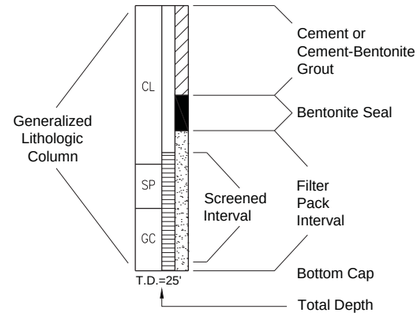


EXPLANATION

SOIL GAS POINT CONSTRUCTION



MONITORING WELL CONSTRUCTION



73 / 82 / 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Corrected Water Level (Ft MSL) Measured 4/21/14

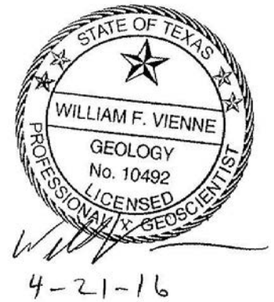
LNAPL Level (Ft MSL) Measured 4/21/14

LNAPL OBSERVATION

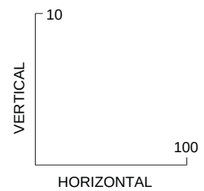
- Discoloration, Stain, Sheen
- Saturated

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
OH	Organic Clay
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GM	Silty Gravel, Non-Plastic Fines(≥ 15% fines)
GP	Poorly Graded Gravel
GR	Gravel
SC	Clayey Sand, Plastic Fines (≥ 15% fines)
SM	Silty Sand, Non-Plastic Fines (≥ 15% fines)
SP	Poorly Graded Sand
SW	Well Graded Sand



SCALE IN FEET



10x Vertical Exaggeration

Notes:
1. See Figure 10 for cross section location.
2. Lithologic information for borings ERM-SB-7 and ERM-SB-9 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-2 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

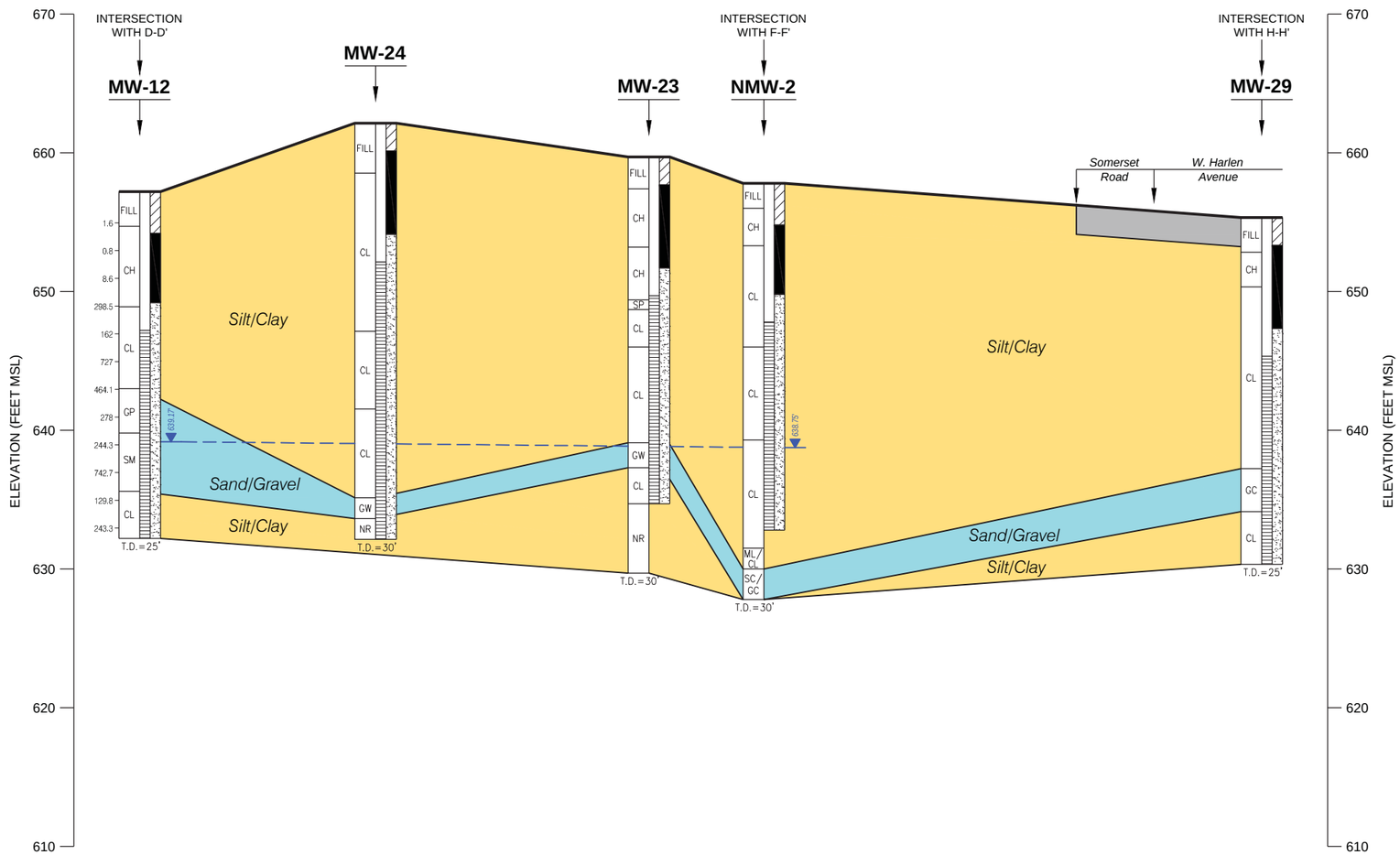
R&H OIL/TROPICANA ENERGY SITE

Figure 16

CROSS SECTION F-F'

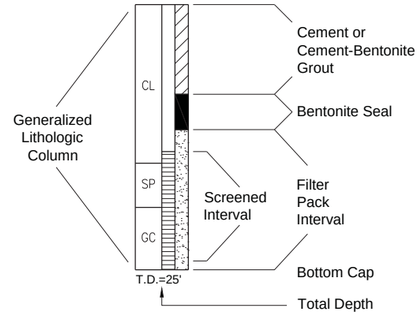
PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

MONITORING WELL CONSTRUCTION



73, 82, 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Corrected Water Level (Ft MSL) Measured 4/21/14

LNAPL Level (Ft MSL) Measured 4/21/14

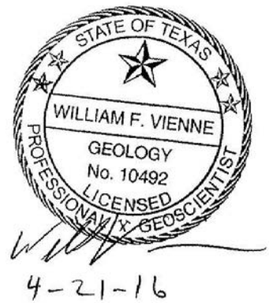
LNAPL OBSERVATION

Discoloration, Stain, Sheen

Saturated

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
OH	Organic Clay
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GM	Silty Gravel, Non-Plastic Fines(≥ 15% fines)
GP	Poorly Graded Gravel
GR	Gravel
SC	Clayey Sand, Plastic Fines (≥ 15% fines)
SM	Silty Sand, Non-Plastic Fines (≥ 15% fines)
SP	Poorly Graded Sand
SW	Well Graded Sand



SCALE IN FEET

VERTICAL 10

HORIZONTAL 100

10x Vertical Exaggeration

Notes:
1. See Figure 10 for cross section location.

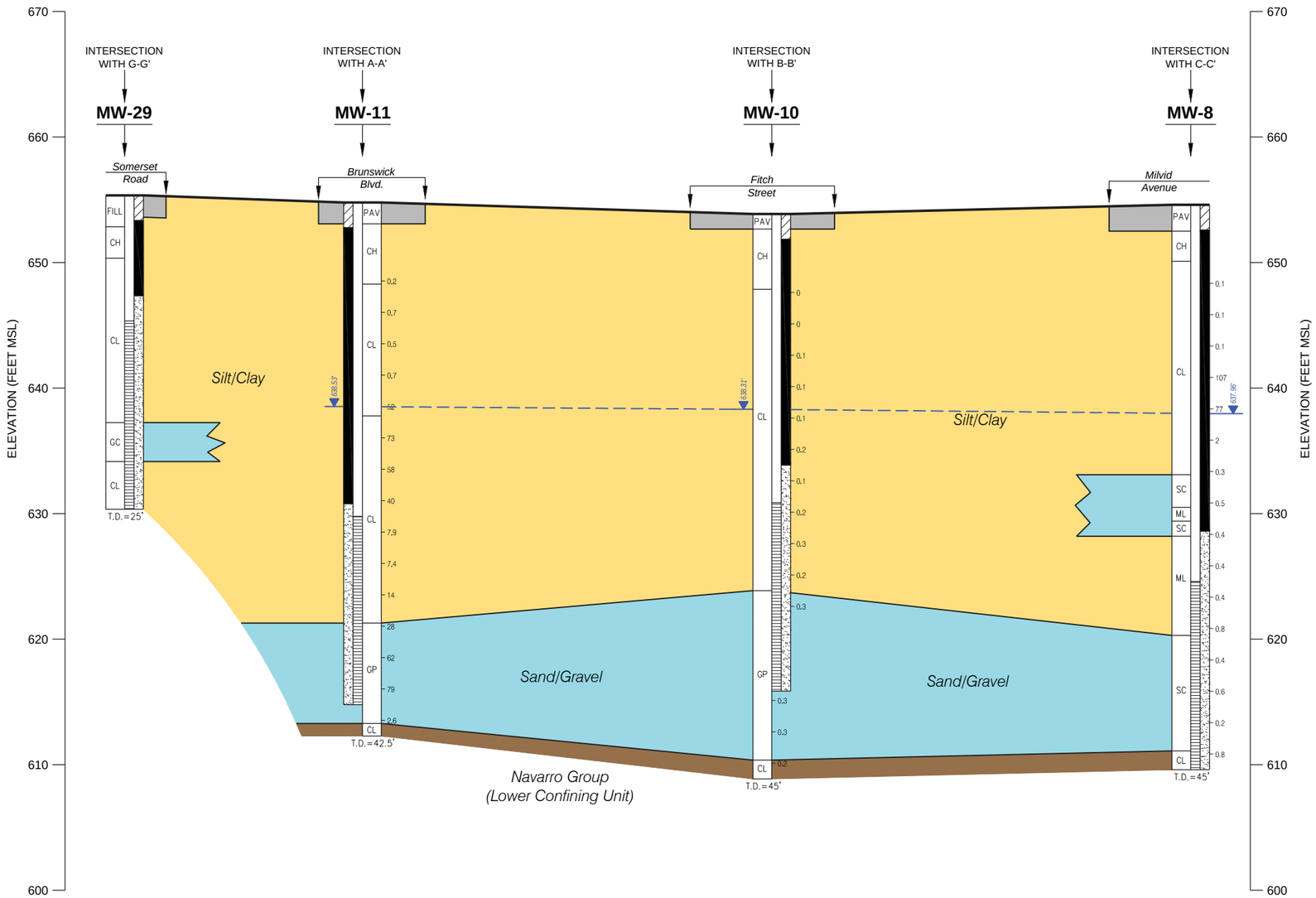
R&H OIL/TROPICANA ENERGY SITE

Figure 17

CROSS SECTION G-G'

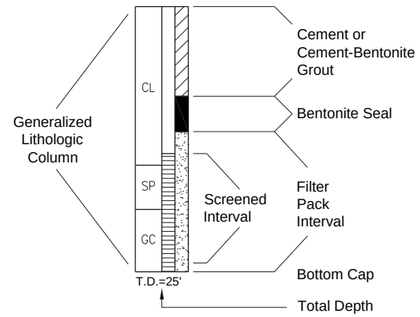
PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

MONITORING WELL CONSTRUCTION



73, 82, 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Corrected Water Level (Ft MSL) Measured 4/21/14

LNAPL Level (Ft MSL) Measured 4/21/14

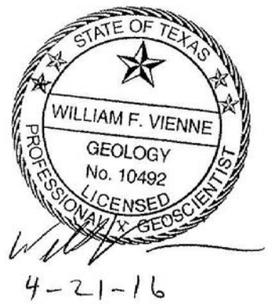
LNAPL OBSERVATION

Discoloration, Stain, Sheen

Saturated

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
OH	Organic Clay
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GM	Silty Gravel, Non-Plastic Fines(≥ 15% fines)
GP	Poorly Graded Gravel
GR	Gravel
SC	Clayey Sand, Plastic Fines (≥ 15% fines)
SM	Silty Sand, Non-Plastic Fines (≥ 15% fines)
SP	Poorly Graded Sand
SW	Well Graded Sand



SCALE IN FEET

VERTICAL 10

HORIZONTAL 100

10x Vertical Exaggeration

Notes:
1. See Figure 10 for cross section location.

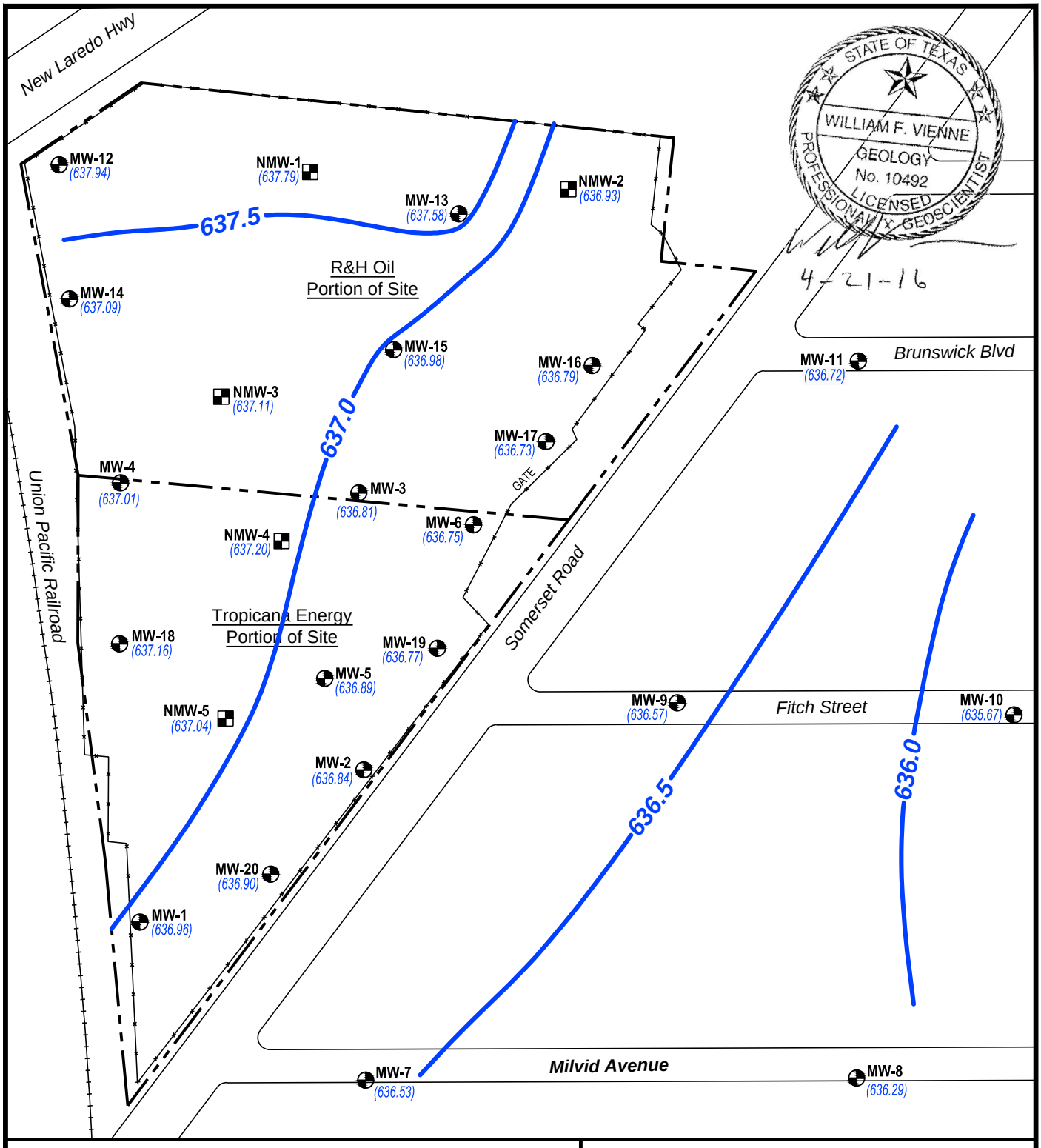
R&H OIL/TROPICANA ENERGY SITE

Figure 18

CROSS SECTION H-H'

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: WFV	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (636.53) Groundwater Potentiometric Elevation (Ft, MSL)
- 636.5 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

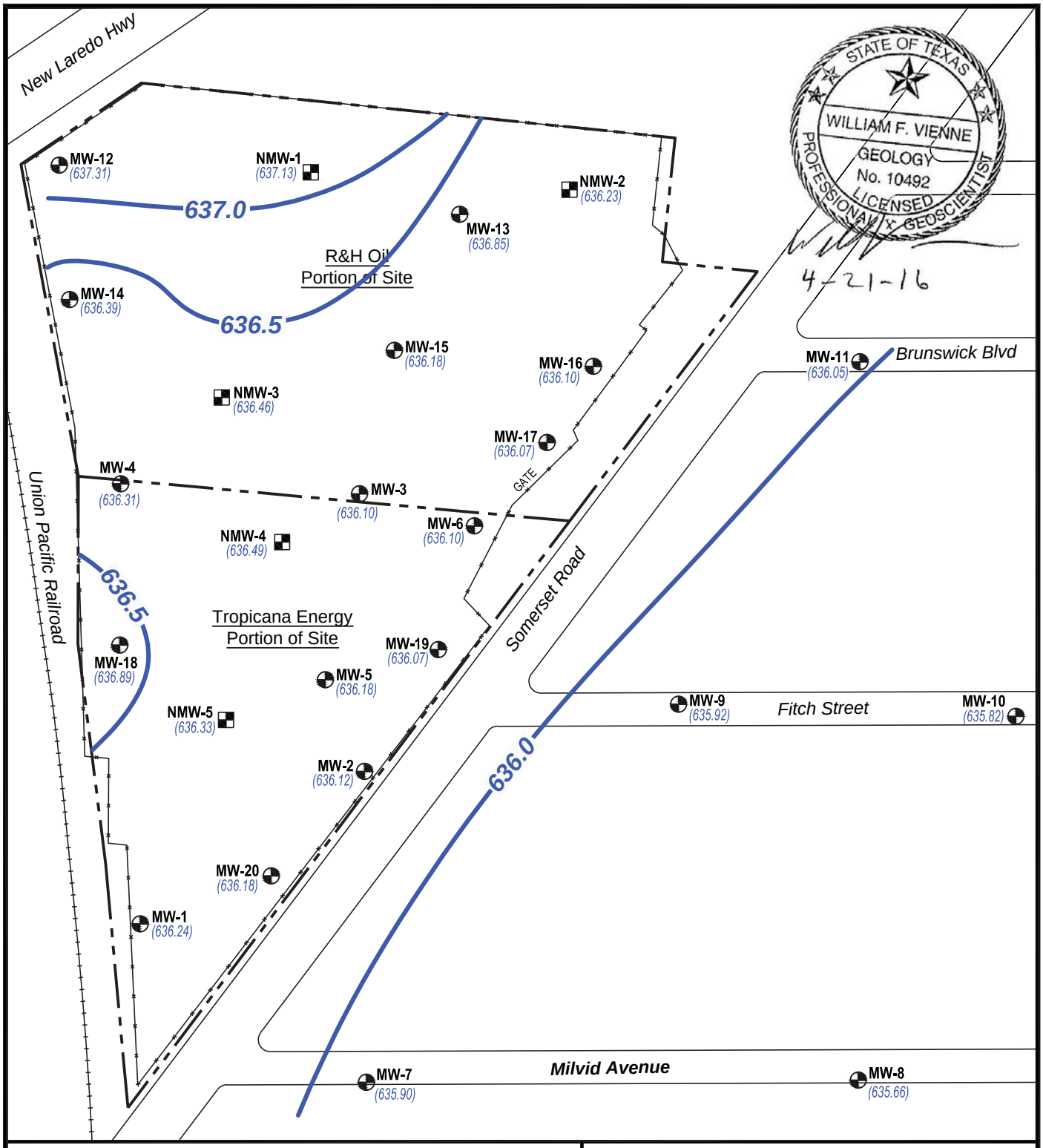
R&H OIL/TROPICANA ENERGY SITE

Figure 19

GROUNDWATER POTENTIOMETRIC SURFACE MAP - JULY 25, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (636.18) Groundwater Potentiometric Elevation (Ft, MSL)
- 636.5 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

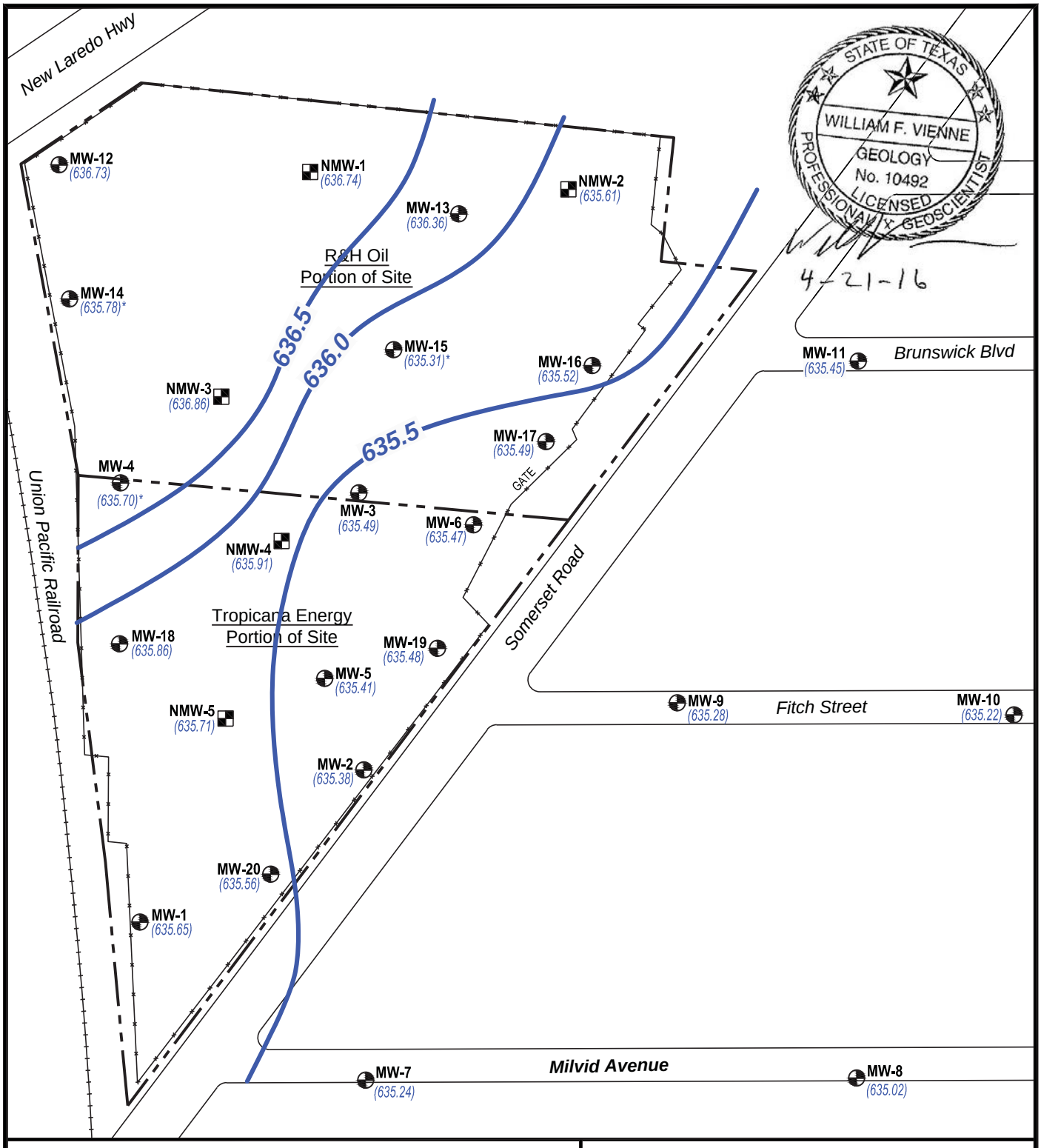
R&H OIL/TROPICANA ENERGY SITE

Figure 20

GROUNDWATER POTENTIOMETRIC SURFACE MAP - AUGUST 23, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.65) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 635.5 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note: See RI Table 5 for summary data.

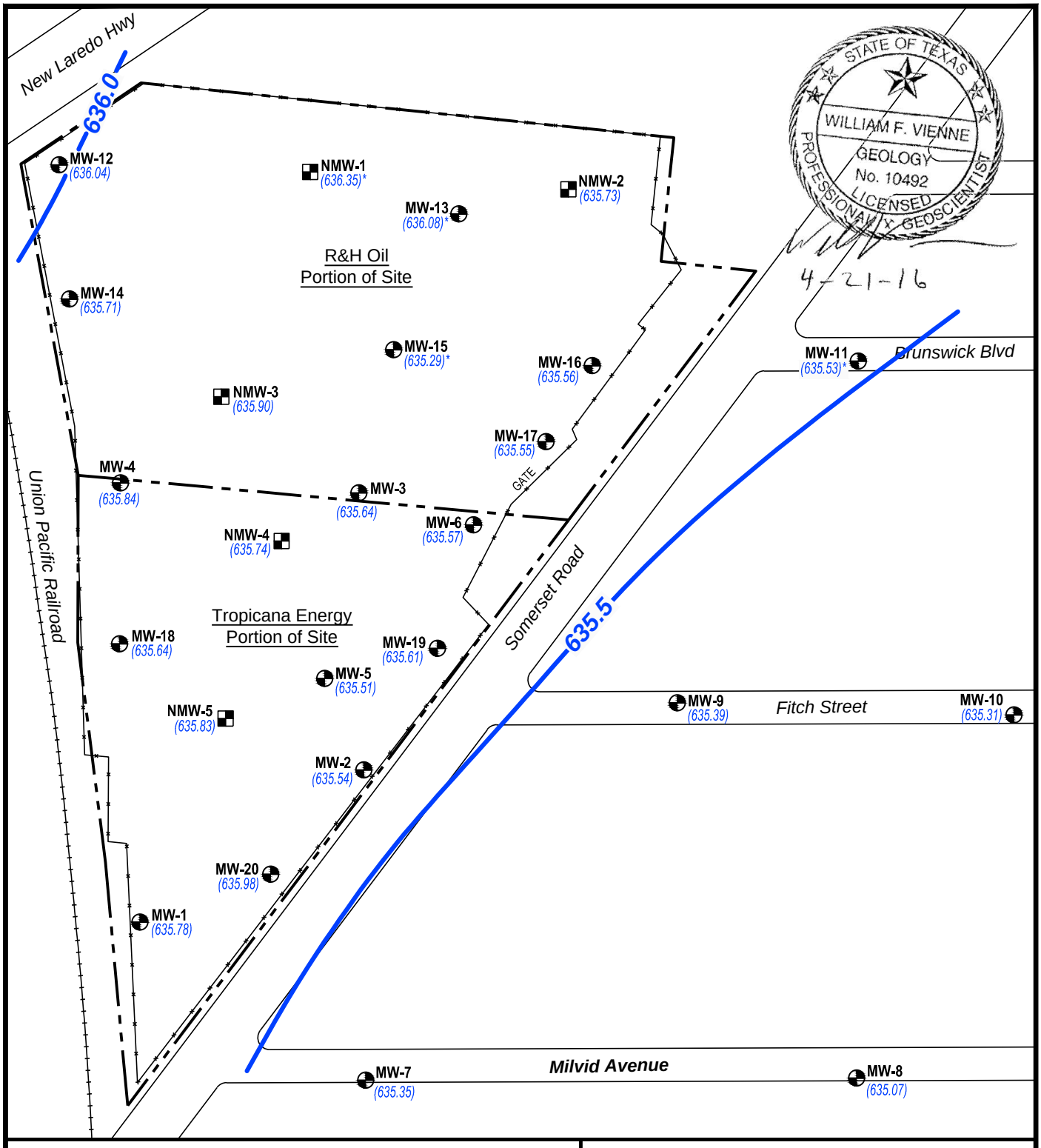
R&H OIL/TROPICANA ENERGY SITE

Figure 21

GROUNDWATER POTENTIOMETRIC SURFACE MAP - SEPT. 15, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.55) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 635.5 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note: See RI Table 5 for summary data.

R&H OIL/TROPICANA ENERGY SITE

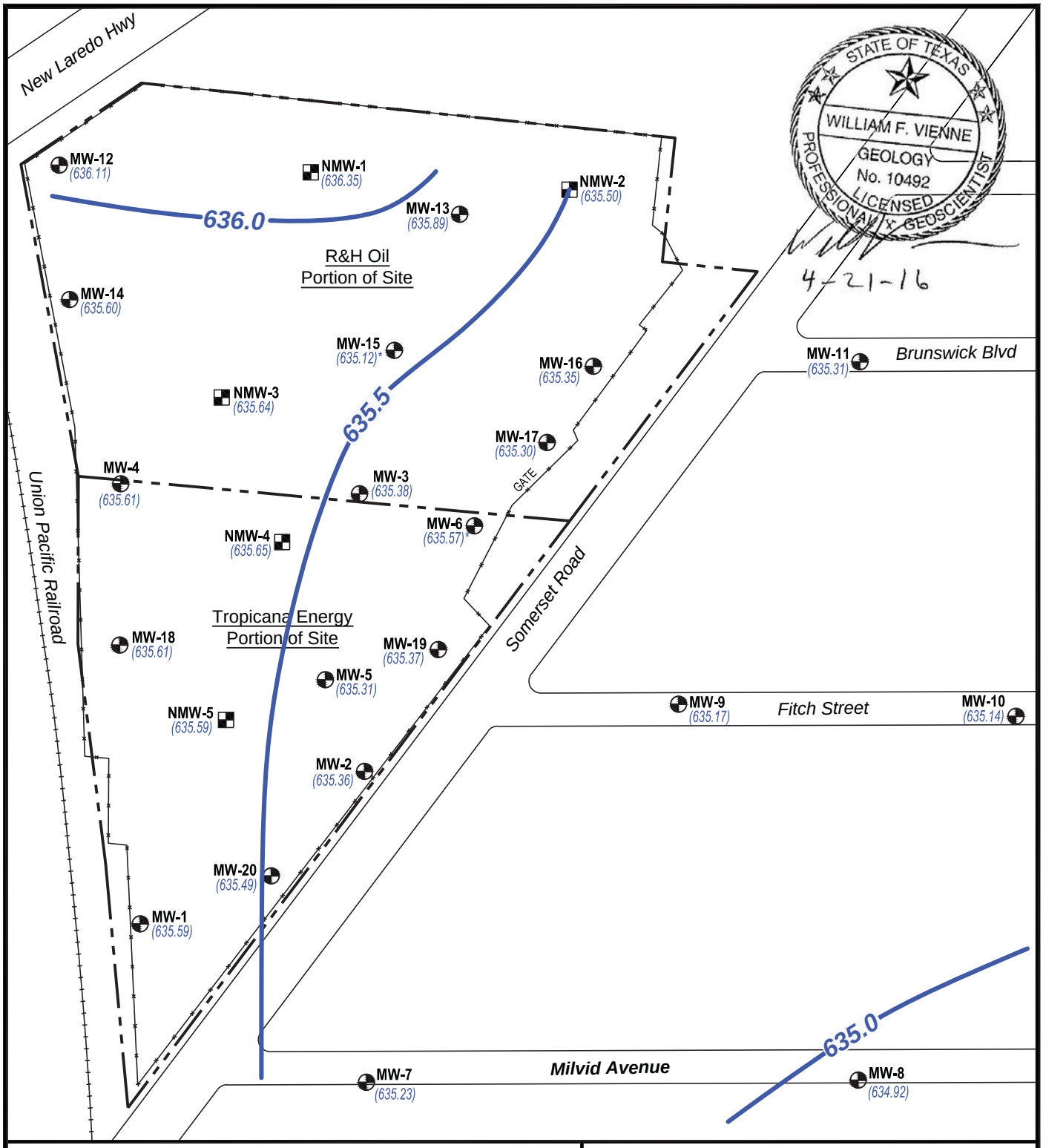
Figure 22

GROUNDWATER POTENTIOMETRIC SURFACE MAP - OCT. 10, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.59) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 635.5 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

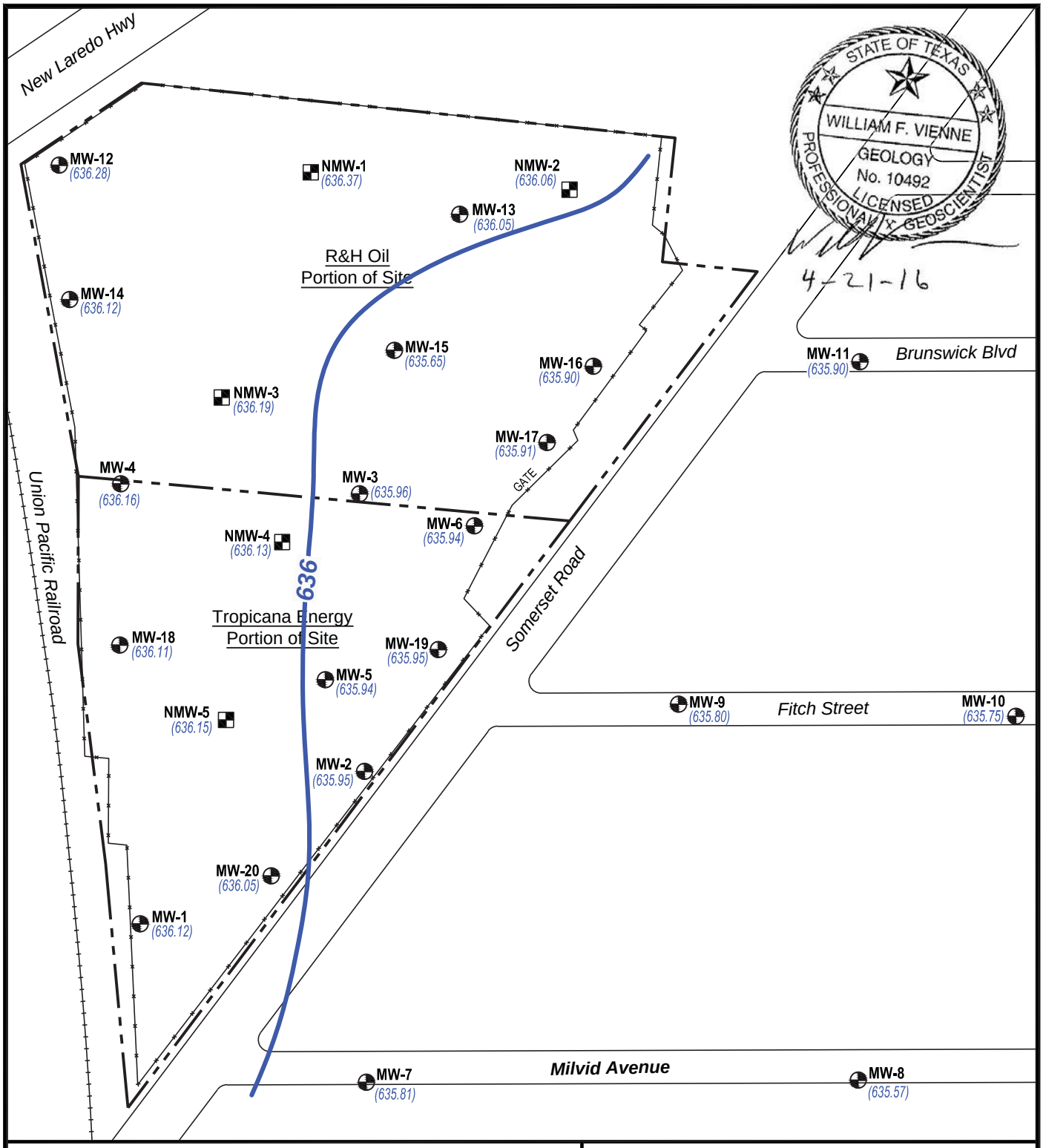
R&H OIL/TROPICANA ENERGY SITE

Figure 23

GROUNDWATER POTENTIOMETRIC SURFACE MAP - NOV. 16, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.94) Groundwater Potentiometric Elevation (Ft, MSL)
- 636 Potentiometric Surface Contour (Ft, MSL) C.I.= 1 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

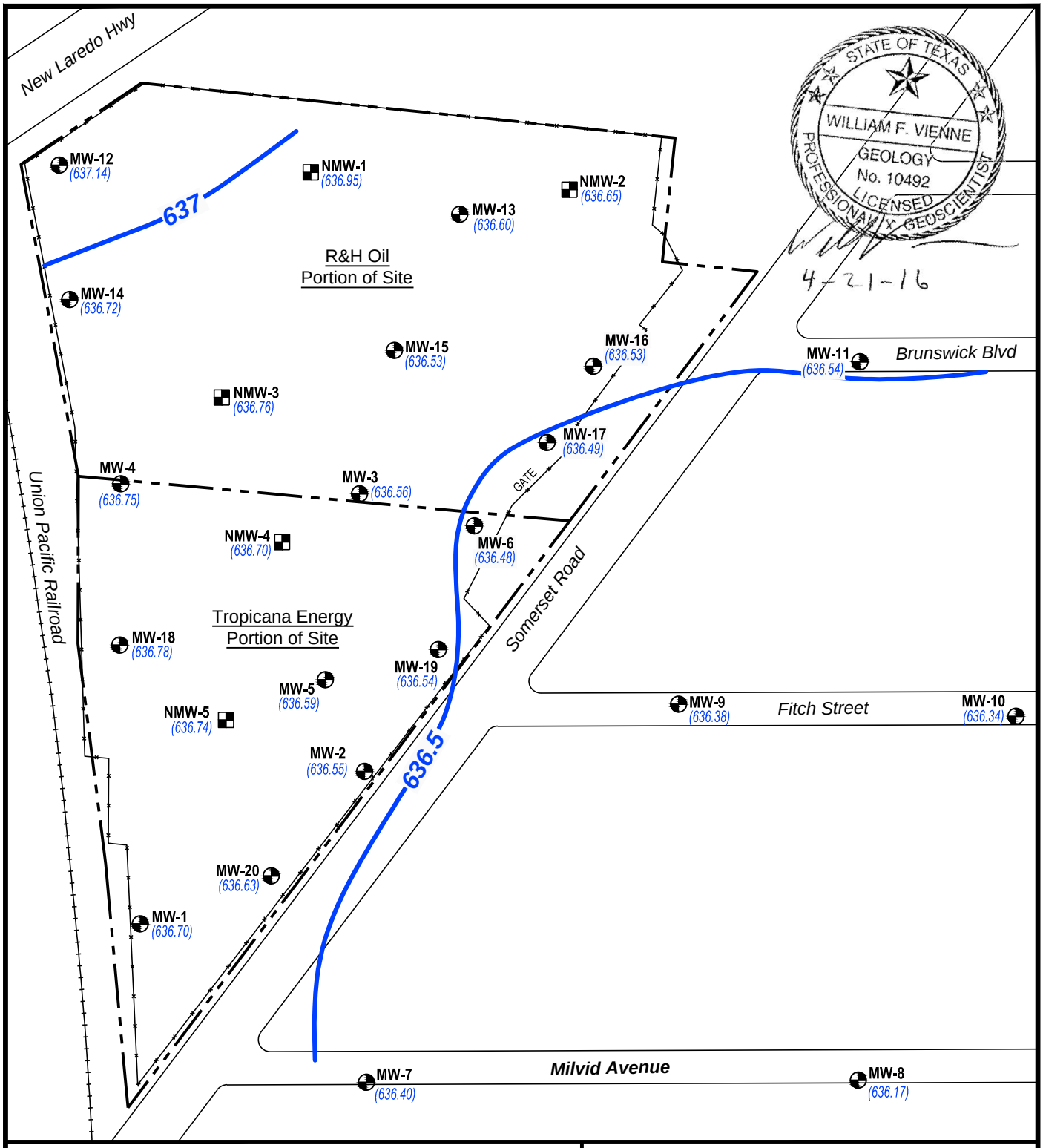
R&H OIL/TROPICANA ENERGY SITE

Figure 24

GROUNDWATER POTENTIOMETRIC SURFACE MAP - DEC. 13, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.94) Groundwater Potentiometric Elevation (Ft, MSL)
- 636 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

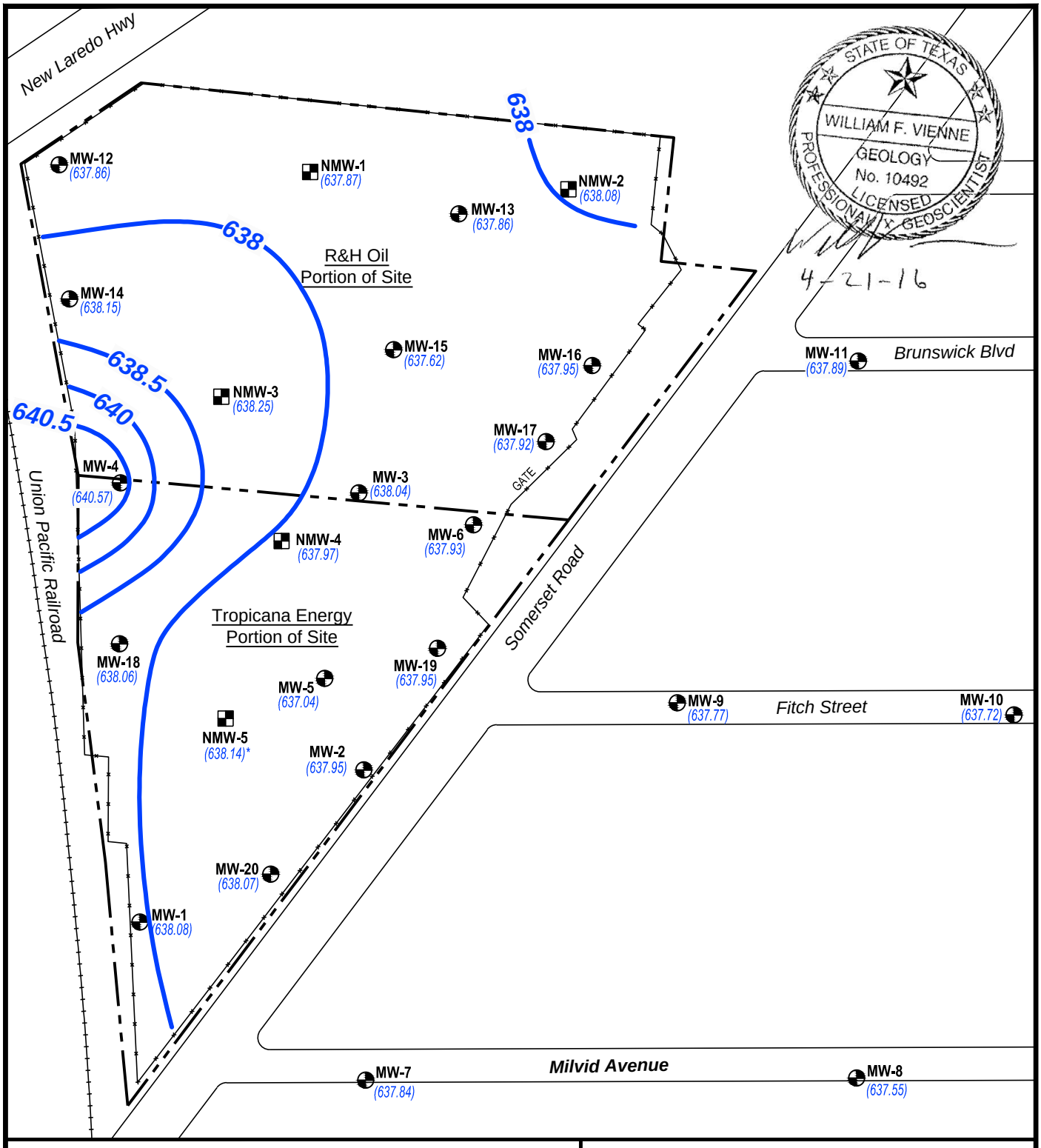
R&H OIL/TROPICANA ENERGY SITE

Figure 25

GROUNDWATER POTENTIOMETRIC SURFACE MAP - JAN. 23, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.94) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 636 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note: See RI Table 5 for summary data.

R&H OIL/TROPICANA ENERGY SITE

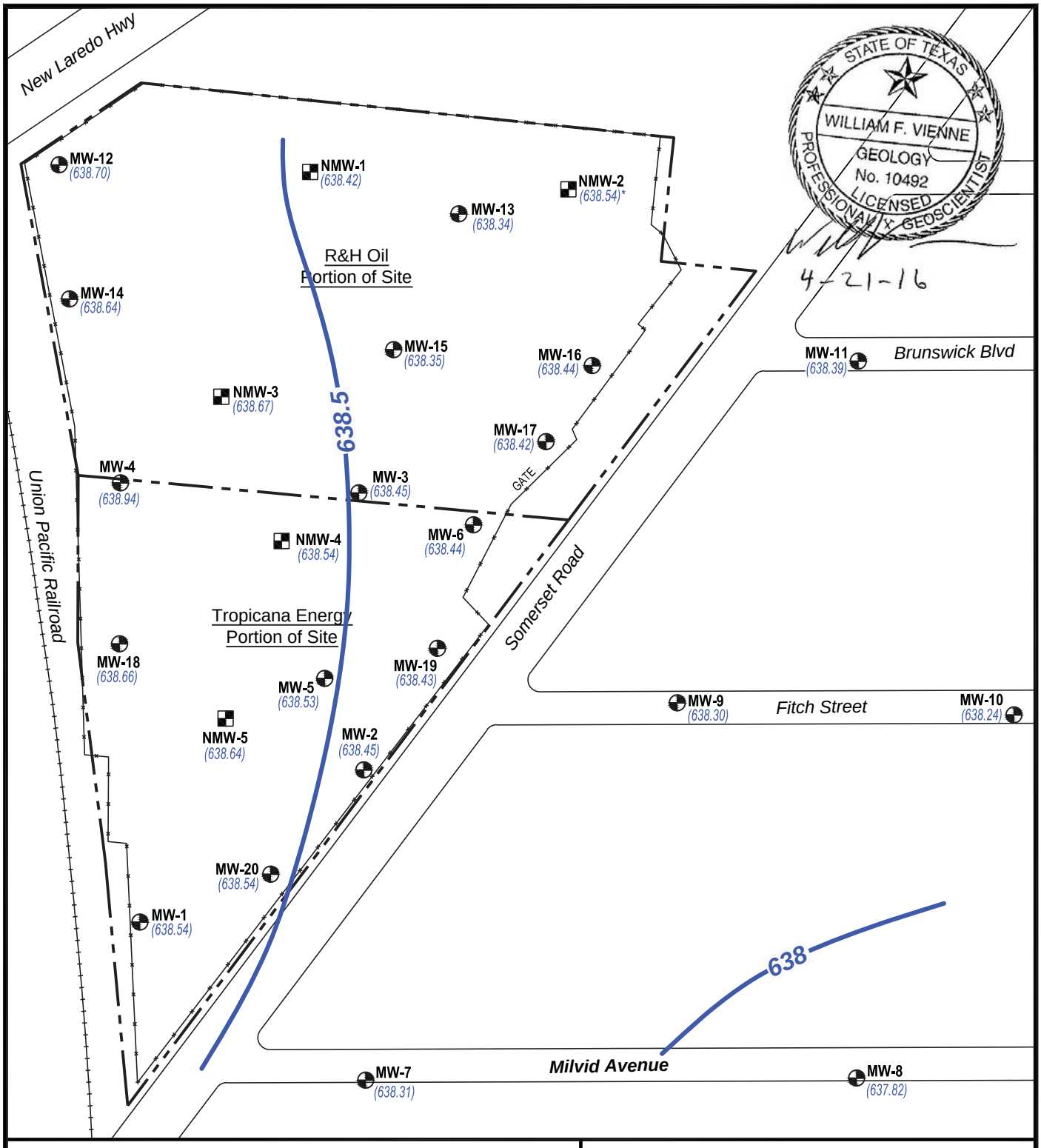
Figure 26

GROUNDWATER POTENTIOMETRIC SURFACE MAP - FEB. 20, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.94) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 636 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note: See RI Table 5 for summary data.

R&H OIL/TROPICANA ENERGY SITE

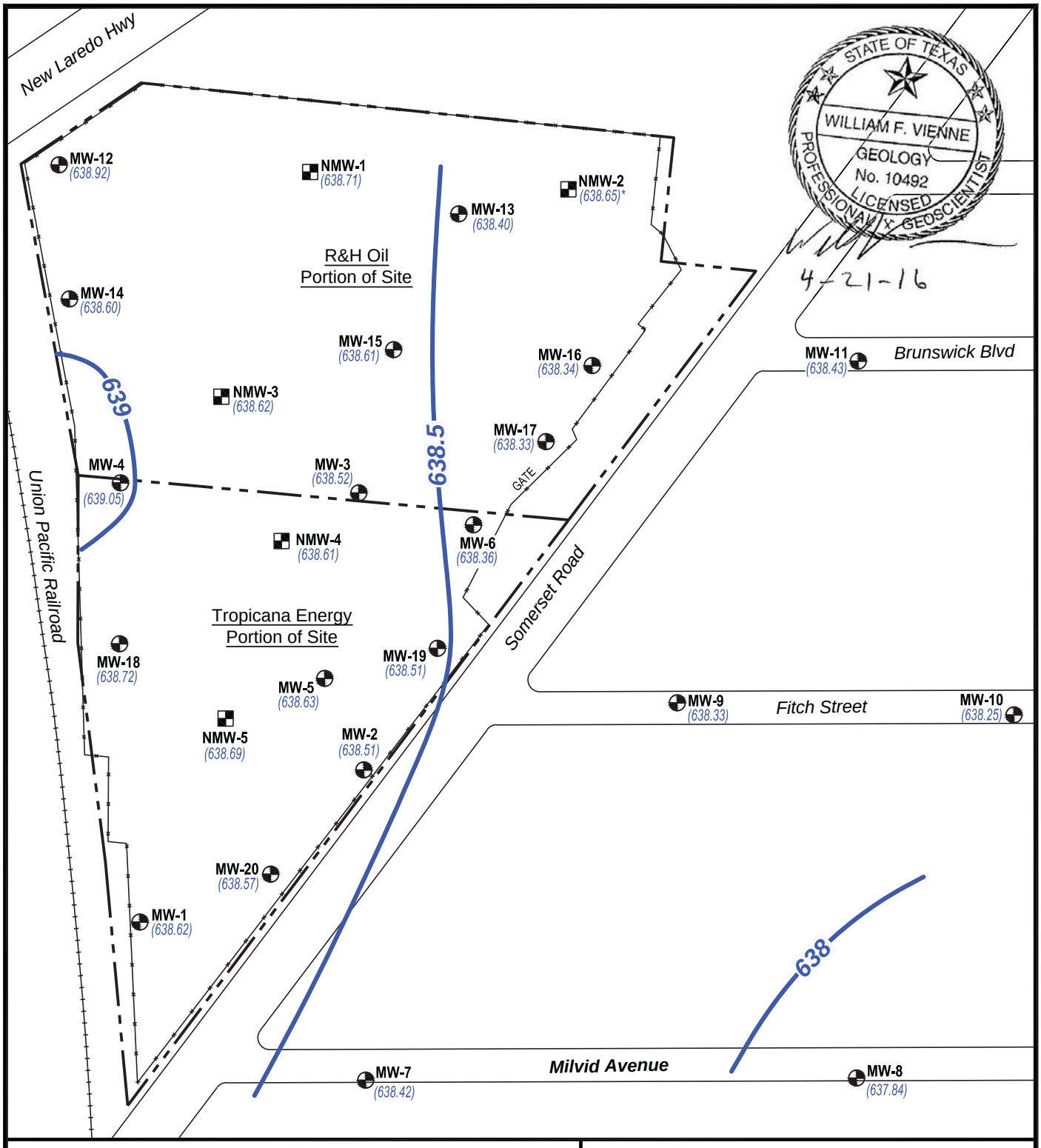
Figure 27

GROUNDWATER POTENTIOMETRIC SURFACE MAP - MARCH 14, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.94) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 636 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

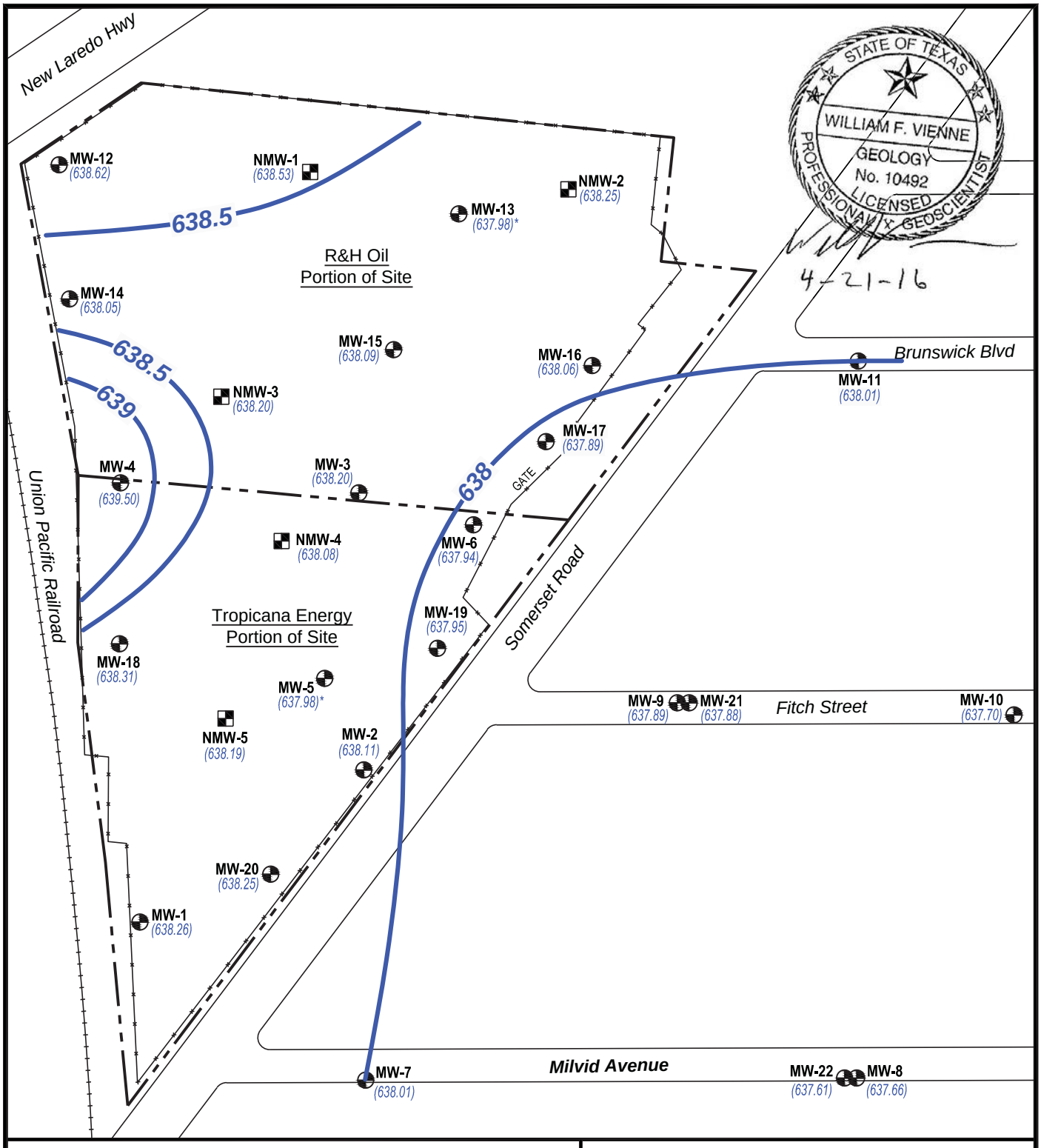
R&H OIL/TROPICANA ENERGY SITE

Figure 28

GROUNDWATER POTENTIOMETRIC SURFACE MAP - APRIL 11, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.94) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 636 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note: See RI Table 5 for summary data.

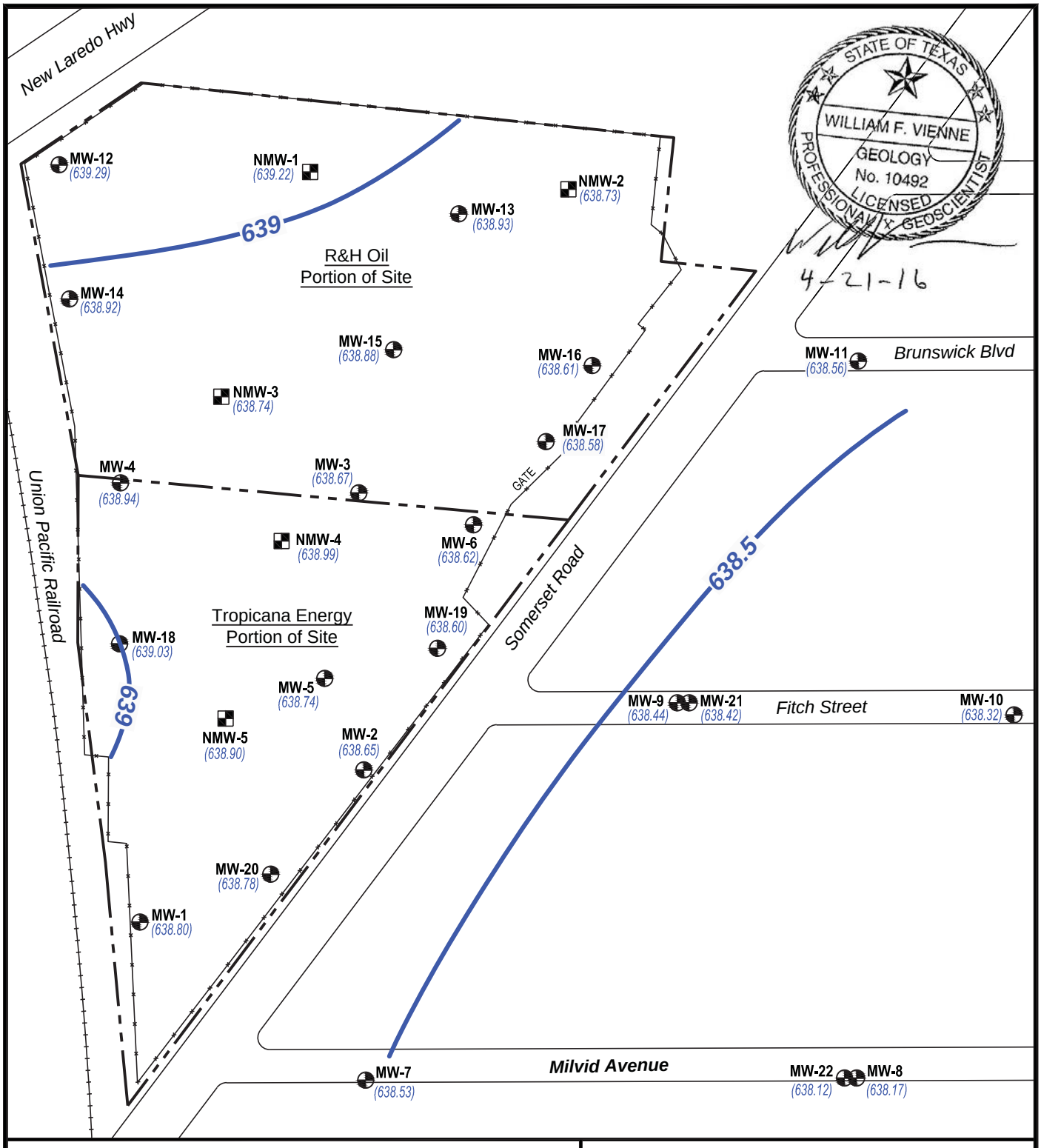
R&H OIL/TROPICANA ENERGY SITE

Figure 29

GROUNDWATER POTENTIOMETRIC SURFACE MAP - MAY 9, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (635.94) Groundwater Potentiometric Elevation (Ft, MSL)
- 636 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

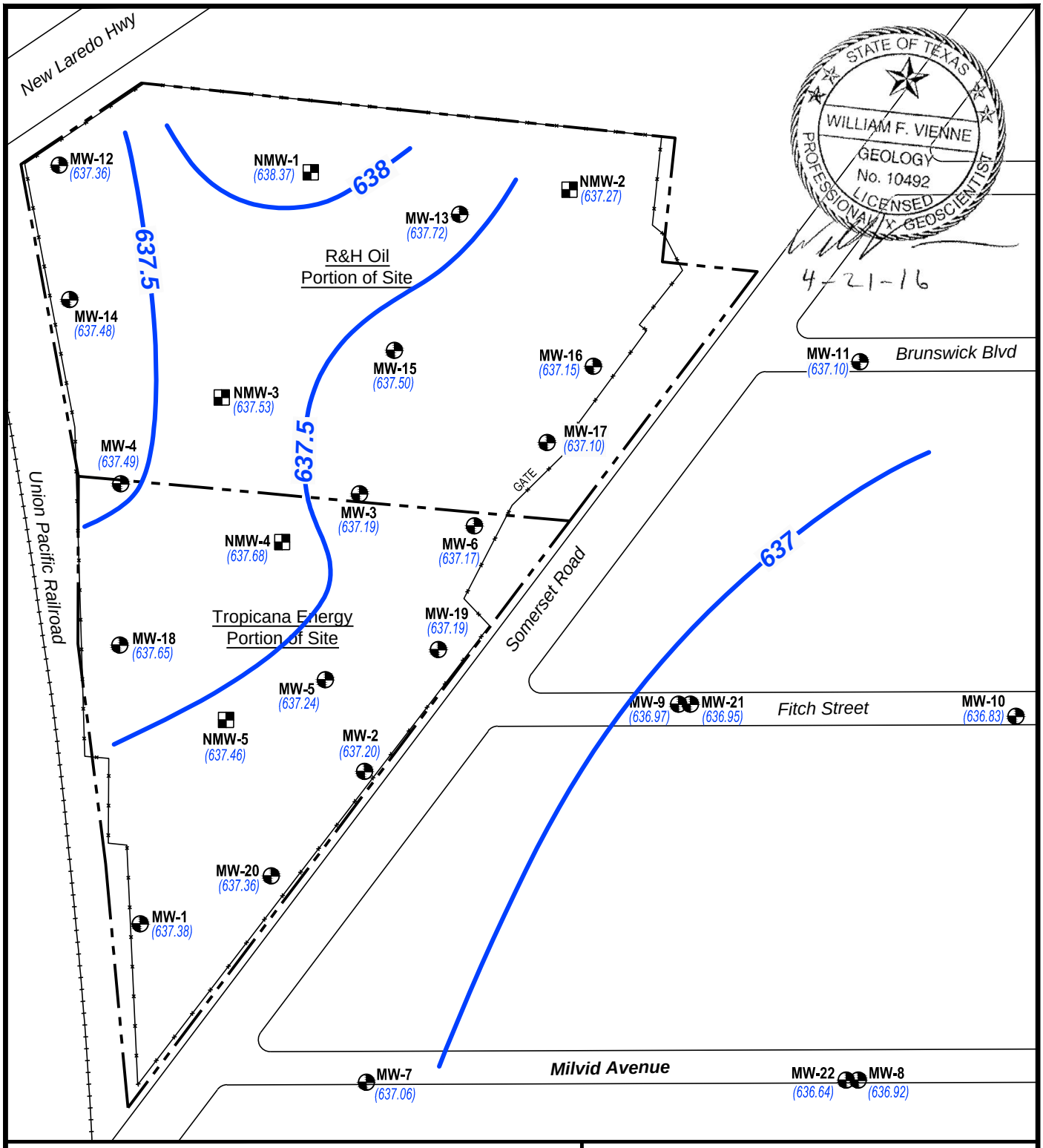
R&H OIL/TROPICANA ENERGY SITE

Figure 30

GROUNDWATER POTENTIOMETRIC SURFACE MAP - JUNE 6, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (637.65) Groundwater Potentiometric Elevation (Ft, MSL)
- 637 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

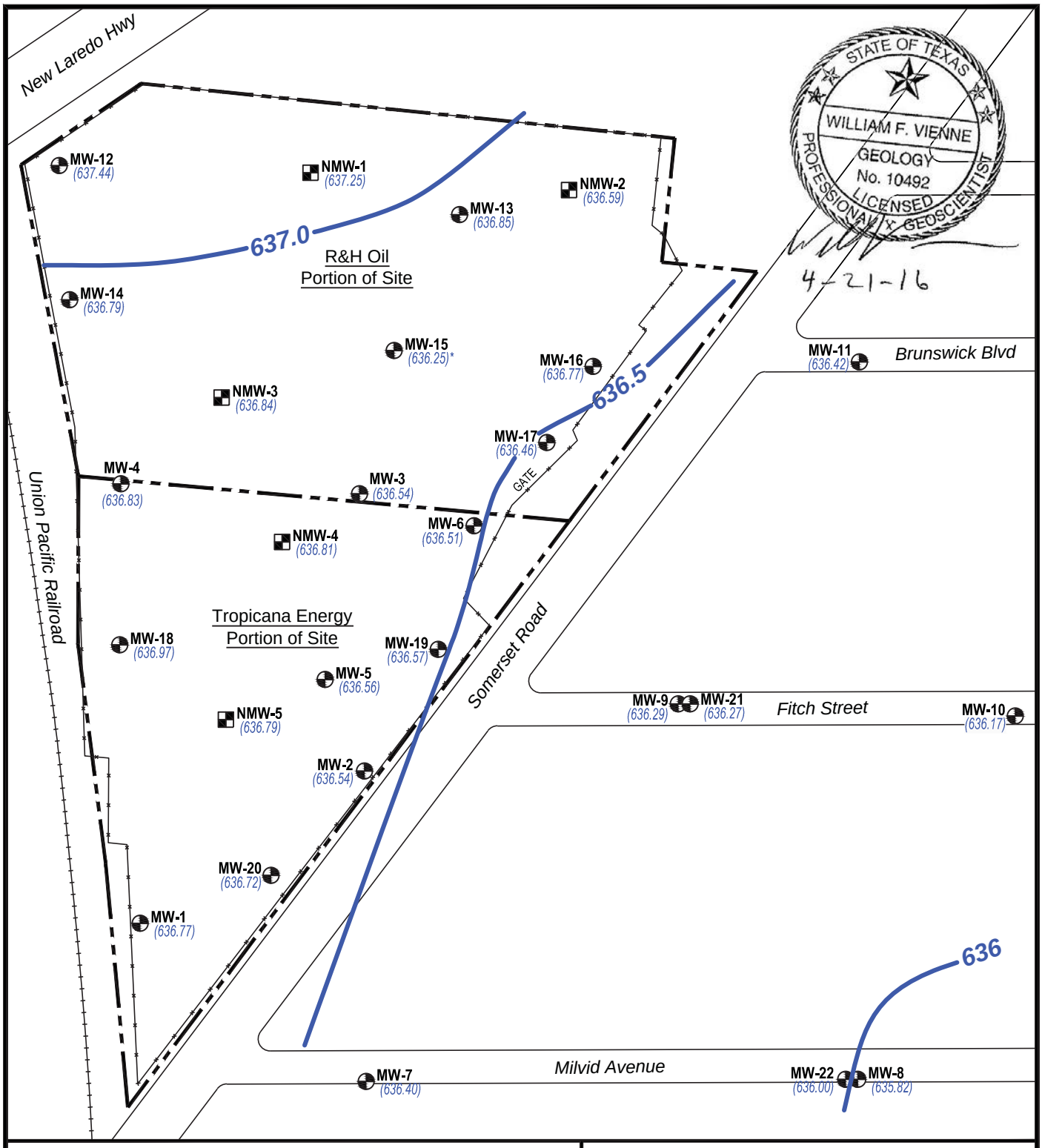
R&H OIL/TROPICANA ENERGY SITE

Figure 31

GROUNDWATER POTENTIOMETRIC SURFACE MAP - JULY 7, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (636.40) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 637 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

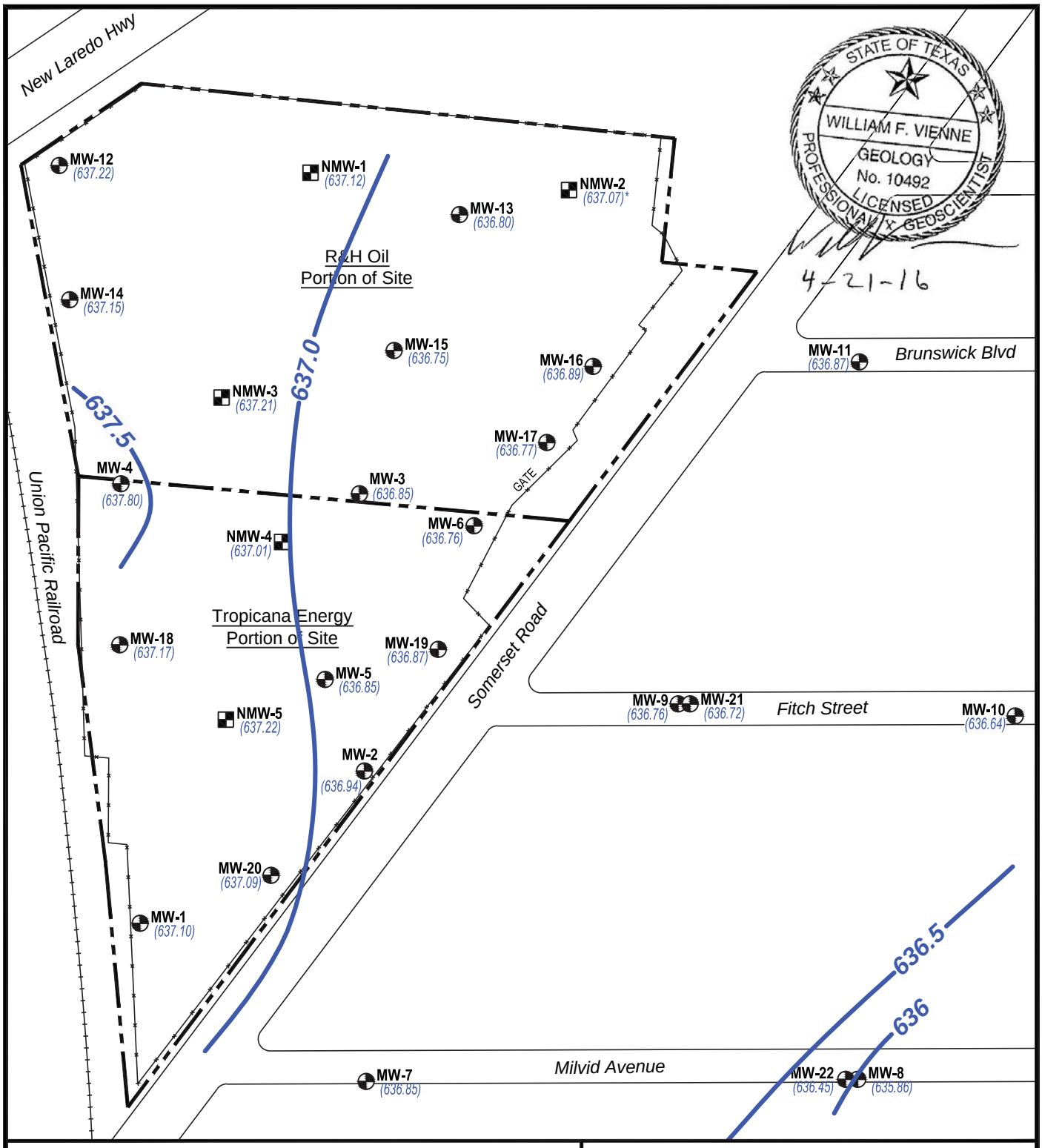
R&H OIL/TROPICANA ENERGY SITE

Figure 32

GROUNDWATER POTENTIOMETRIC SURFACE MAP - AUGUST 23, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (636.85) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 637 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note: See RI Table 5 for summary data.

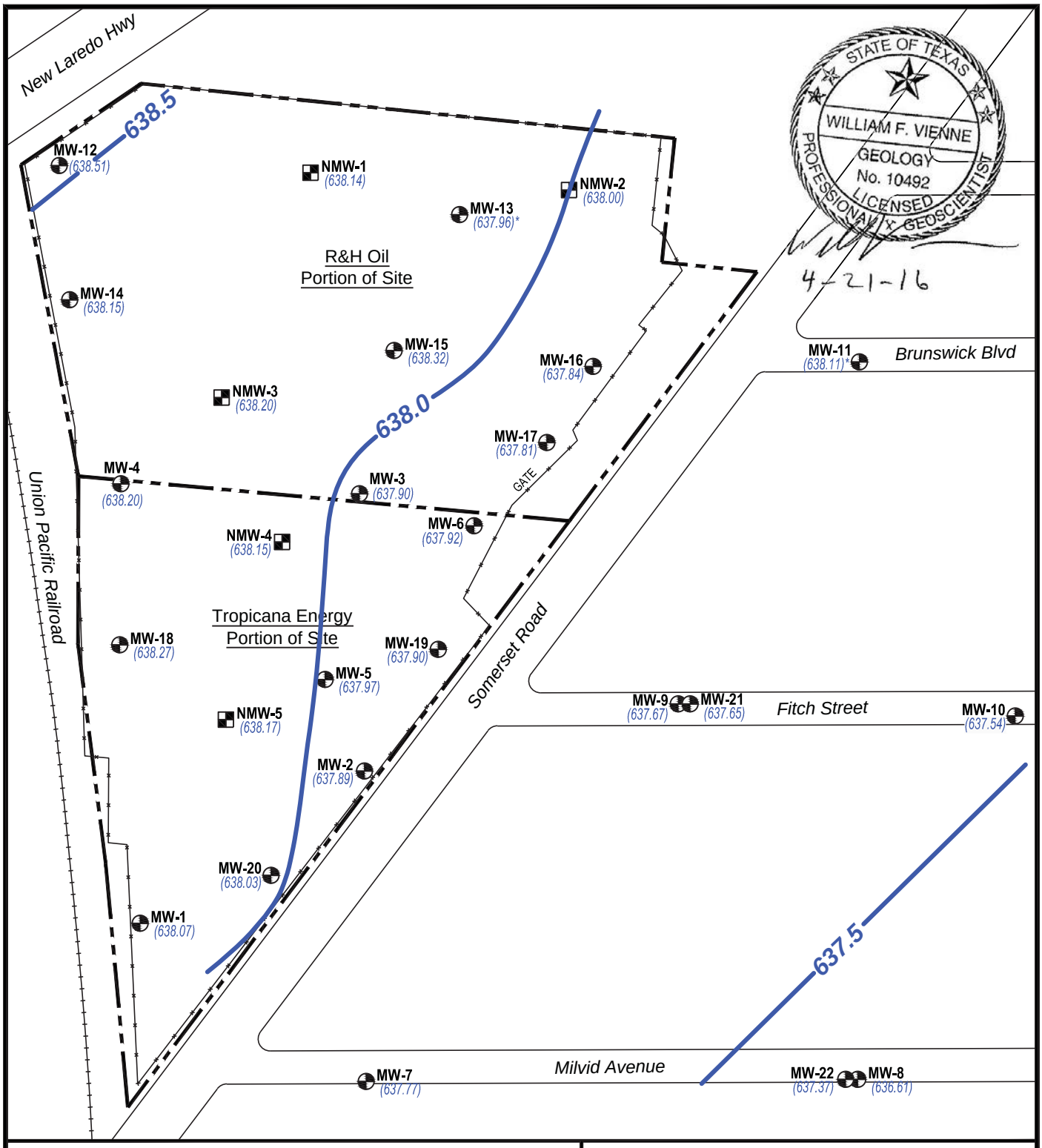
R&H OIL/TROPICANA ENERGY SITE

Figure 33

GROUNDWATER POTENTIOMETRIC SURFACE MAP - SEPT. 26, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (637.77) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- —638— Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

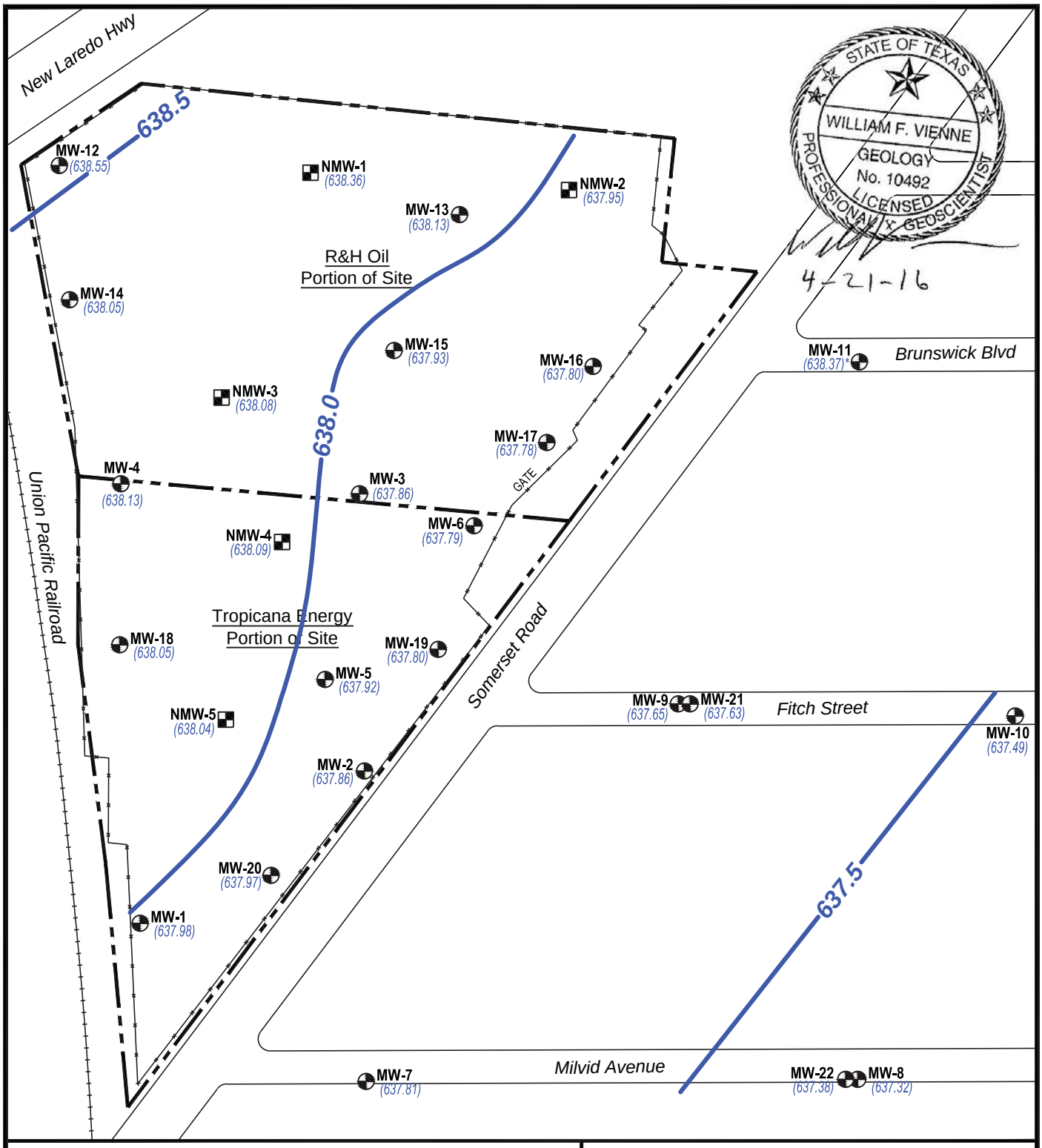
R&H OIL/TROPICANA ENERGY SITE

Figure 34

GROUNDWATER POTENTIOMETRIC SURFACE MAP - OCT. 24, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (637.81) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 638 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

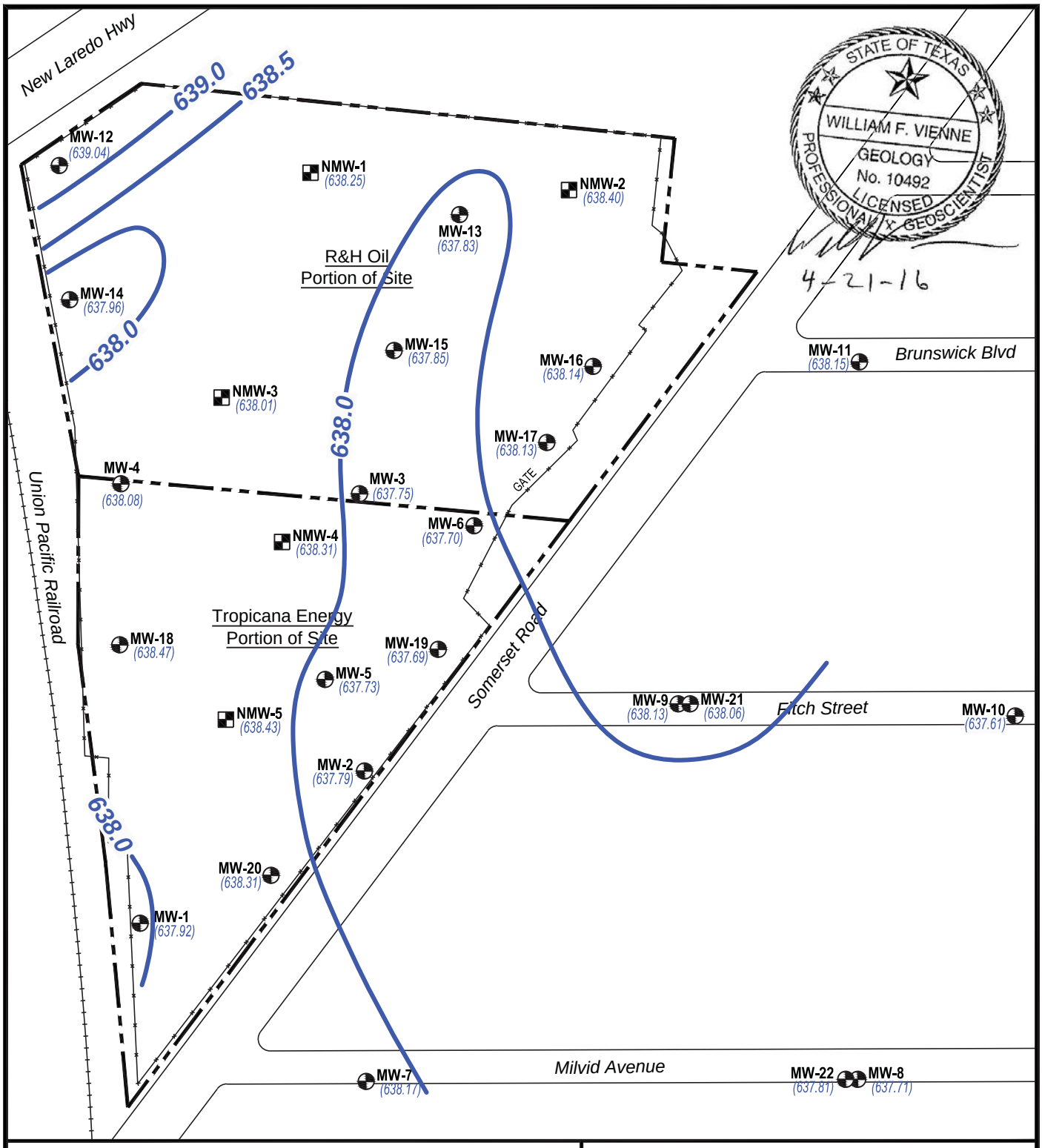
R&H OIL/TROPICANA ENERGY SITE

Figure 35

GROUNDWATER POTENTIOMETRIC SURFACE MAP - NOV. 27, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (637.81) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 638 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

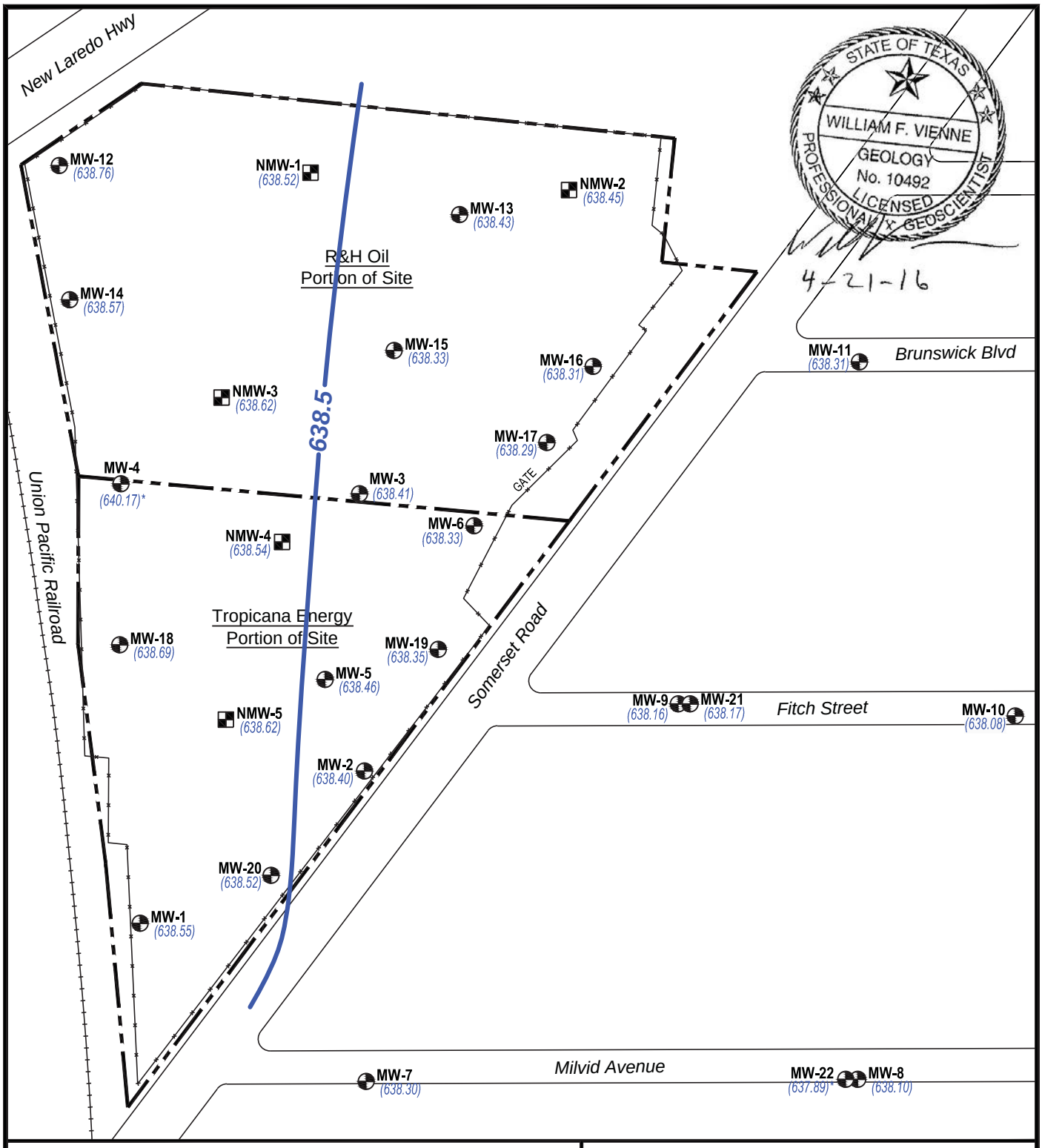
R&H OIL/TROPICANA ENERGY SITE

Figure 36

GROUNDWATER POTENTIOMETRIC SURFACE MAP - DEC. 11, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (638.30) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- —638.5— Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

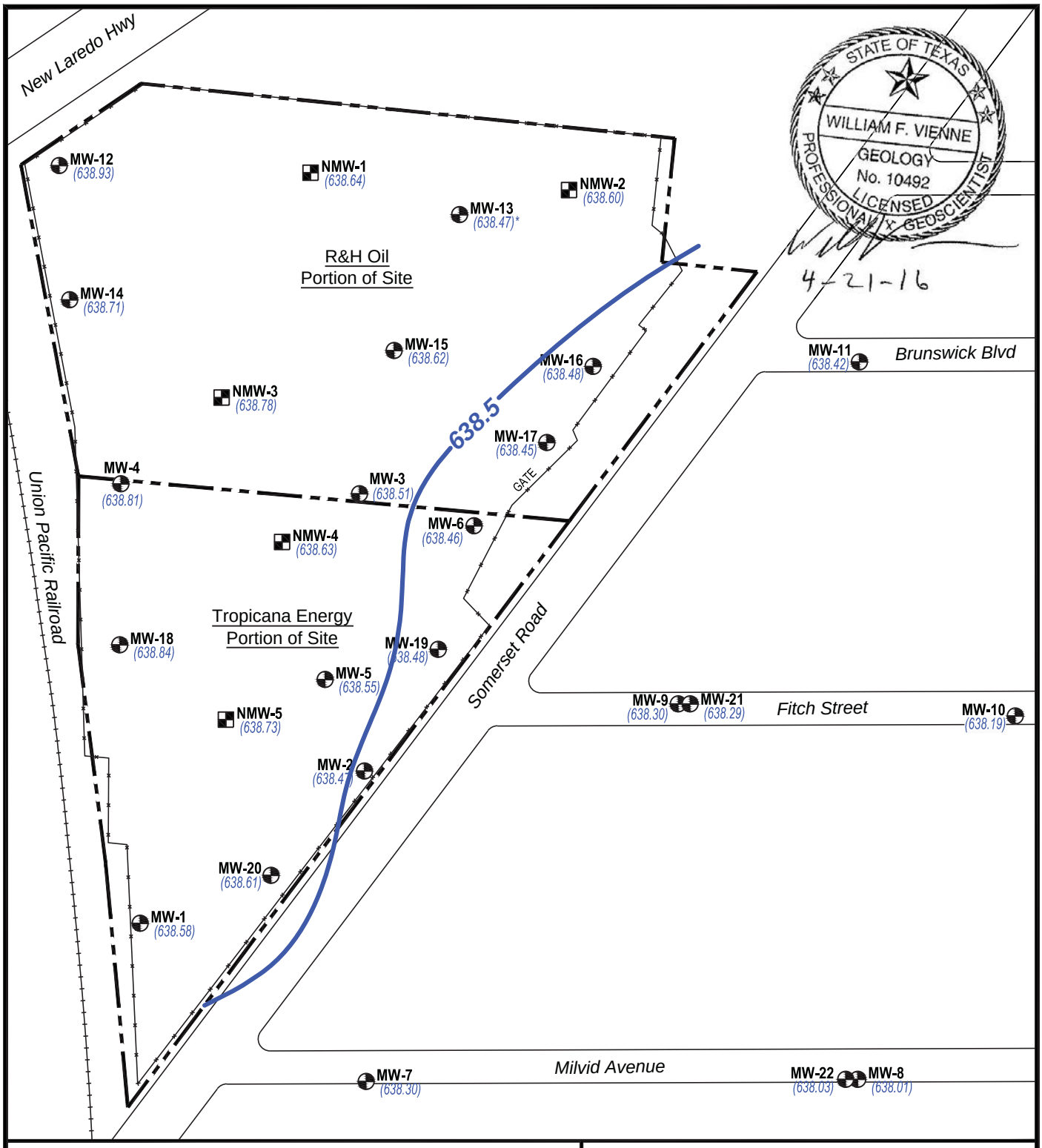
R&H OIL/TROPICANA ENERGY SITE

Figure 37

GROUNDWATER POTENTIOMETRIC SURFACE MAP - JAN. 16, 2013

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (638.30) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 638.5 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

R&H OIL/TROPICANA ENERGY SITE

Figure 38

GROUNDWATER POTENTIOMETRIC SURFACE MAP - FEB. 20, 2013

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

SS052MW562 (NM)

SS052MW097 (638.90)

SS052MW125 (638.75)

New Laredo Hwy

Union Pacific Railroad

MW-12 (639.17)

639.0

NMW-1 (638.87)

NMW-2 (638.75)

MW-13 (638.66)

R&H Oil
Portion of Site

MW-14 (638.69)

MW-15 (638.55)

MW-16 (638.59)

NMW-3 (638.75)

MW-17 (638.60)

MW-4 (638.89)

MW-3 (638.46)

638.5

MW-6 (638.41)

NMW-4 (638.88)

Tropicana Energy
Portion of Site

MW-18 (638.96)

MW-19 (638.51)

MW-5 (638.53)

Somerset Road

NMW-5 (638.88)

MW-2 (638.66)

MW-20 (638.74)

MW-1 (638.80)

SS052MW184 (NM)

Fay Avenue

MW-7 (638.46)

Milvid Avenue

638.0

MW-22 (638.15)

MW-8 (637.96)

W Harlan Avenue

MW-11 (638.53)

Brunswick Blvd

MW-9 (638.43)

MW-21 (638.40)

Fitch Street

MW-10 (638.31)

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (638.53) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 638.5 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

Notes:
1. See RI Table 5 for summary data.
2. NM - Not measured

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

N

Approx. Scale in Feet

0 60 120

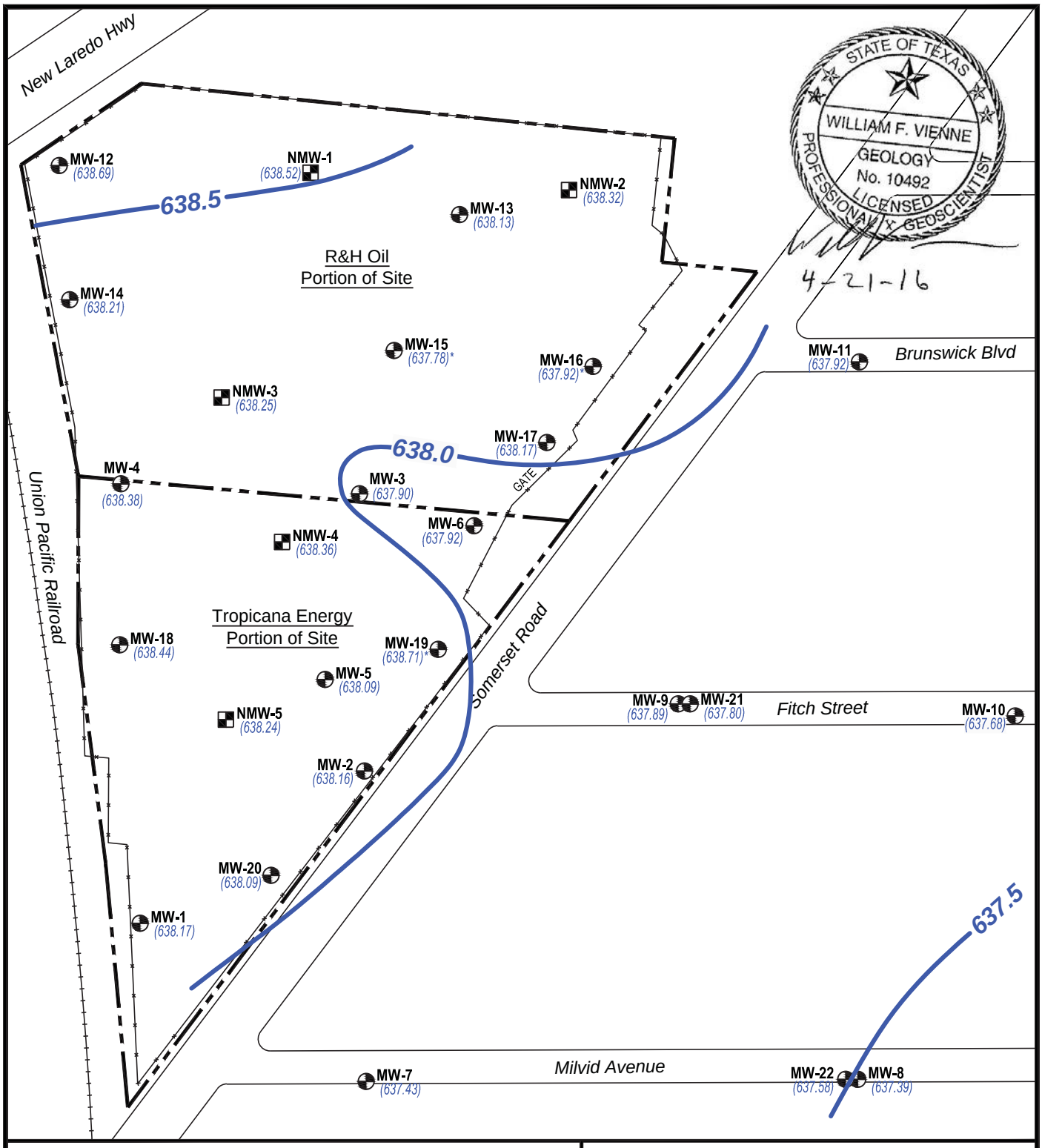
R&H OIL/TROPICANA ENERGY SITE

Figure 39

GROUNDWATER POTENTIOMETRIC SURFACE MAP - APRIL 21, 2014

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (637.58) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 638 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

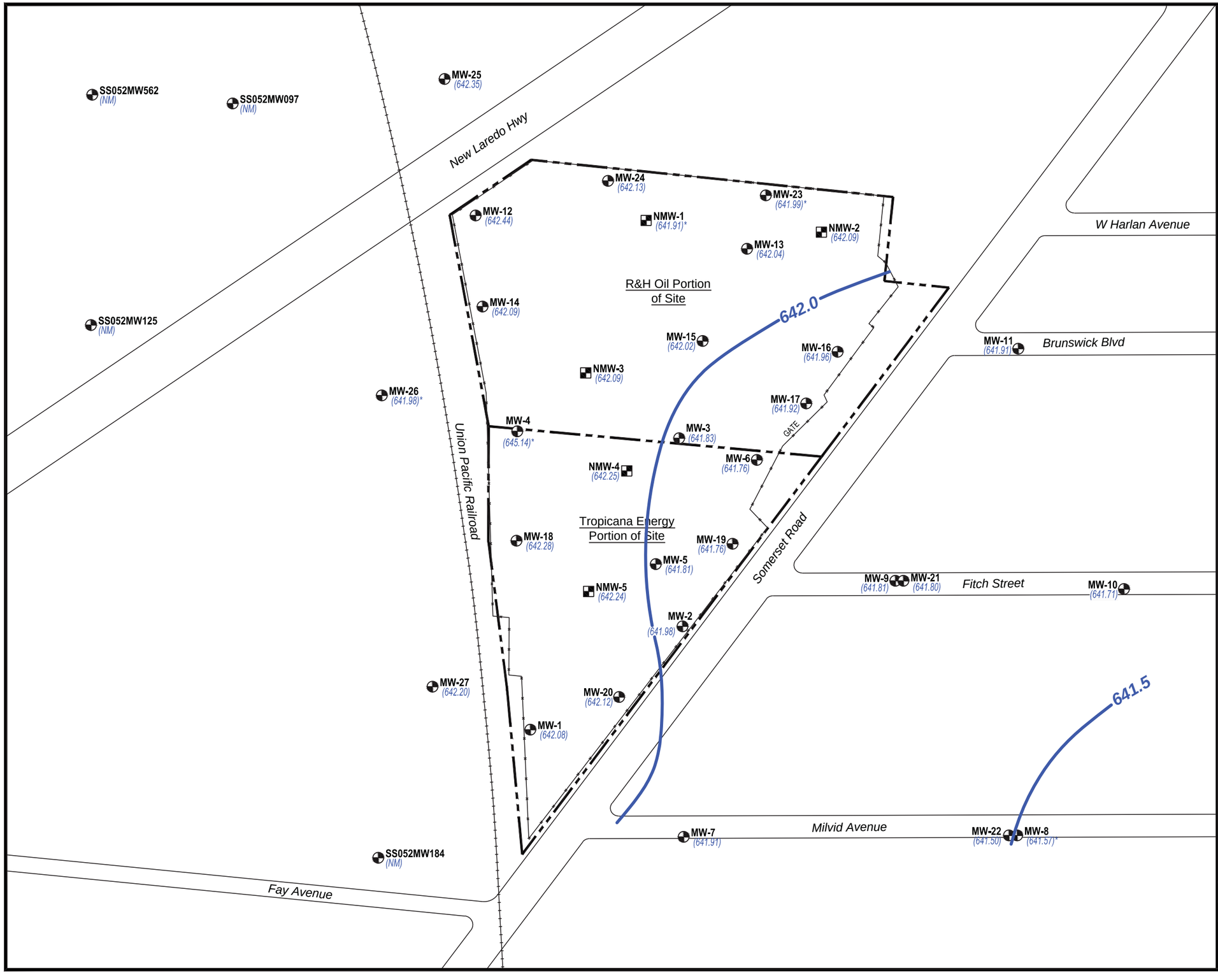
R&H OIL/TROPICANA ENERGY SITE

Figure 40

GROUNDWATER POTENTIOMETRIC SURFACE MAP - DEC. 18, 2014

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (641.91) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 642.0 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

Note:
See RI Table 5 for summary data.

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

N

Approx. Scale in Feet

0 60 120

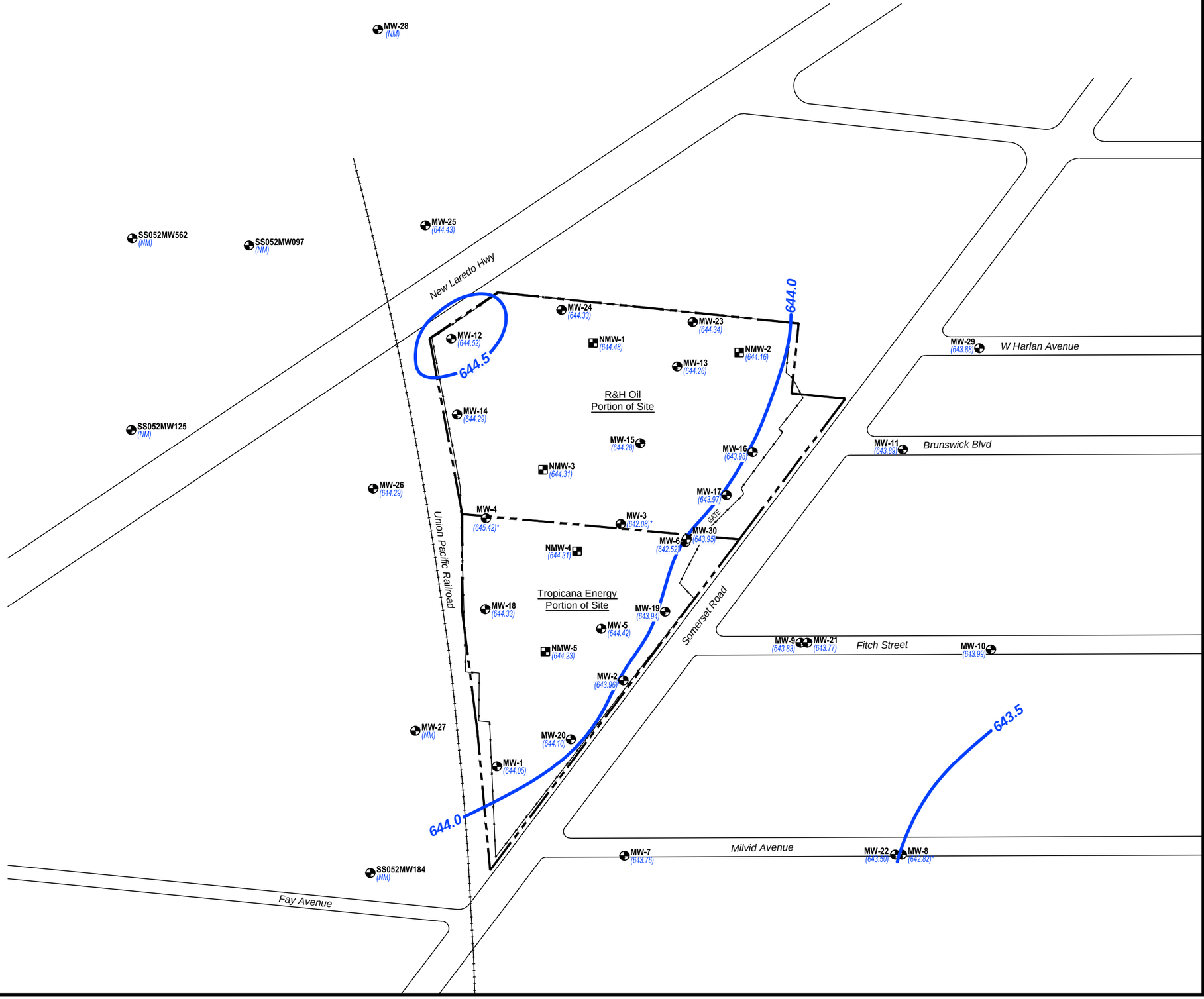
R&H OIL/TROPICANA ENERGY SITE

Figure 41

GROUNDWATER POTENTIOMETRIC SURFACE MAP - MAY 4, 2015

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (641.91) Groundwater Potentiometric Elevation (Ft, MSL) (* - Denotes not used in contouring)
- 642.0 Potentiometric Surface Contour (Ft, MSL) C.I.= 0.5 Ft

Notes:
1. See RI Table 5 for summary data.
2. NM - Not measured

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4-21-16

N

Approx. Scale in Feet

0 75 150

R&H OIL/TROPICANA ENERGY SITE

Figure 42

GROUNDWATER POTENTIOMETRIC SURFACE MAP - MARCH 3, 2016

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

NMW-1				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	TPH, Total	2,270	NA	12,000
0-0.5	Lead	1.5	33.1	52
0-0.5	Mercury	0.0039	0.04	0.08
3-4	TPH, Total	2,270	NA	7,500
3-4	Mercury	0.0039	0.04	0.013

MW-12				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	83
0-0.5	Mercury	0.0039	0.04	0.22

SB-4				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Arsenic	0.68	6.3	7.6
0-0.5	Thallium	0.78	NA	1.3J
3-4	TPH, Total	2,270	NA	170,000
3-4	Mercury	0.0039	0.04	0.0097J

MW-13				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Barium	220	300	230
0-0.5	Lead	1.5	33.1	69
3-4	TPH, Total	2,270	NA	92,000

SB-1				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	69
0-0.5	Mercury	0.0039	0.04	0.098
0-0.5	Benzo(a)anthracene	0.16	NA	0.22J
0-0.5	Benzo(a)pyrene	0.016	NA	0.21J
0-0.5	Benzo(b)fluoranthene	0.16	NA	0.47J
0-0.5	Chrysene	16	NA	0.27J
0-0.5	Indeno(1,2,3-cd)pyrene	0.16	NA	0.23J

NMW-2				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	TPH, Total	2,270	NA	5,600J
0-0.5	Lead	1.5	33.1	49
0-0.5	Mercury	0.0039	0.04	0.15
2-3	TPH, Total	2,270	NA	70,000J
2-3	Benzene	0.013	NA	3.3J

MW-14			
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
3-5	Benzene	0.013	0.2

MW-15				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	TPH, Total	2,270	NA	8,000J
0-0.5	Lead	1.5	33.1	110
0-0.5	Mercury	0.0039	0.04	0.055
2-3	TPH, Total	2,270	NA	6,800J
2-3	Benzene	0.013	NA	1.7

SB-2				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	TPH, Total	2,270	NA	4,800
0-0.5	Arsenic	0.68	6.3	7.9
0-0.5	Lead	1.5	33.1	430
0-0.5	Mercury	0.0039	0.04	0.37

MW-16			
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
0-0.5	TPH, Total	2,270	10,000
0-0.5	Methylene Chloride	0.0065	0.029
3-4	TPH, Total	2,270	3,200

SB-3				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	TPH, Total	2,270	NA	3,000
0-0.5	Lead	1.5	33.1	160
0-0.5	Mercury	0.0039	0.04	0.27

MW-17				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	55

NMW-3				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
3-4	Lead	1.5	33.1	44
3-4	Mercury	0.0039	0.04	0.2

MW-19				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	36
0-0.5	Mercury	0.0039	0.04	0.097
0-0.5	Benzo(a)pyrene	0.016	NA	0.16J

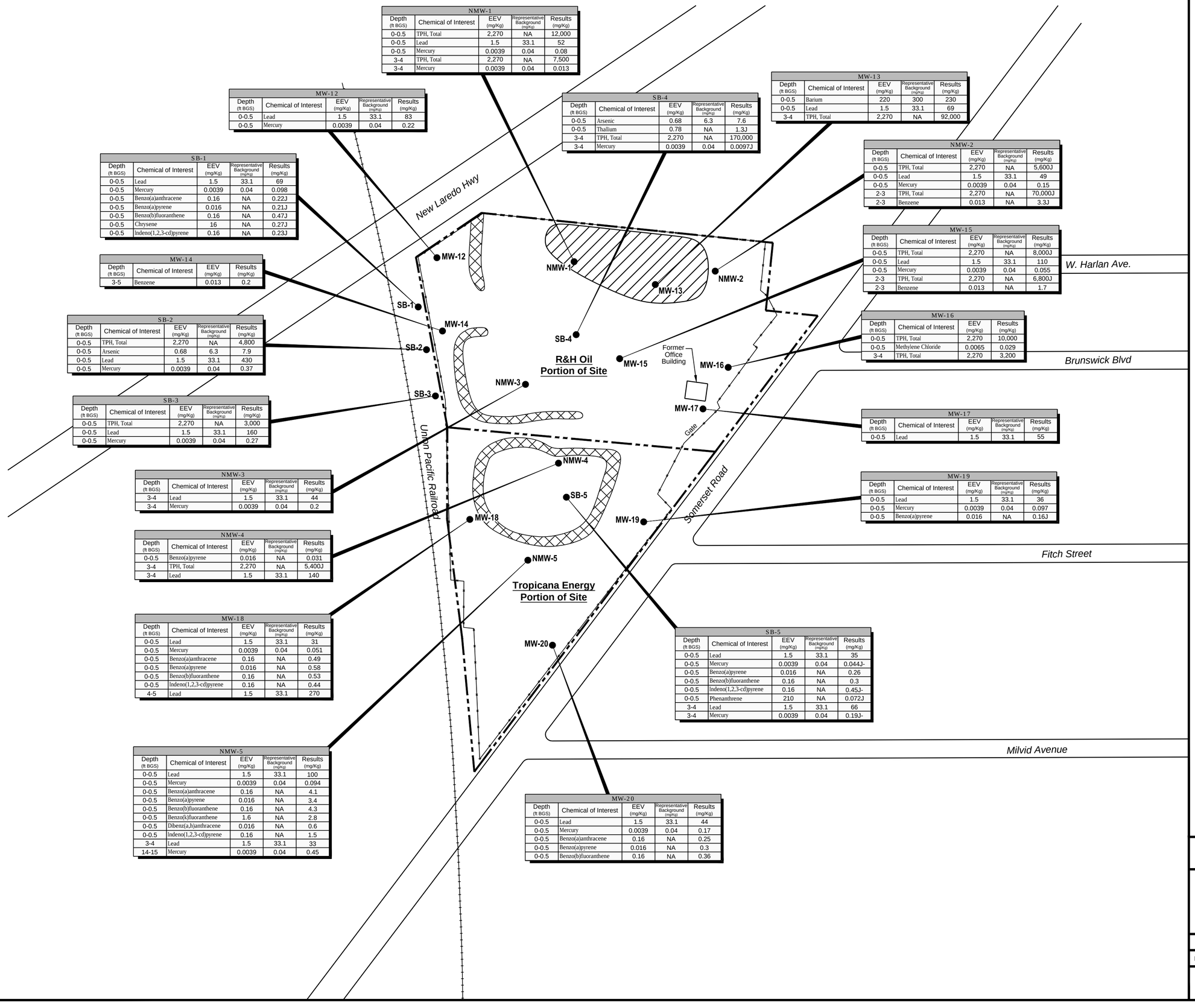
NMW-4				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Benzo(a)pyrene	0.016	NA	0.031
3-4	TPH, Total	2,270	NA	5,400J
3-4	Lead	1.5	33.1	140

MW-18				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	31
0-0.5	Mercury	0.0039	0.04	0.051
0-0.5	Benzo(a)anthracene	0.16	NA	0.49
0-0.5	Benzo(a)pyrene	0.016	NA	0.58
0-0.5	Benzo(b)fluoranthene	0.16	NA	0.53
0-0.5	Indeno(1,2,3-cd)pyrene	0.16	NA	0.44
4-5	Lead	1.5	33.1	270

SB-5				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	35
0-0.5	Mercury	0.0039	0.04	0.044J-
0-0.5	Benzo(a)pyrene	0.016	NA	0.26
0-0.5	Benzo(b)fluoranthene	0.16	NA	0.3
0-0.5	Indeno(1,2,3-cd)pyrene	0.16	NA	0.45J-
0-0.5	Phenanthrene	210	NA	0.072J
3-4	Lead	1.5	33.1	66
3-4	Mercury	0.0039	0.04	0.19J-

NMW-5				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	100
0-0.5	Mercury	0.0039	0.04	0.094
0-0.5	Benzo(a)anthracene	0.16	NA	4.1
0-0.5	Benzo(a)pyrene	0.016	NA	3.4
0-0.5	Benzo(b)fluoranthene	0.16	NA	4.3
0-0.5	Benzo(k)fluoranthene	1.6	NA	2.8
0-0.5	Dibenz(a,h)anthracene	0.016	NA	0.6
0-0.5	Indeno(1,2,3-cd)pyrene	0.16	NA	1.5
3-4	Lead	1.5	33.1	33
14-15	Mercury	0.0039	0.04	0.45

MW-20				
Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
0-0.5	Lead	1.5	33.1	44
0-0.5	Mercury	0.0039	0.04	0.17
0-0.5	Benzo(a)anthracene	0.16	NA	0.25
0-0.5	Benzo(a)pyrene	0.016	NA	0.3
0-0.5	Benzo(b)fluoranthene	0.16	NA	0.36



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Sample Location
- Earthen Berm (Approximate)
- Location of Tarry Seeps (Approximate Area as Observed on 9/13/16)

Note:
1. Surface samples collected from 0 to 0.5 ft interval, shallow samples collected from 0.5 to 5 ft interval.
2. Soils samples analyzed for VOCs, SVOCs, TPH, and RCRA metals.
3. Soil sampling results provided on Tables 8 through 13 in the RI Report.
4. Only results exceeding the EEV and Background Value (Table 2) are shown.

N

Approx. Scale in Feet

0 50 100

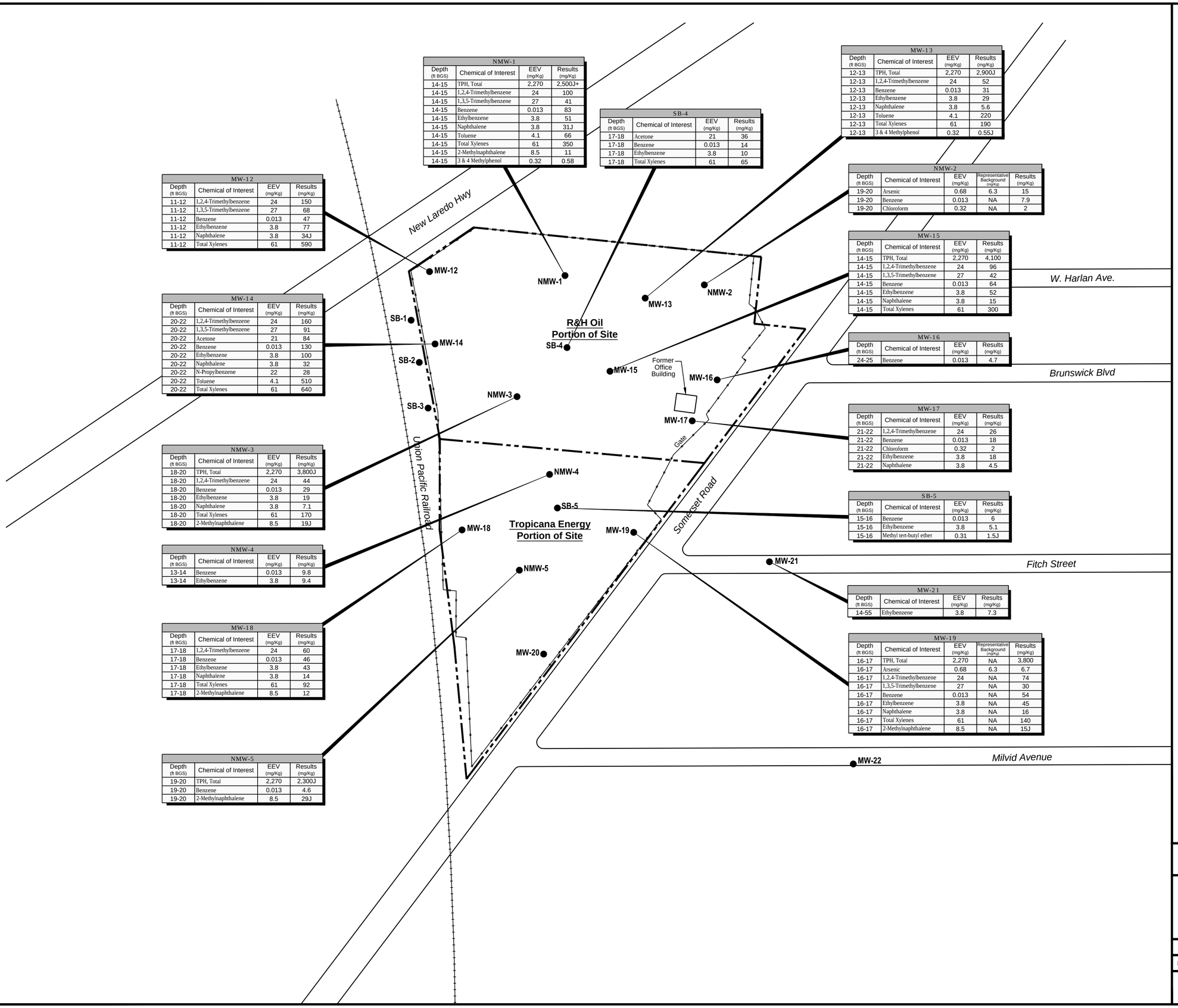
R&H OIL/TROPICANA ENERGY SITE

Figure 43

SURFACE AND SHALLOW SOIL EXTENT EVALUATION VALUE EXCEEDENCES

PROJECT: 1651	BY: AJD	REVISIONS
DATE: SEPT., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



MW-12

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
11-12	1,2,4-Trimethylbenzene	24	150
11-12	1,3,5-Trimethylbenzene	27	68
11-12	Benzene	0.013	47
11-12	Ethylbenzene	3.8	77
11-12	Naphthalene	3.8	34J
11-12	Total Xylenes	61	590

MW-14

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
20-22	1,2,4-Trimethylbenzene	24	160
20-22	1,3,5-Trimethylbenzene	27	91
20-22	Acetone	21	84
20-22	Benzene	0.013	130
20-22	Ethylbenzene	3.8	100
20-22	Naphthalene	3.8	32
20-22	N-Propylbenzene	22	28
20-22	Toluene	4.1	510
20-22	Total Xylenes	61	640

NMW-3

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
18-20	TPH, Total	2,270	3,800J
18-20	1,2,4-Trimethylbenzene	24	44
18-20	Benzene	0.013	29
18-20	Ethylbenzene	3.8	19
18-20	Naphthalene	3.8	7.1
18-20	Total Xylenes	61	170
18-20	2-Methylnaphthalene	8.5	19J

NMW-4

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
13-14	Benzene	0.013	9.8
13-14	Ethylbenzene	3.8	9.4

MW-18

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
17-18	1,2,4-Trimethylbenzene	24	60
17-18	Benzene	0.013	46
17-18	Ethylbenzene	3.8	43
17-18	Naphthalene	3.8	14
17-18	Total Xylenes	61	92
17-18	2-Methylnaphthalene	8.5	12

NMW-5

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
19-20	TPH, Total	2,270	2,300J
19-20	Benzene	0.013	4.6
19-20	2-Methylnaphthalene	8.5	29J

NMW-1

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
14-15	TPH, Total	2,270	2,500J+
14-15	1,2,4-Trimethylbenzene	24	100
14-15	1,3,5-Trimethylbenzene	27	41
14-15	Benzene	0.013	83
14-15	Ethylbenzene	3.8	51
14-15	Naphthalene	3.8	31J
14-15	Toluene	4.1	66
14-15	Total Xylenes	61	350
14-15	2-Methylnaphthalene	8.5	11
14-15	3 & 4 Methylphenol	0.32	0.58

SB-4

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
17-18	Acetone	21	36
17-18	Benzene	0.013	14
17-18	Ethylbenzene	3.8	10
17-18	Total Xylenes	61	65

MW-13

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
12-13	TPH, Total	2,270	2,900J
12-13	1,2,4-Trimethylbenzene	24	52
12-13	Benzene	0.013	31
12-13	Ethylbenzene	3.8	29
12-13	Naphthalene	3.8	5.6
12-13	Toluene	4.1	220
12-13	Total Xylenes	61	190
12-13	3 & 4 Methylphenol	0.32	0.55J

NMW-2

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
19-20	Arsenic	0.68	6.3	15
19-20	Benzene	0.013	NA	7.9
19-20	Chloroform	0.32	NA	2

MW-15

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
14-15	TPH, Total	2,270	4,100
14-15	1,2,4-Trimethylbenzene	24	96
14-15	1,3,5-Trimethylbenzene	27	42
14-15	Benzene	0.013	64
14-15	Ethylbenzene	3.8	52
14-15	Naphthalene	3.8	15
14-15	Total Xylenes	61	300

MW-16

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
24-25	Benzene	0.013	4.7

MW-17

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
21-22	1,2,4-Trimethylbenzene	24	26
21-22	Benzene	0.013	18
21-22	Chloroform	0.32	2
21-22	Ethylbenzene	3.8	18
21-22	Naphthalene	3.8	4.5

SB-5

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
15-16	Benzene	0.013	6
15-16	Ethylbenzene	3.8	5.1
15-16	Methyl tert-butyl ether	0.31	1.5J

MW-21

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Results (mg/Kg)
14-55	Ethylbenzene	3.8	7.3

MW-19

Depth (ft BGS)	Chemical of Interest	EEV (mg/Kg)	Representative Background (mg/Kg)	Results (mg/Kg)
16-17	TPH, Total	2,270	NA	3,800
16-17	Arsenic	0.68	6.3	6.7
16-17	1,2,4-Trimethylbenzene	24	NA	74
16-17	1,3,5-Trimethylbenzene	27	NA	30
16-17	Benzene	0.013	NA	54
16-17	Ethylbenzene	3.8	NA	45
16-17	Naphthalene	3.8	NA	16
16-17	Total Xylenes	61	NA	140
16-17	2-Methylnaphthalene	8.5	NA	15J

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Sample Location

Note:
1. Deep samples collected from >5 ft interval.
2. Soils samples analyzed for VOCs, SVOCs, TPH, and RCRA metals.
3. Soil sampling results provided on Tables 8 through 13 in the RI Report.
4. Only results exceeding the EEV and Background Value (Table 2) are shown.

N

Approx. Scale in Feet

0 50 100

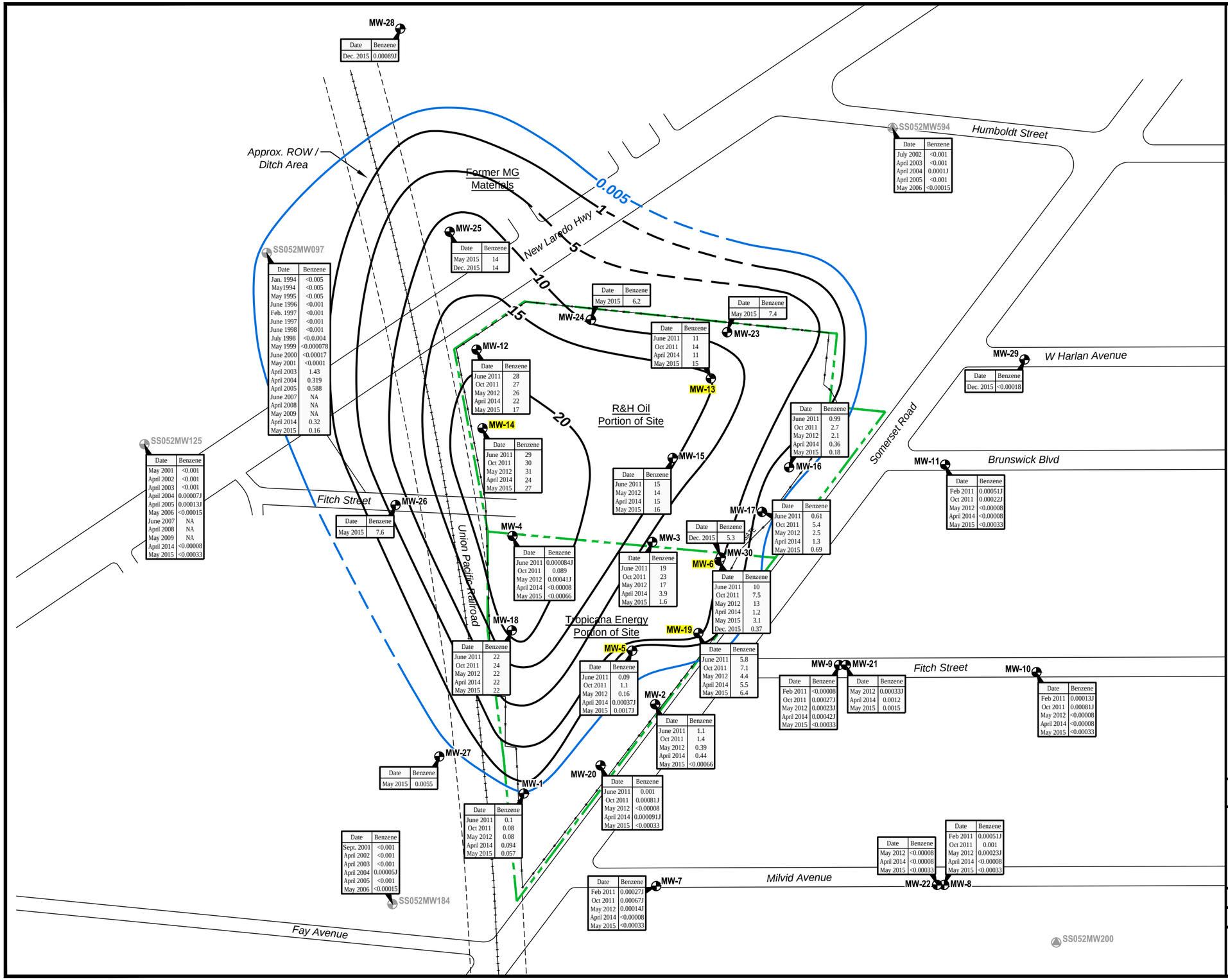
R&H OIL/TROPICANA ENERGY SITE

Figure 44

DEEP SOIL EXTENT EVALUATION VALUE EXCEEDENCES

PROJECT: 1651	BY: AJD	REVISIONS
DATE: SEPT., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- Groundwater Monitoring Well (Kelly Air Force Base Well)
- Recovery Well
- Compliance Well (Kelly Air Force Base Well)
- 5 — Benzene Concentration Contour (Based on Most Recent Data From Each Well Location) Dashed where Inferred
- Extent Evaluation Value - 0.005 mg/L
- 0.005 — Extent Evaluation Contour

Notes:
1. All concentrations in mg/L.
2. J = Estimated value.
3. NA = Not analyzed.
4. Well highlighted in yellow contained measurable LNAPL during the most recent Site-Wide Sampling Event (May 2015).
5. See RI Tables 17, 21, 25, and 27 through 33 for summary data.

N

Approx. Scale in Feet

0 70 140

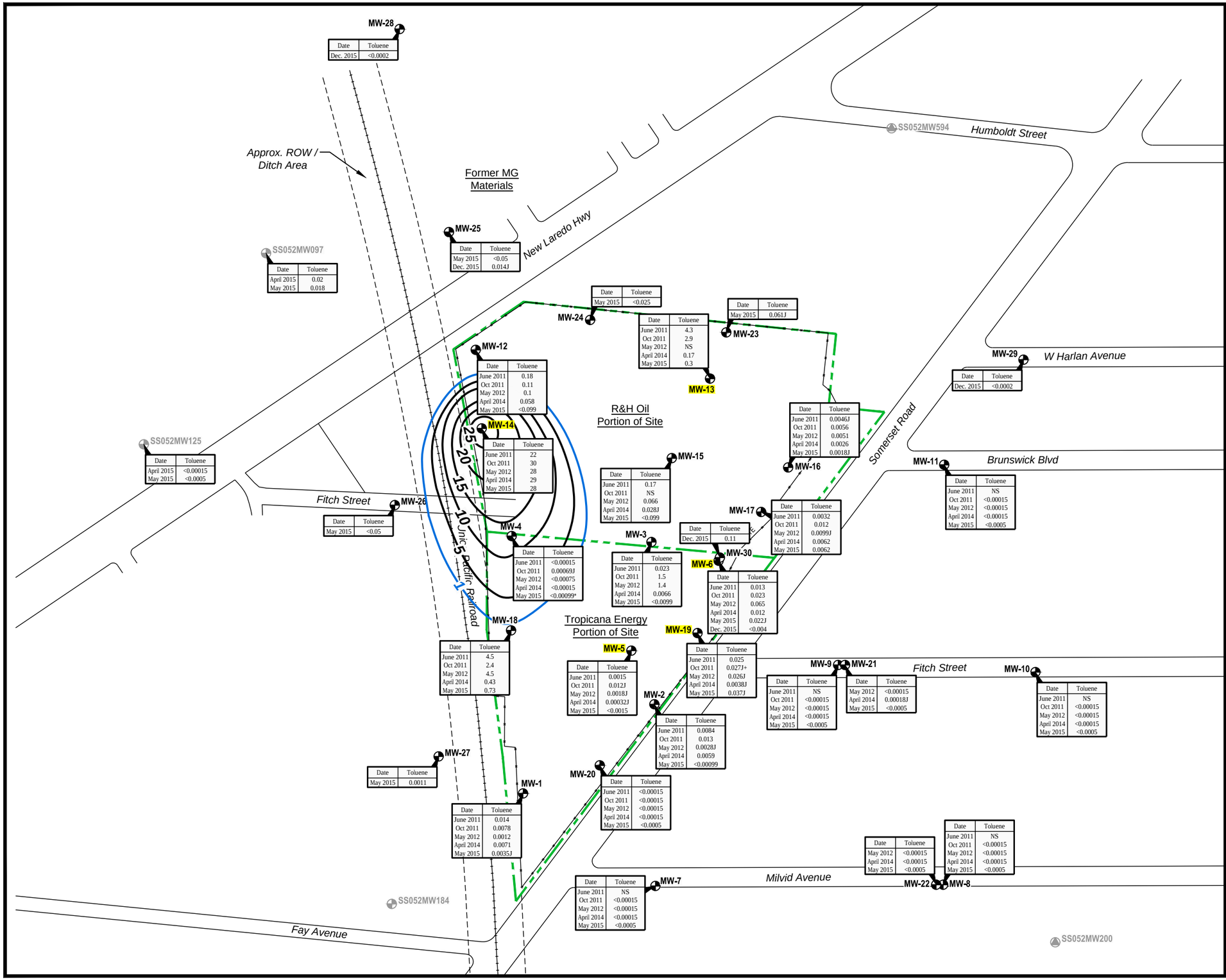
R&H OIL/TROPICANA ENERGY SITE

Figure 45

GROUNDWATER CONCENTRATION MAP: BENZENE

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- Groundwater Monitoring Well (Kelly Air Force Base Well)
- Recovery Well
- Compliance Well (Kelly Air Force Base Well)
- 5 — Toluene Concentration Contour (Based on Most Recent Data From Each Well Location)

Extent Evaluation Value - 1 mg/L

- 1 — Extent Evaluation Contour

Notes:
1. All concentrations in mg/L.
2. J = Estimated value.
3. NA = Not analyzed.
4. Well highlighted in yellow contained measurable LNAPL during the most recent Site-Wide Sampling Event (May 2015).
5. * Results not used in contouring (MW-4).
6. See RI Tables 17, 21, 25, and 27 through 33 for summary data.

N

Approx. Scale in Feet

0 70 140

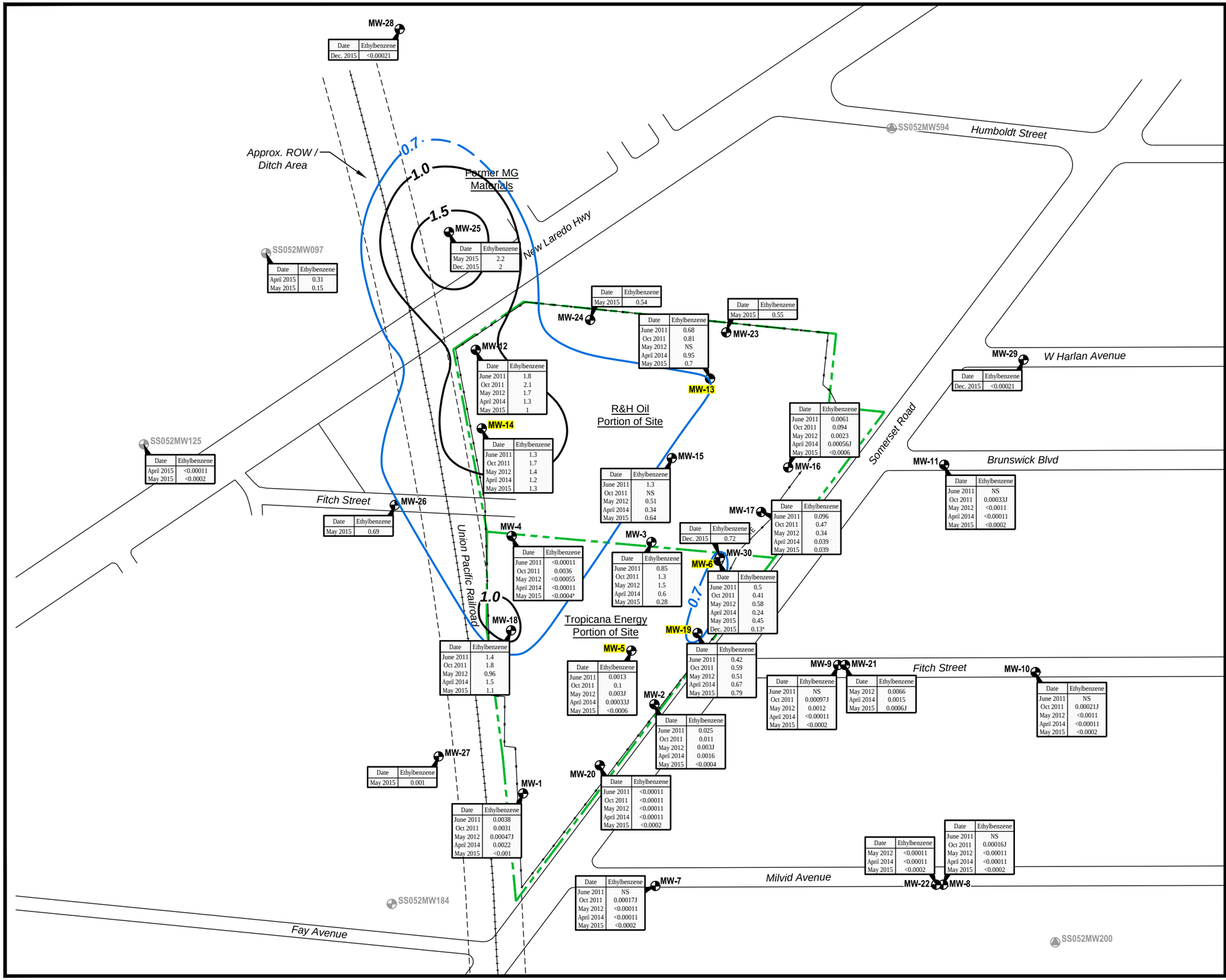
R&H OIL/TROPICANA ENERGY SITE

Figure 46

GROUNDWATER CONCENTRATION MAP: TOLUENE

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- Groundwater Monitoring Well (Kelly Air Force Base Well)
- Recovery Well
- Compliance Well (Kelly Air Force Base Well)
- 1.0 — Ethylbenzene Concentration Contour (Based on Most Recent Data From Each Well Location) Dashed where Inferred

Extent Evaluation Value - 0.7 mg/L

0.7 — Extent Evaluation Contour

Notes:

1. All concentrations in mg/L.
2. J = Estimated value.
3. NA = Not analyzed.
4. Well highlighted in yellow contained measurable LNAPL during the most recent Site-Wide Sampling Event (May 2015).
5. * Results not used in contouring (MW-4 & MW-6).
6. See RI Tables 17, 21, 25, and 27 through 33 for summary data.

N

Approx. Scale in Feet

0 70 140

R&H OIL/TROPICANA ENERGY SITE

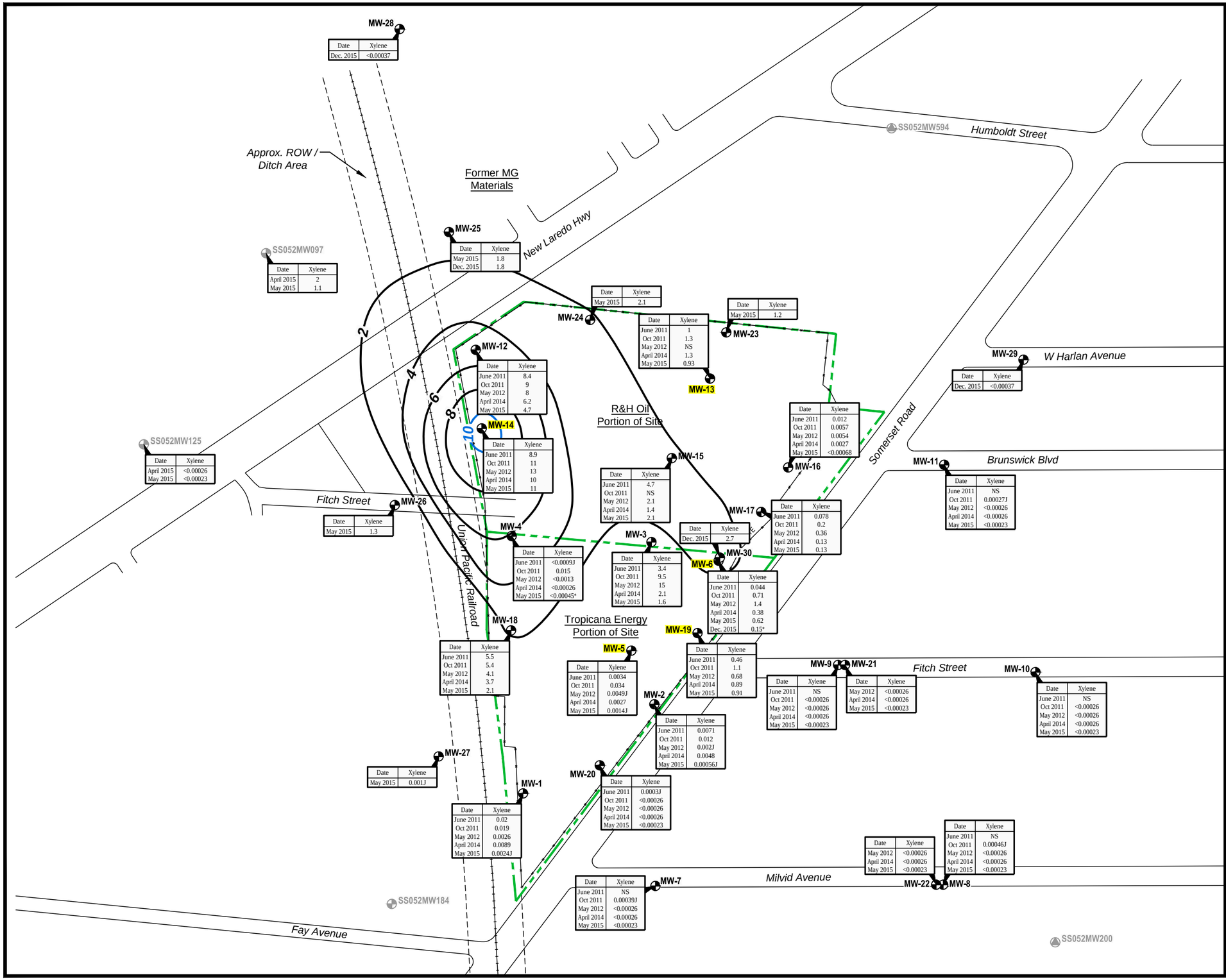
Figure 47

GROUNDWATER CONCENTRATION MAP: ETHYLBENZENE

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- Groundwater Monitoring Well (Kelly Air Force Base Well)
- Recovery Well
- Compliance Well (Kelly Air Force Base Well)
- 2 — Xylene Concentration Contour (Based on Most Recent Data From Each Well Location)

Extent Evaluation Value - 10 mg/L

- 10 — Extent Evaluation Contour

Notes:

1. All concentrations in mg/L.
2. J = Estimated value.
3. NA = Not analyzed.
4. Well highlighted in yellow contained measurable LNAPL during the most recent Site-Wide Sampling Event (May 2015).
5. * Results not used in contouring (MW-4 & MW-6).
6. See RI Tables 17, 21, 25, and 27 through 33 for summary data.

N

Approx. Scale in Feet

0 70 140

R&H OIL/TROPICANA ENERGY SITE

Figure 48

GROUNDWATER CONCENTRATION MAP: XYLENE

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

FIGURE 49

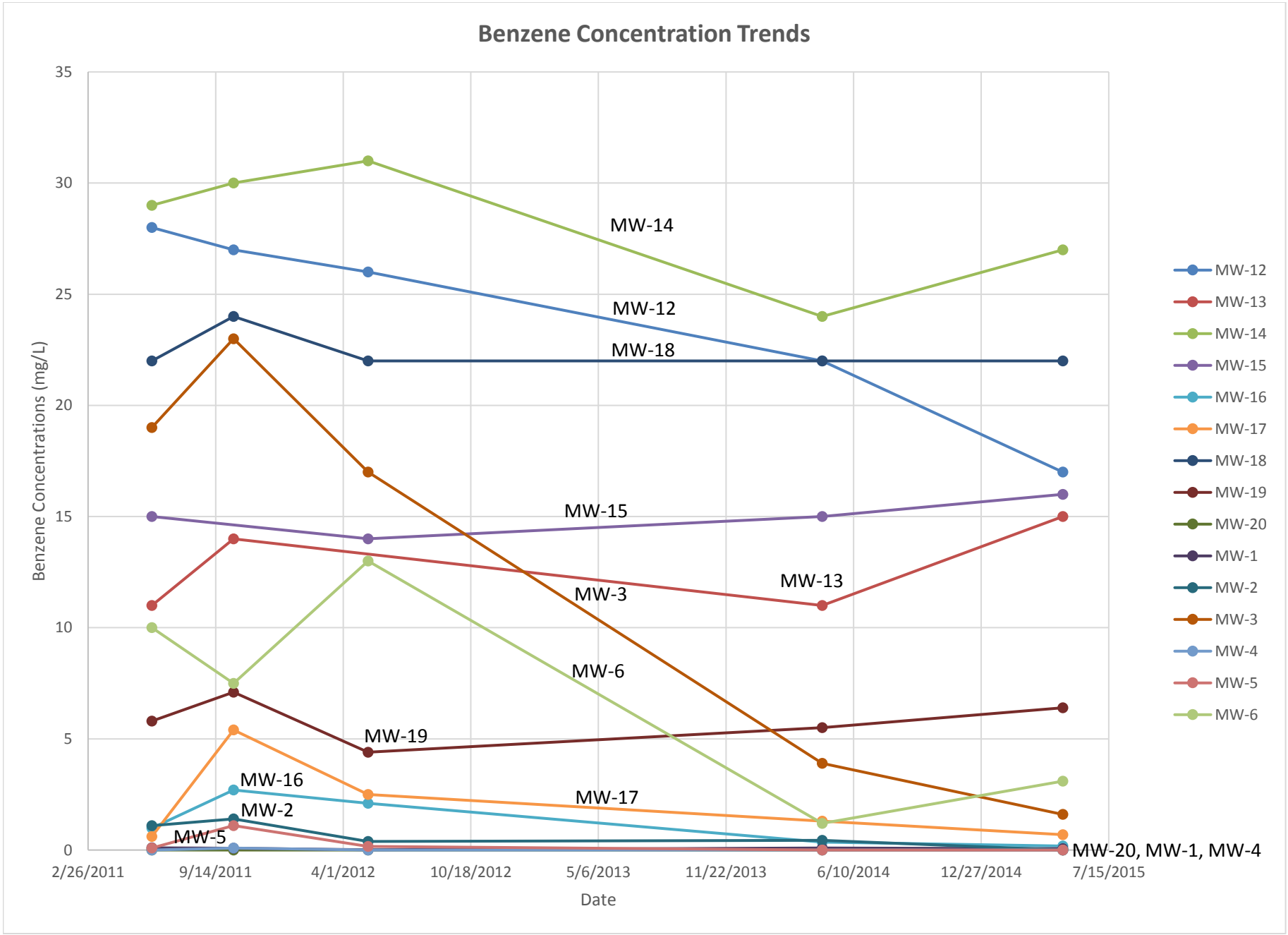

Benzene Concentration Trends
Benzene Concentrations (mg/L)
35
30
25
20
15
10
5
0
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
Date
MW-14
MW-12
MW-18
MW-15
MW-13
MW-3
MW-6
MW-19
MW-16
MW-17
MW-2
MW-5
MW-20, MW-1, MW-4
MW-12
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18
MW-19
MW-20
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6

FIGURE 50

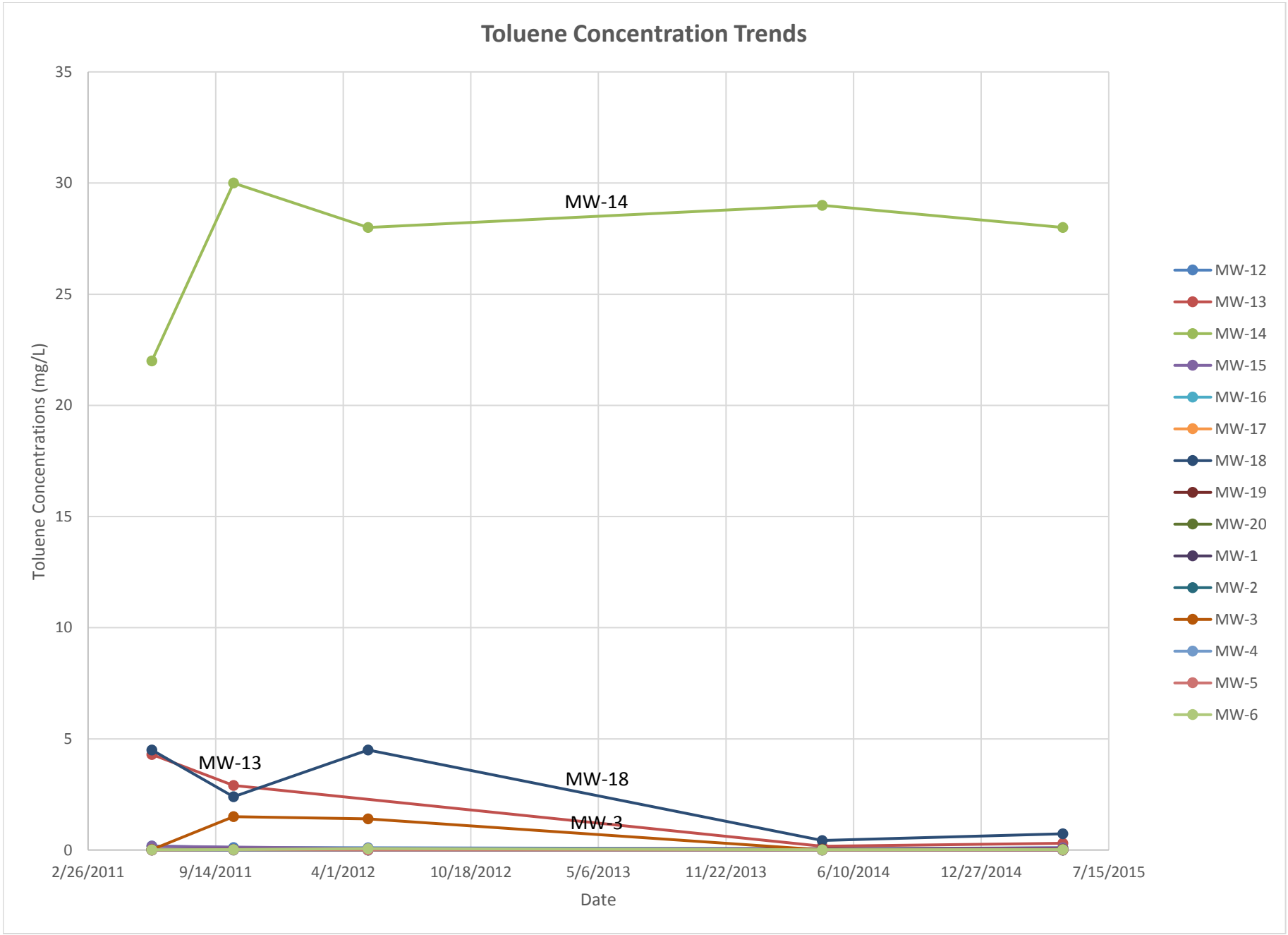

Toluene Concentration Trends
Toluene Concentrations (mg/L)
35
30
25
20
15
10
5
0
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
Date
MW-14
MW-13
MW-18
MW-3
MW-12
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18
MW-19
MW-20
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6

FIGURE 51

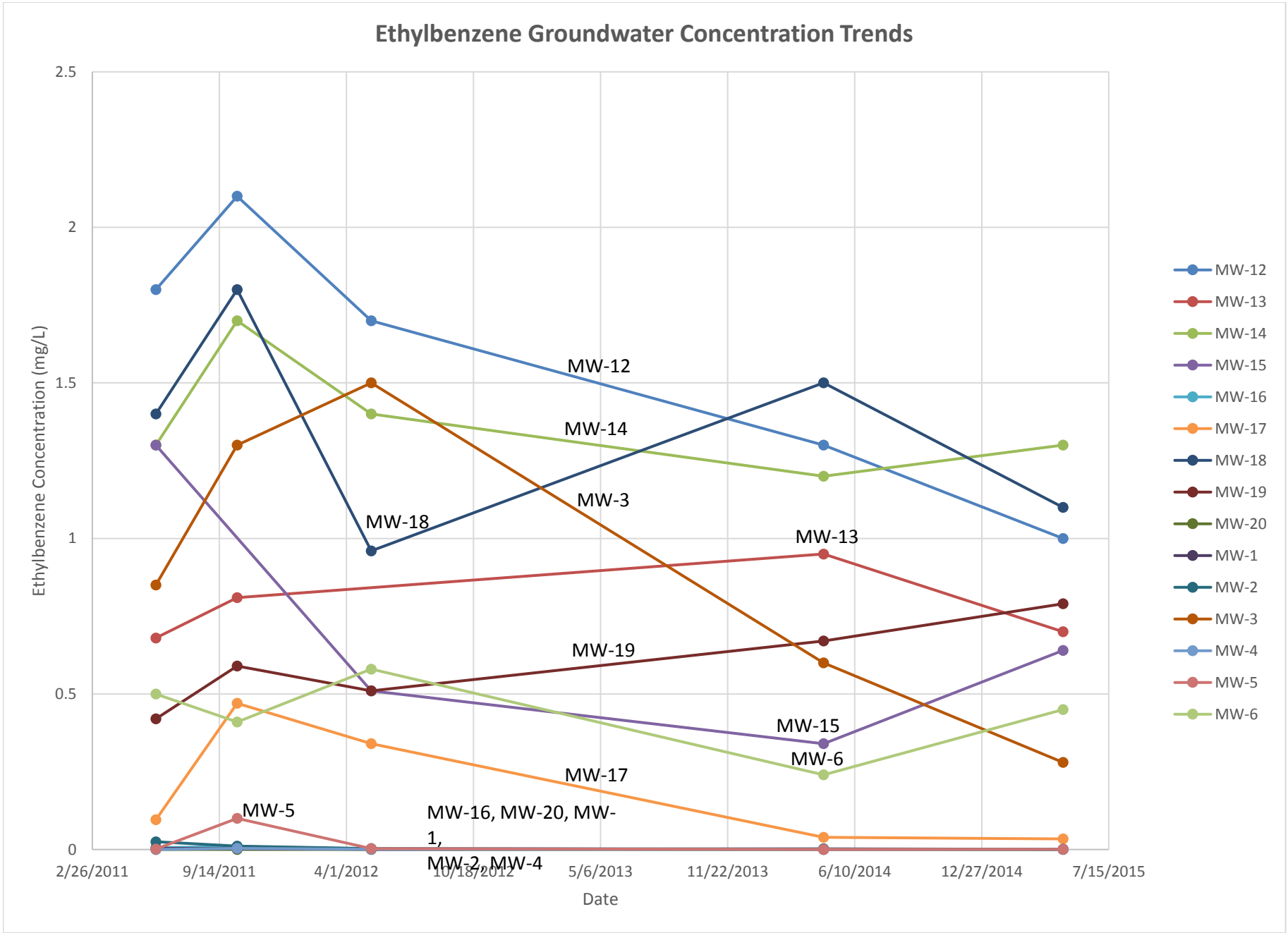

Ethylbenzene Groundwater Concentration Trends
Ethylbenzene Concentration (mg/L)
2.5
2
1.5
1
0.5
0
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
Date
MW-12
MW-14
MW-3
MW-18
MW-13
MW-19
MW-15
MW-6
MW-17
MW-5
MW-16, MW-20, MW-1, MW-2, MW-4
MW-12
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18
MW-19
MW-20
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6

FIGURE 52

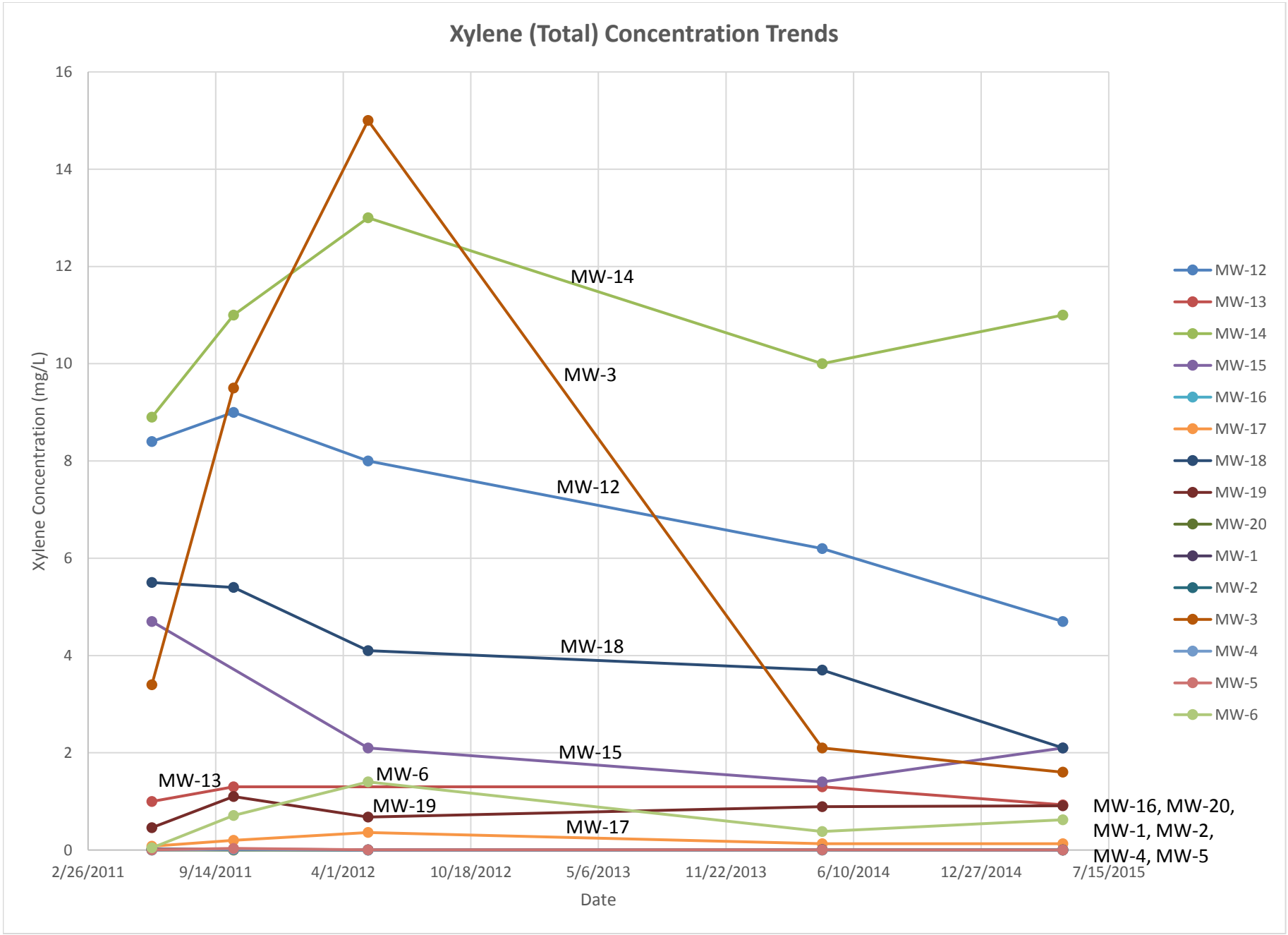
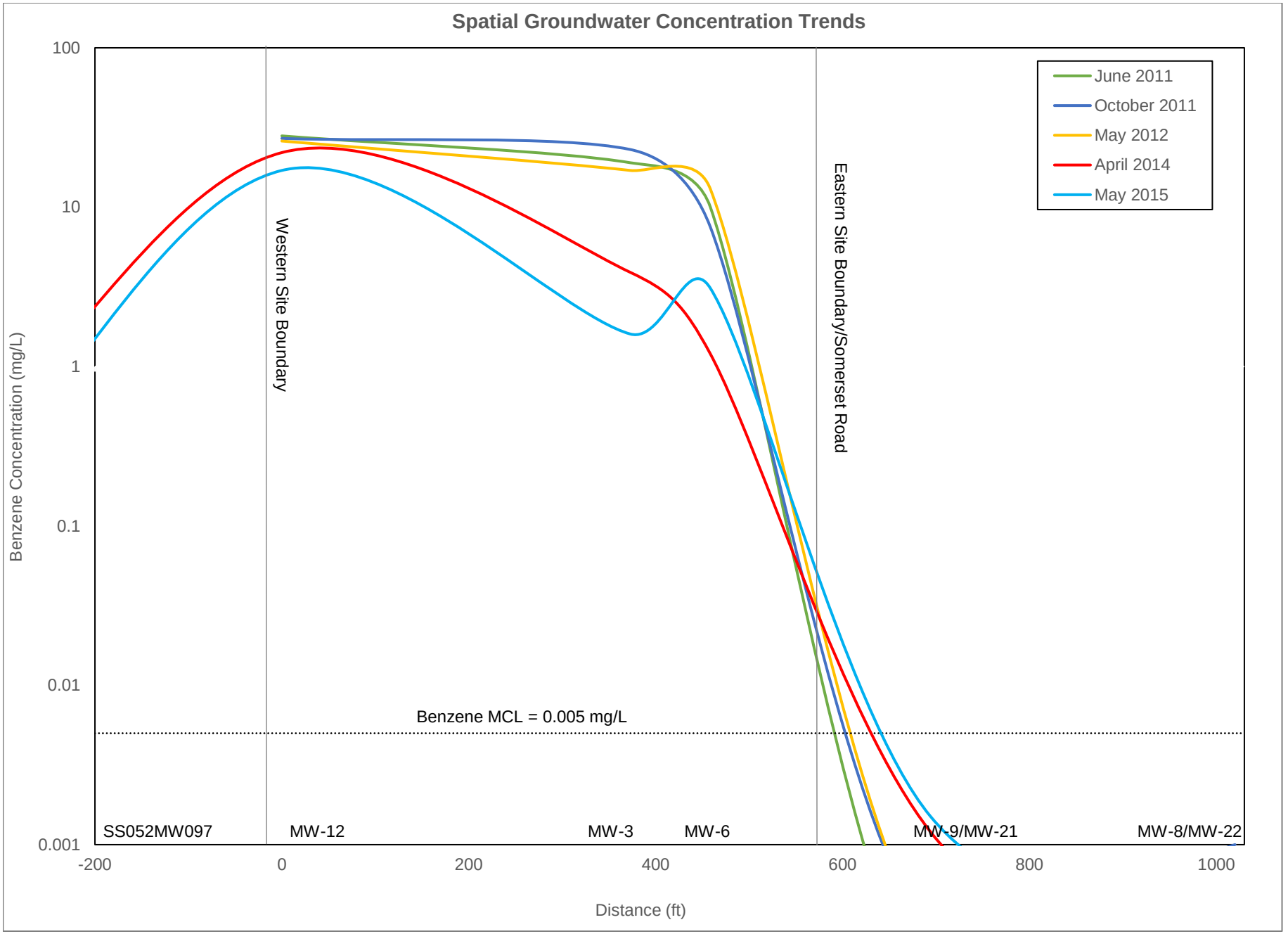
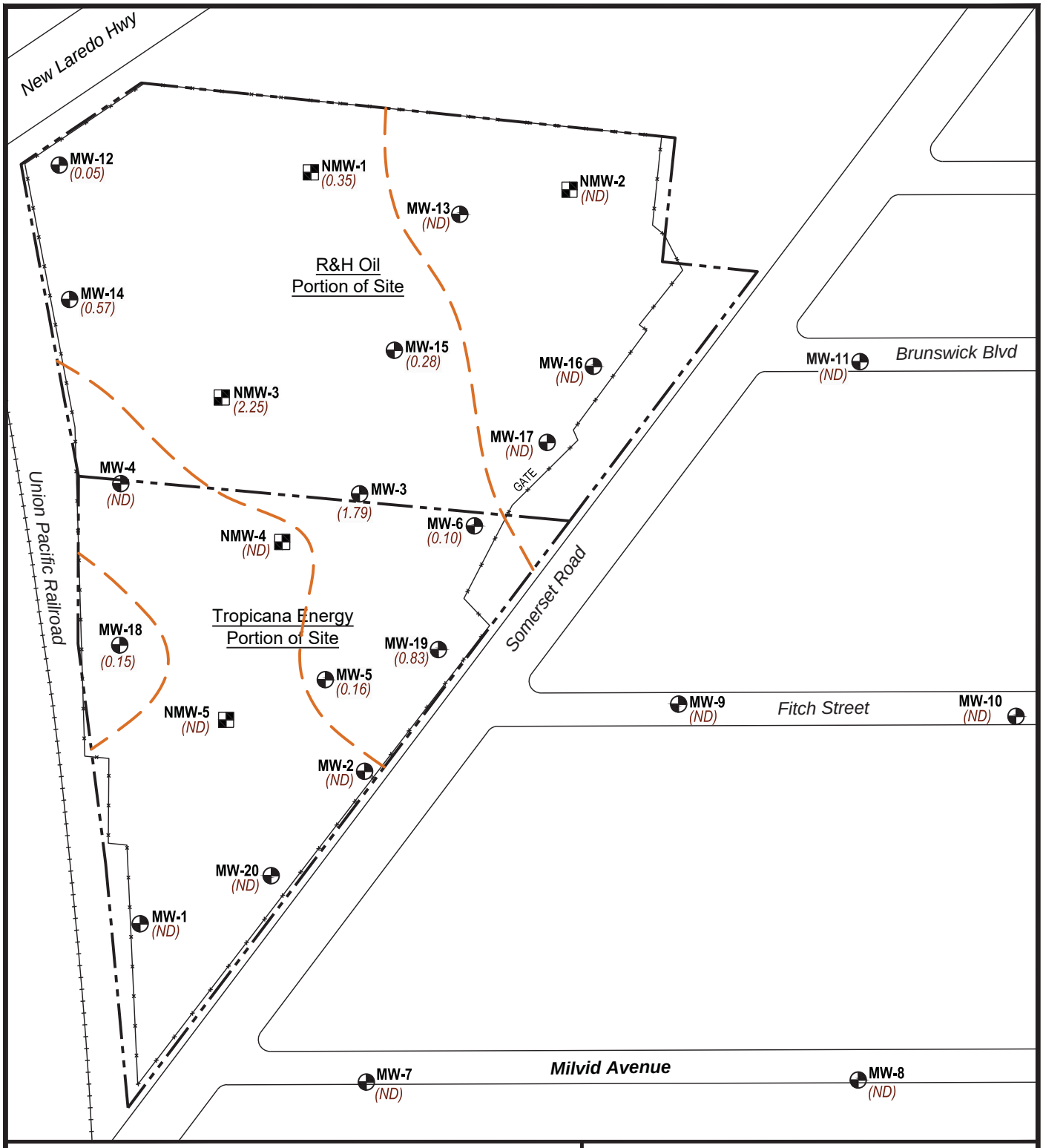

Xylene (Total) Concentration Trends
Xylene Concentration (mg/L)
16
14
12
10
8
6
4
2
0
2/26/2011
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
Date
MW-14
MW-3
MW-12
MW-18
MW-15
MW-13
MW-6
MW-19
MW-17
MW-16, MW-20, MW-1, MW-2, MW-4, MW-5
MW-12
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18
MW-19
MW-20
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6

Figure 53


Spatial Groundwater Concentration Trends
100
10
1
0.1
0.01
0.001
Benzene Concentration (mg/L)
June 2011
October 2011
May 2012
April 2014
May 2015
Western Site Boundary
Eastern Site Boundary/Somerset Road
Benzene MCL = 0.005 mg/L
SS052MW097
MW-12
MW-3
MW-6
MW-9/MW-21
MW-8/MW-22
-200
0
200
400
600
800
1000
Distance (ft)



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.15) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

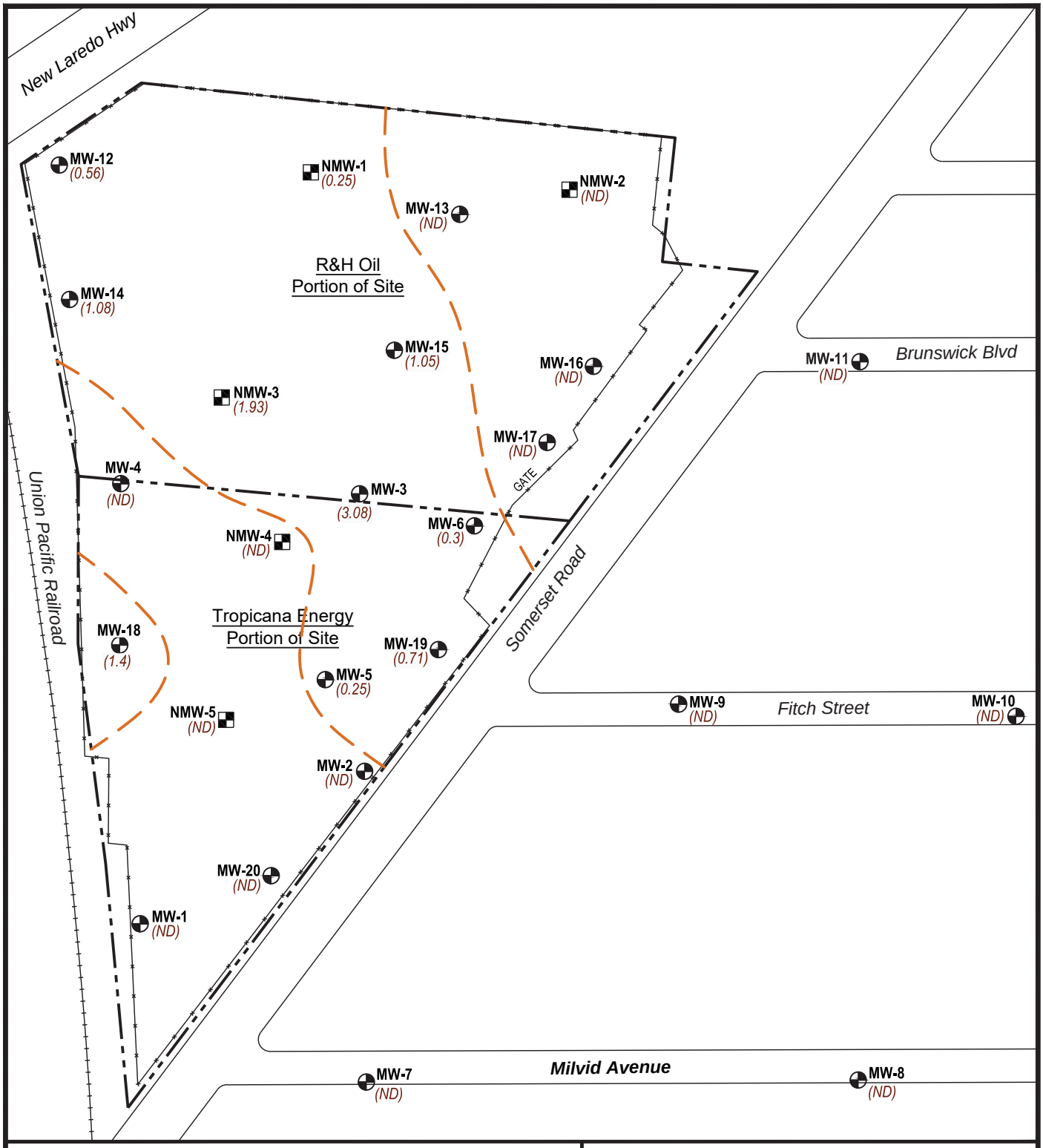
R&H OIL/TROPICANA ENERGY SITE

Figure 54

MEASURED IN-WELL LNAPL THICKNESS - JULY 25, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.4) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

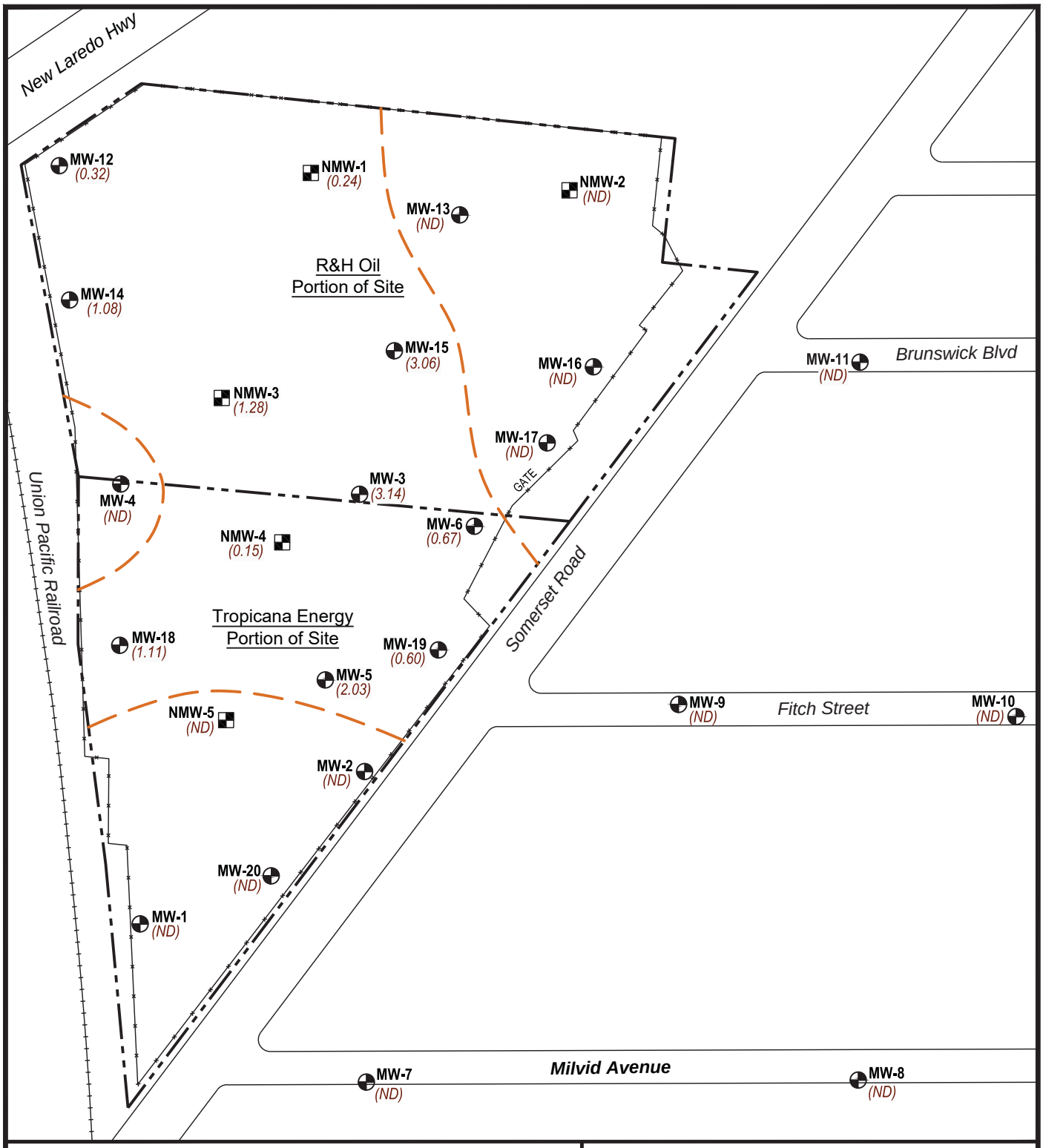
R&H OIL/TROPICANA ENERGY SITE

Figure 55

MEASURED IN-WELL LNAPL THICKNESS - AUGUST 23, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.15) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

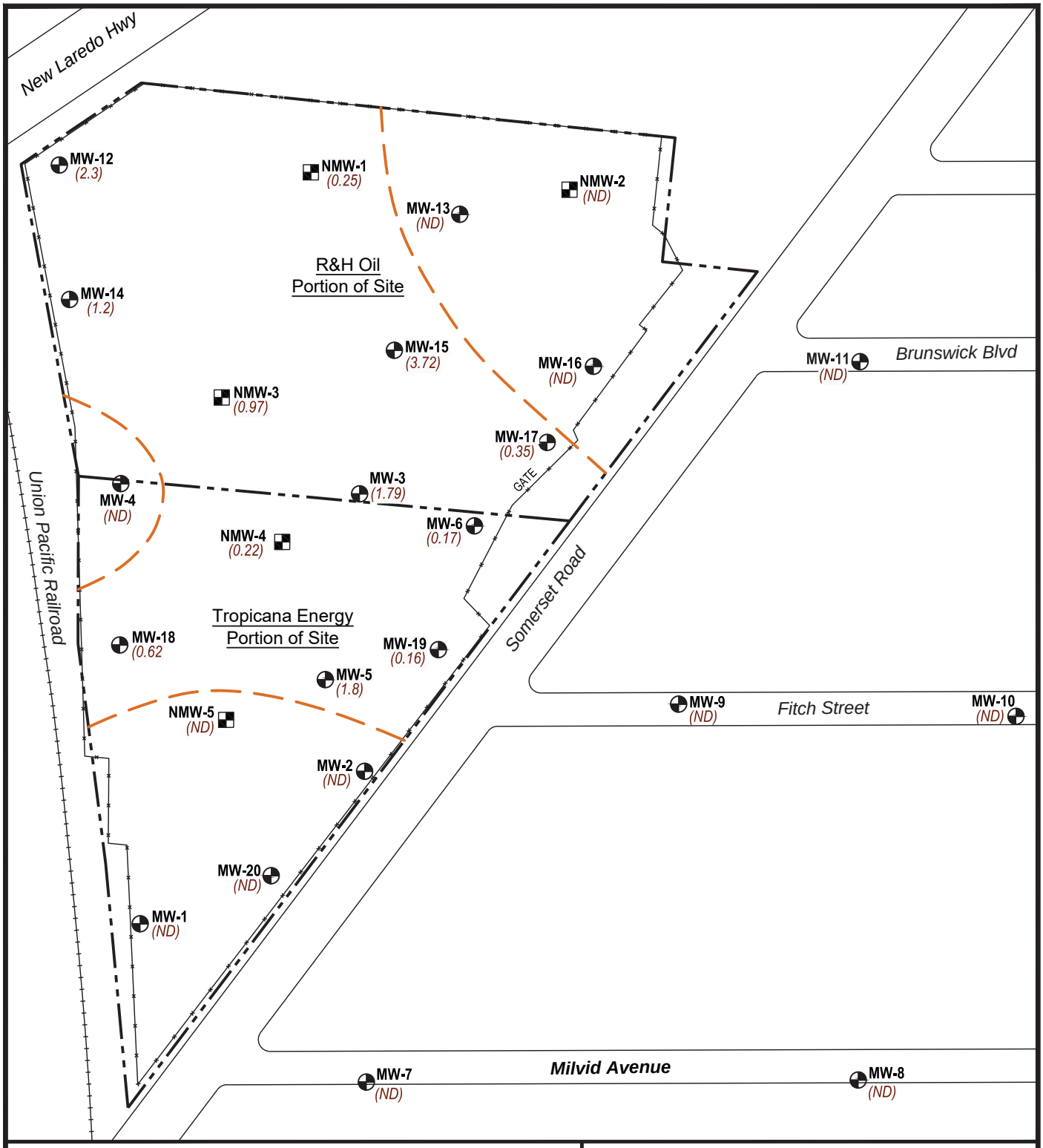
R&H OIL/TROPICANA ENERGY SITE

Figure 56

MEASURED IN-WELL LNAPL THICKNESS - SEPTEMBER 15, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.25) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

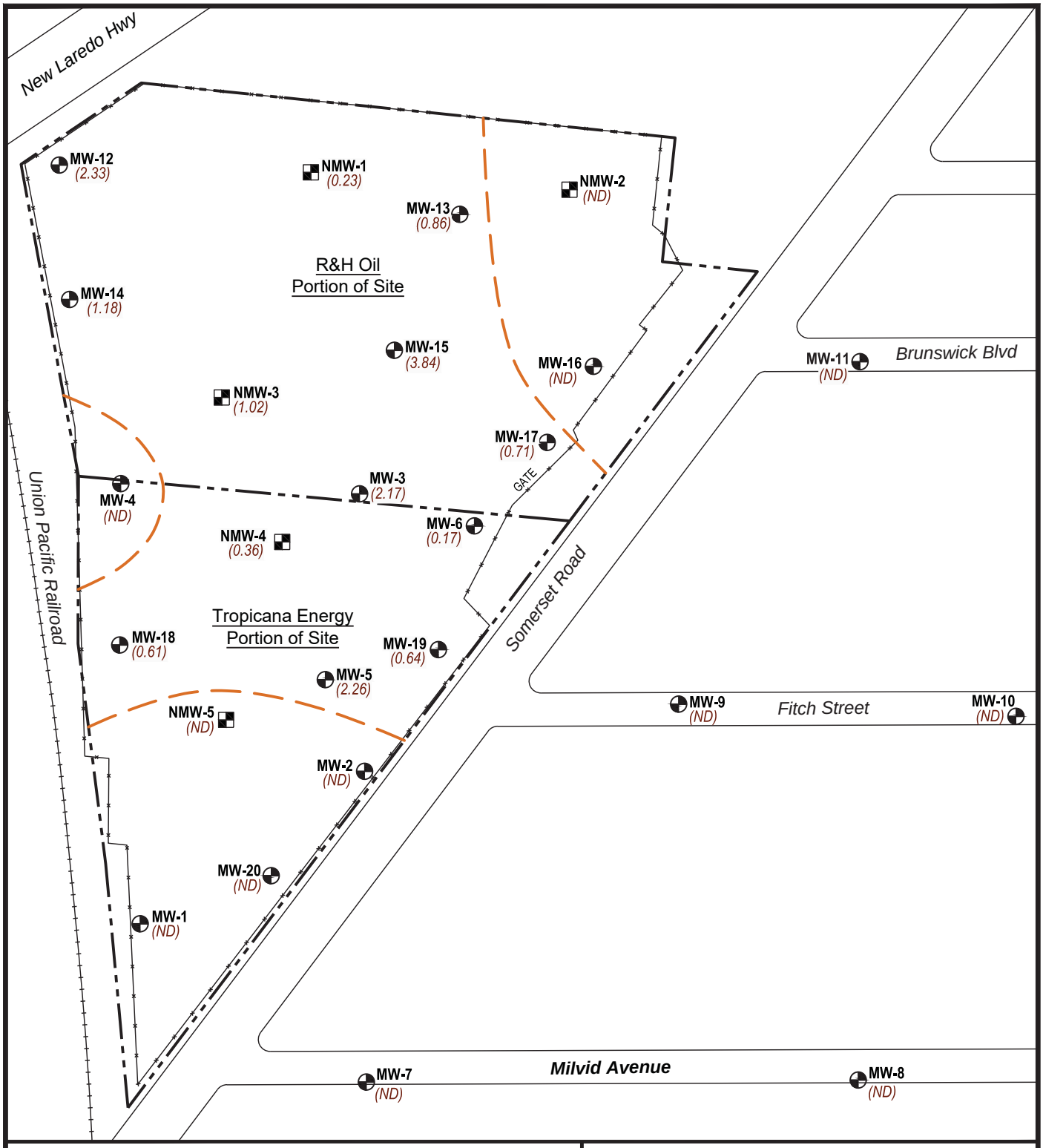
R&H OIL/TROPICANA ENERGY SITE

Figure 57

MEASURED IN-WELL LNAPL THICKNESS - OCTOBER 10, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.36) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

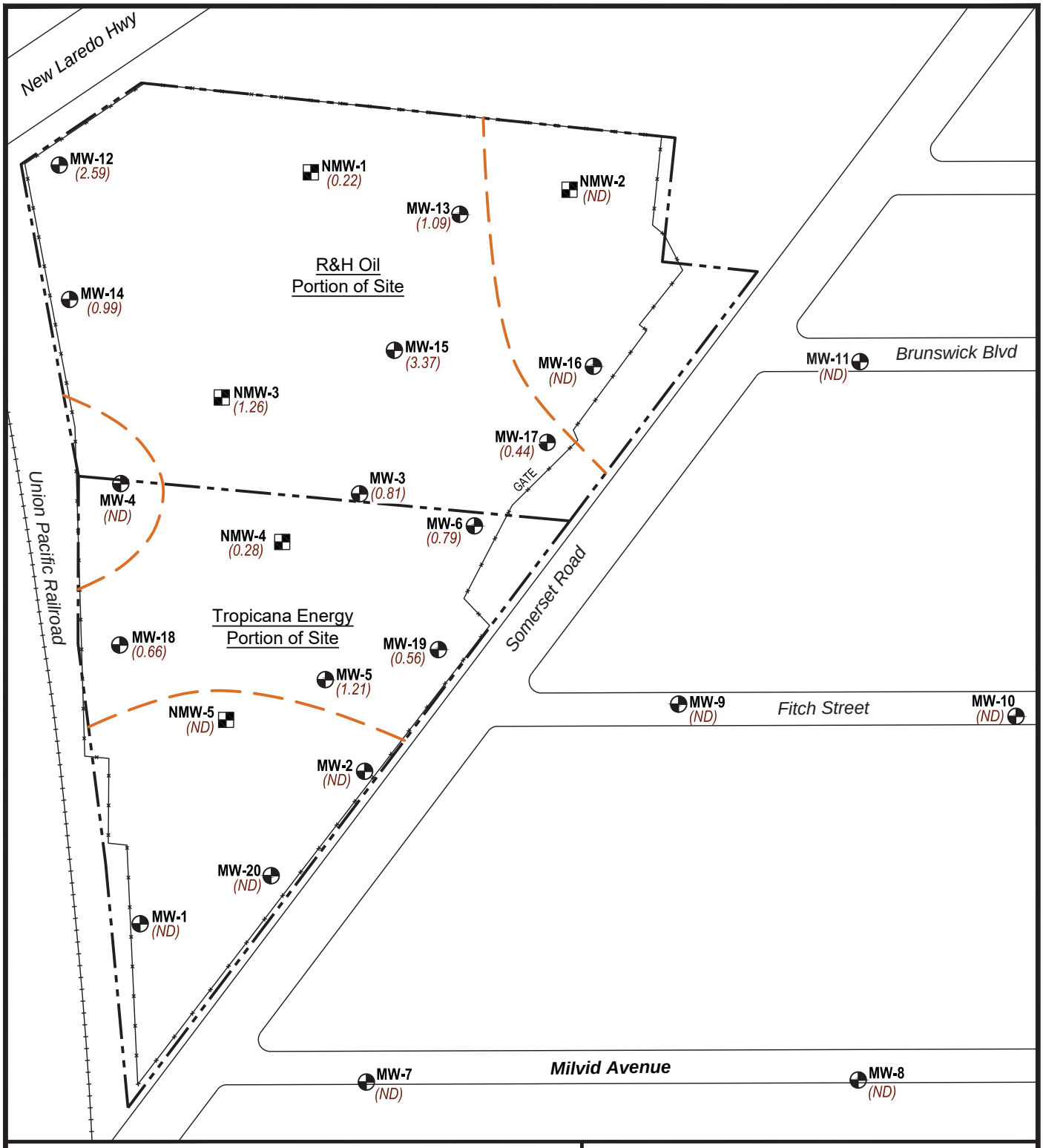
R&H OIL/TROPICANA ENERGY SITE

Figure 58

MEASURED IN-WELL LNAPL THICKNESS - NOVEMBER 16, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

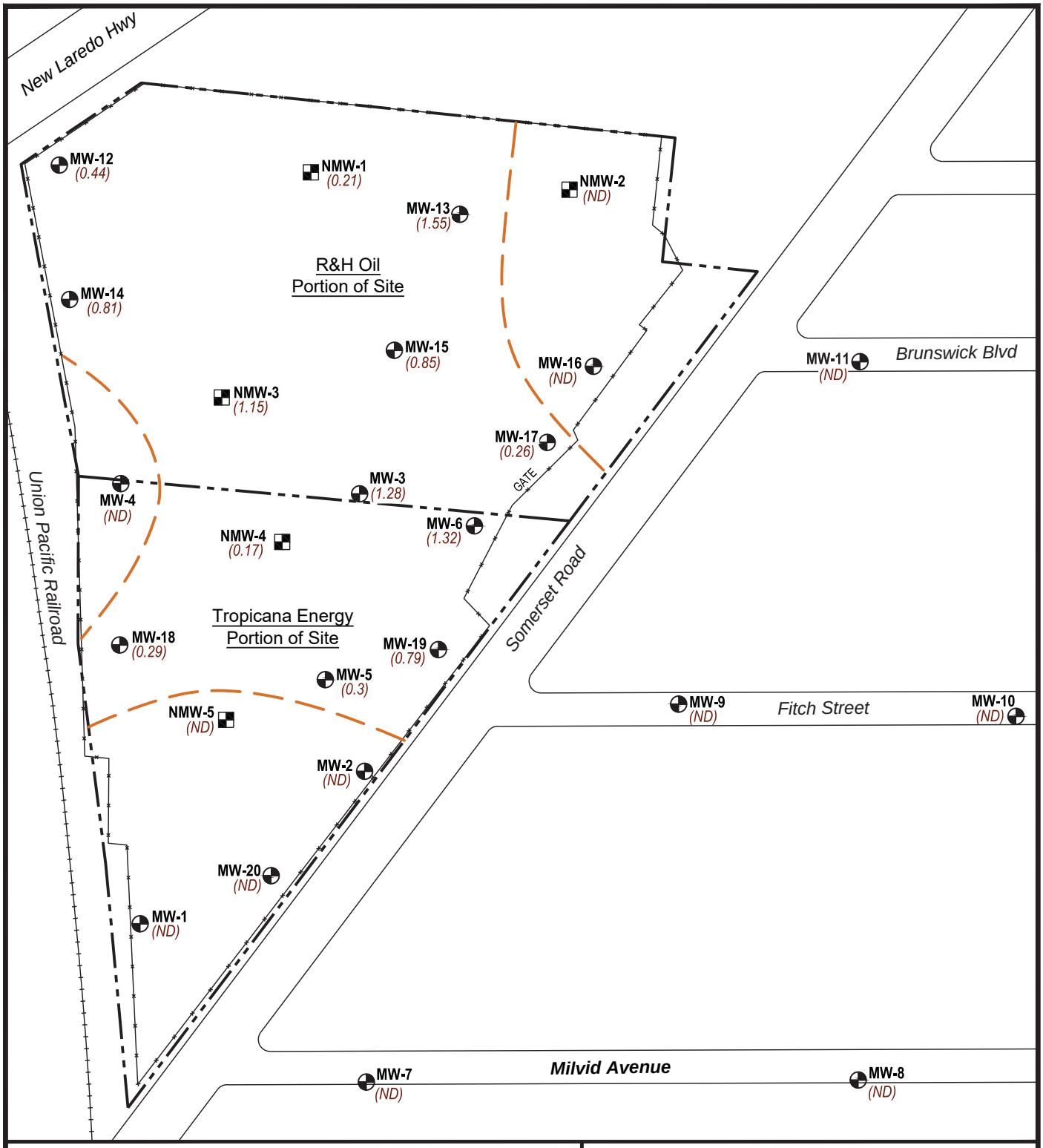
R&H OIL/TROPICANA ENERGY SITE

Figure 59

MEASURED IN-WELL LNAPL THICKNESS - DECEMBER 13, 2011

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

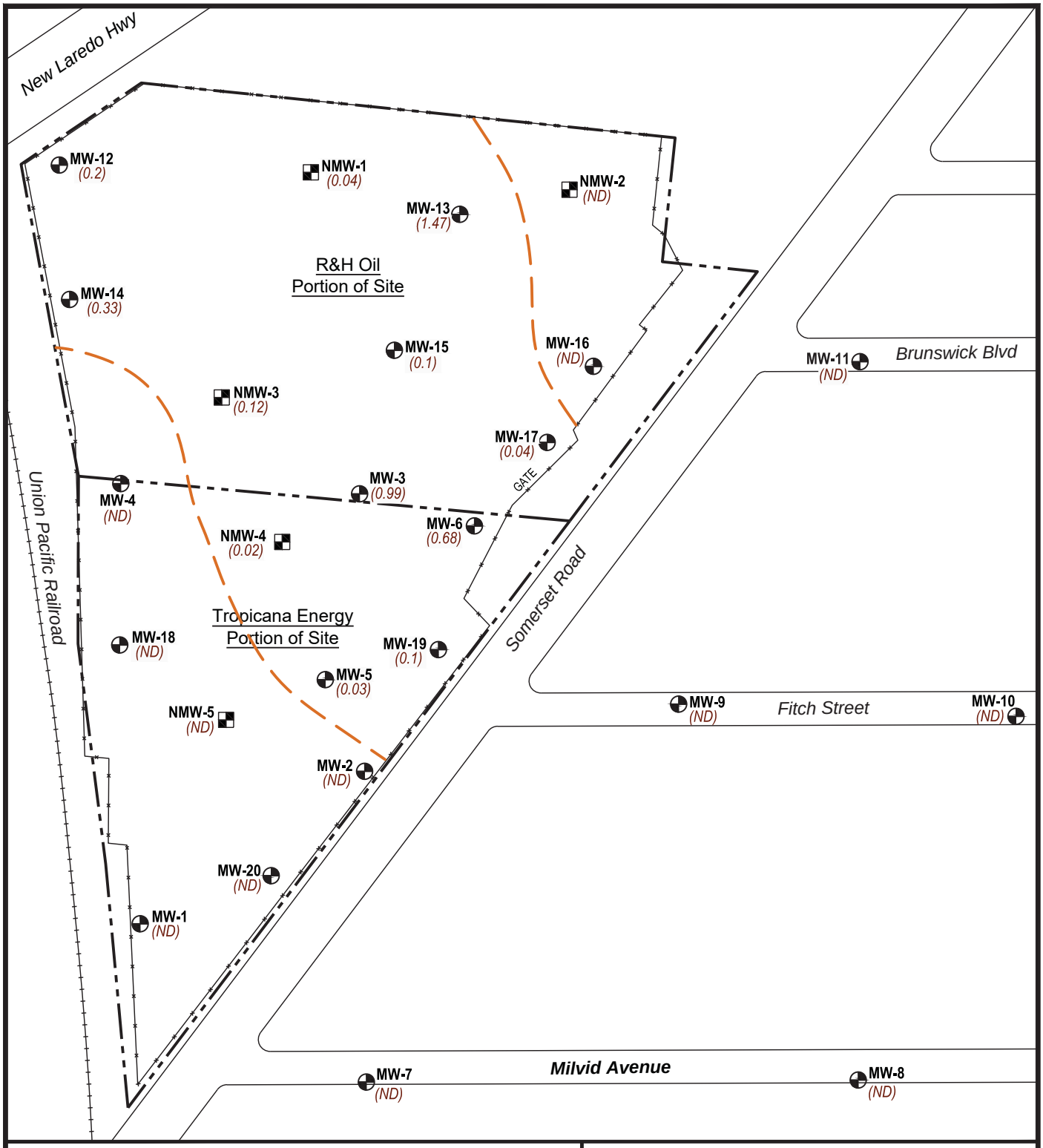
R&H OIL/TROPICANA ENERGY SITE

Figure 60

MEASURED IN-WELL LNAPL THICKNESS - JANUARY 23, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

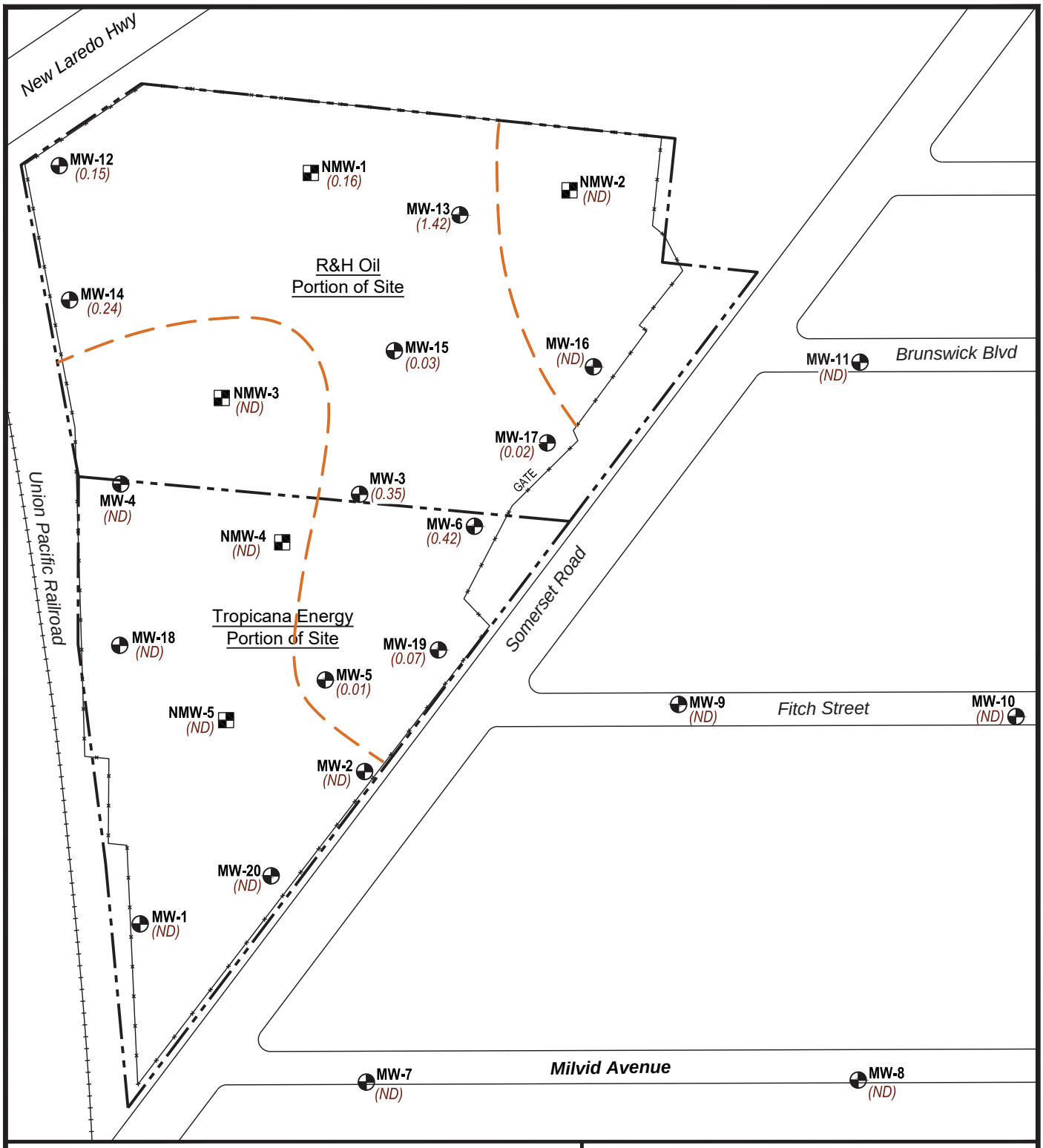
R&H OIL/TROPICANA ENERGY SITE

Figure 61

MEASURED IN-WELL LNAPL THICKNESS - FEBRUARY 20, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

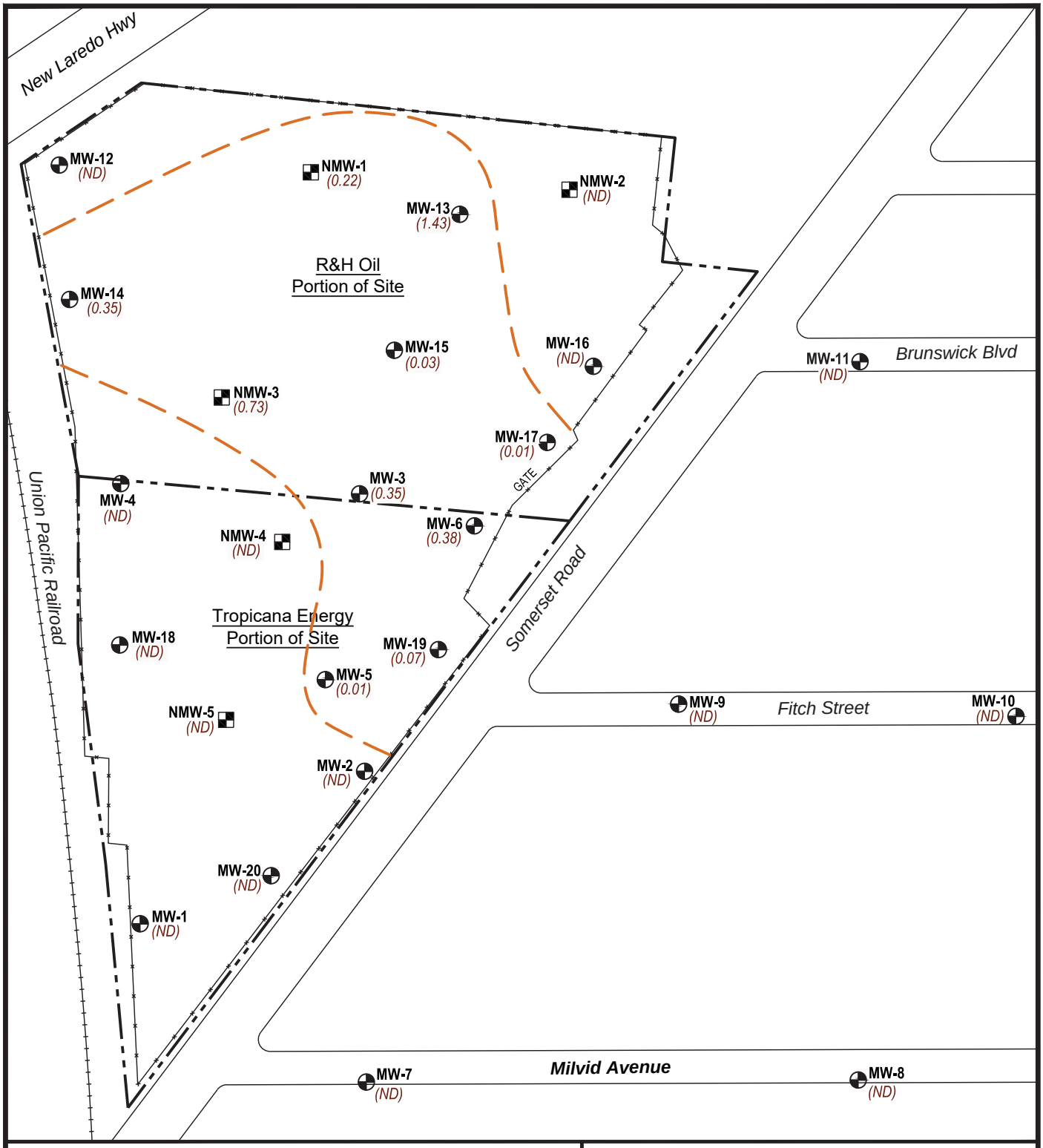
R&H OIL/TROPICANA ENERGY SITE

Figure 62

MEASURED IN-WELL LNAPL THICKNESS - MARCH 14, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

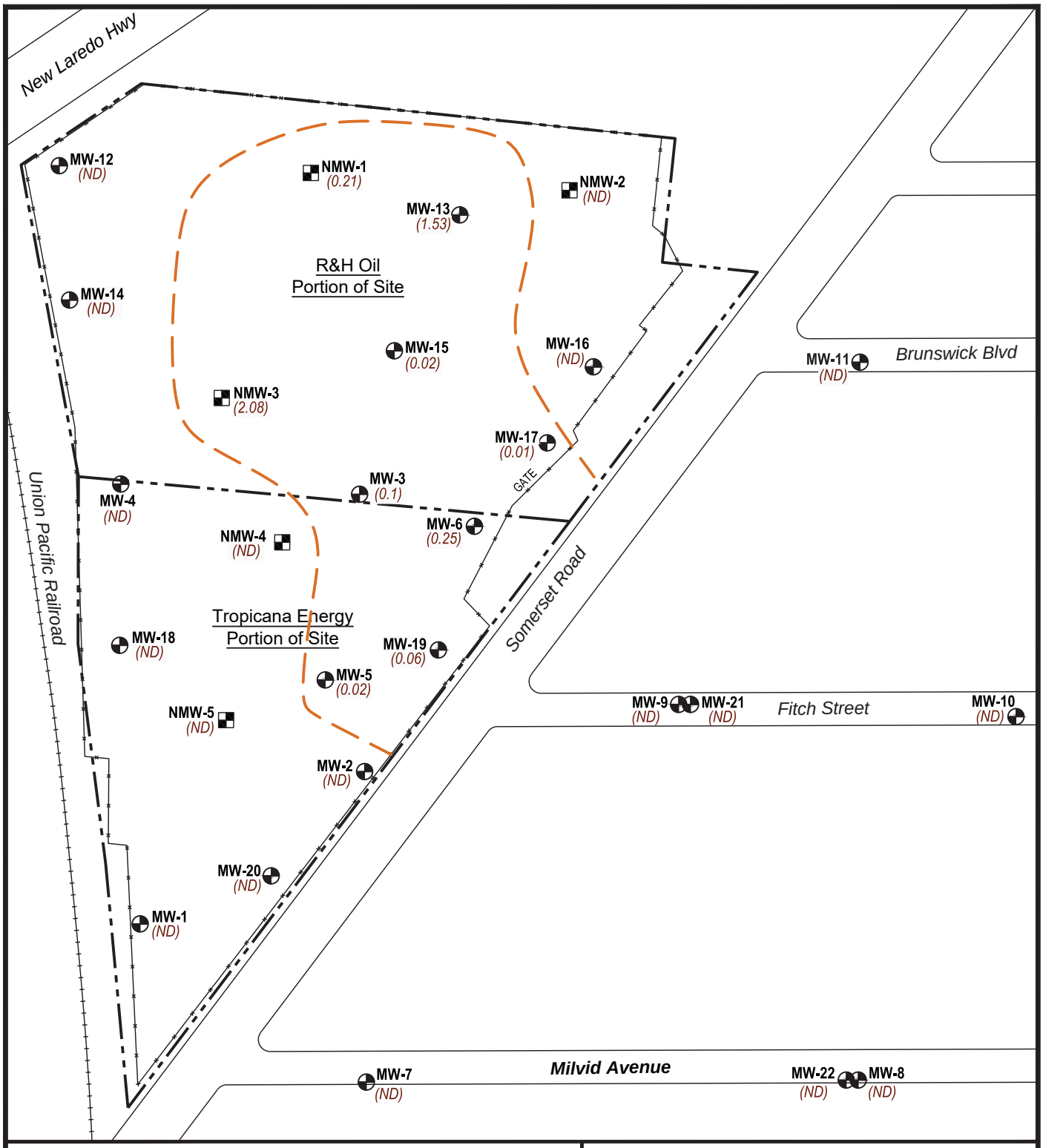
R&H OIL/TROPICANA ENERGY SITE

Figure 63

MEASURED IN-WELL LNAPL THICKNESS - APRIL 11, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

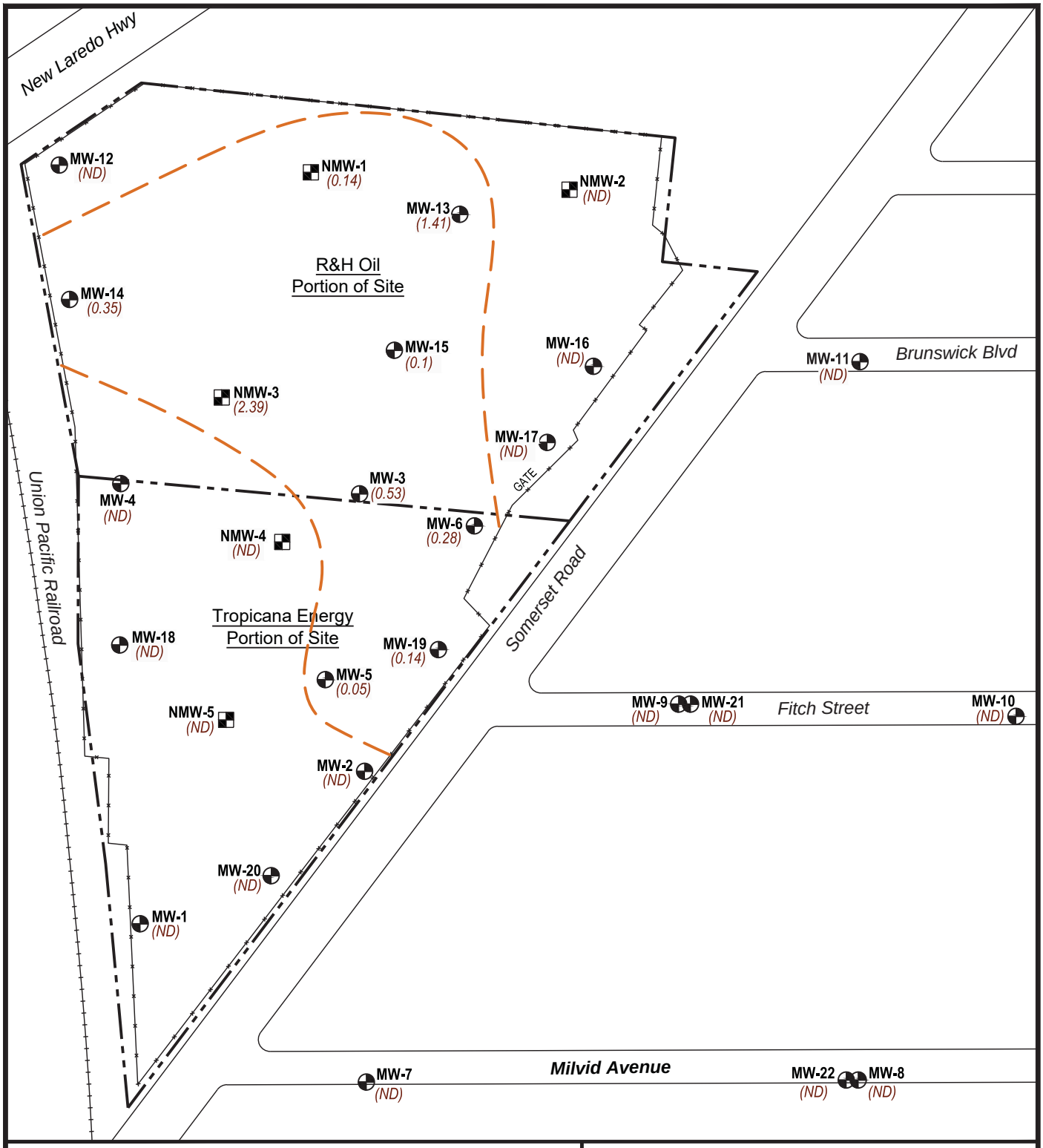
R&H OIL/TROPICANA ENERGY SITE

Figure 64

MEASURED IN-WELL LNAPL THICKNESS - MAY 9, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

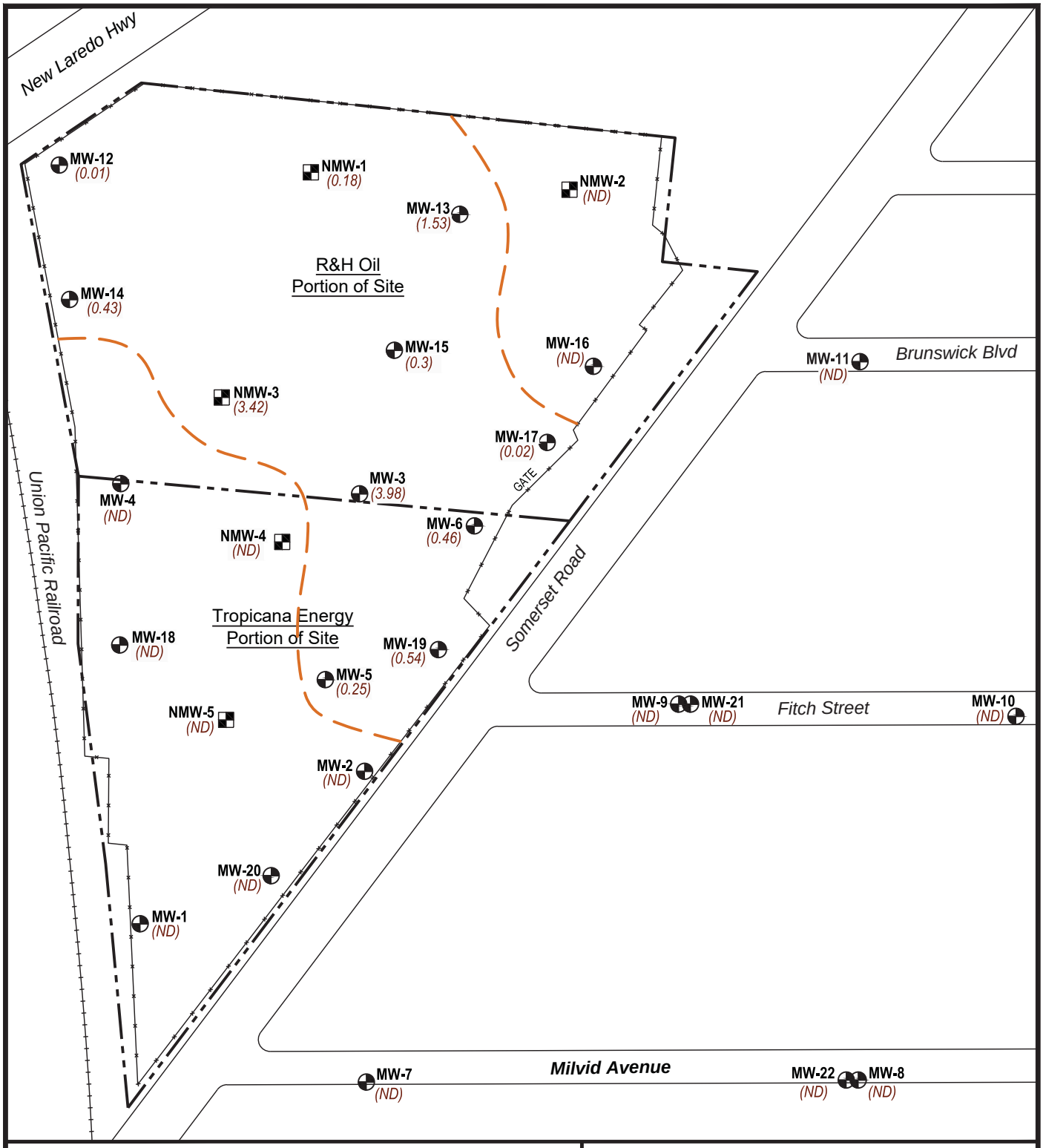
R&H OIL/TROPICANA ENERGY SITE

Figure 65

MEASURED IN-WELL LNAPL THICKNESS - JUNE 6, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

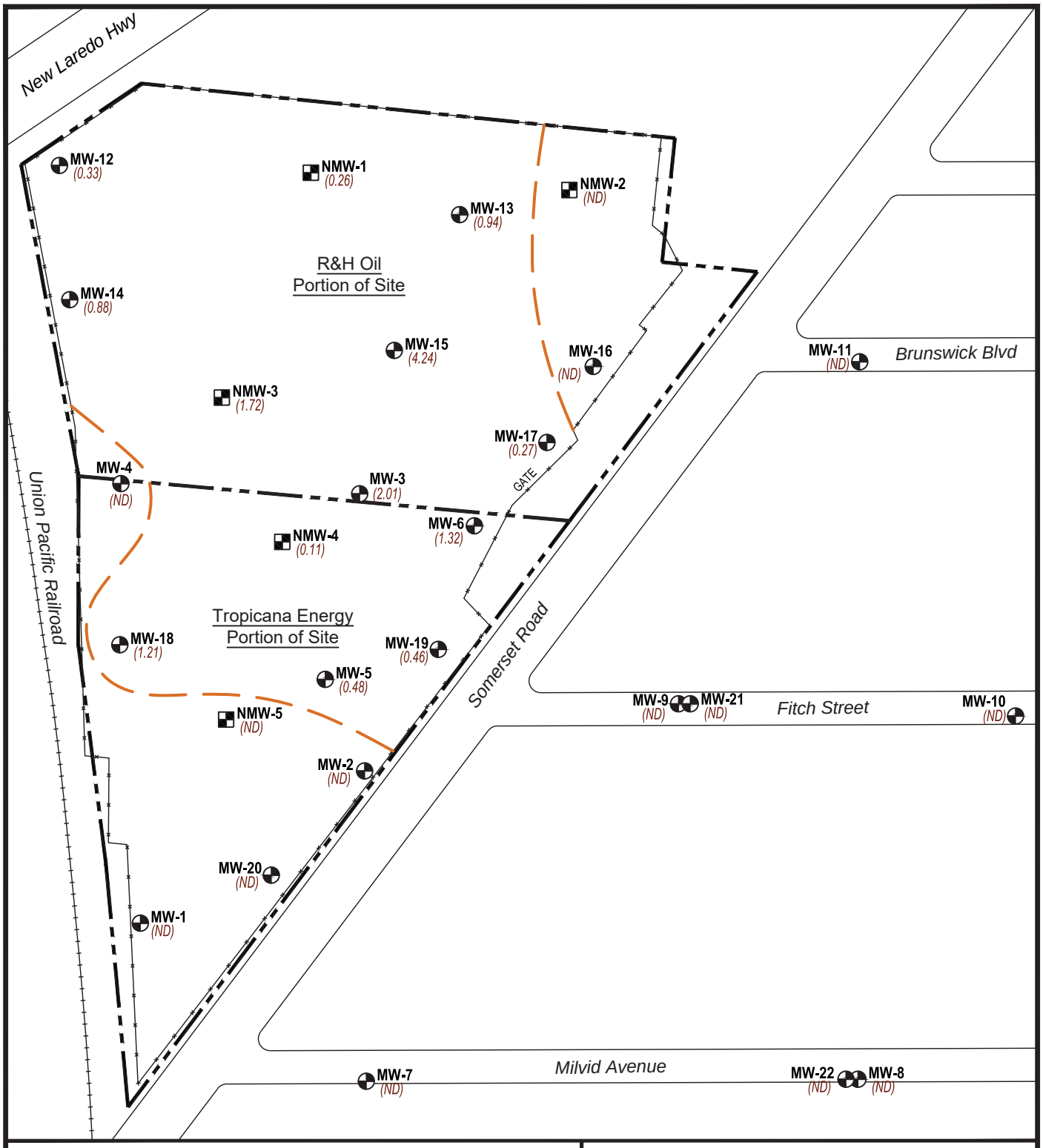
R&H OIL/TROPICANA ENERGY SITE

Figure 66

MEASURED IN-WELL LNAPL THICKNESS - JULY 7, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

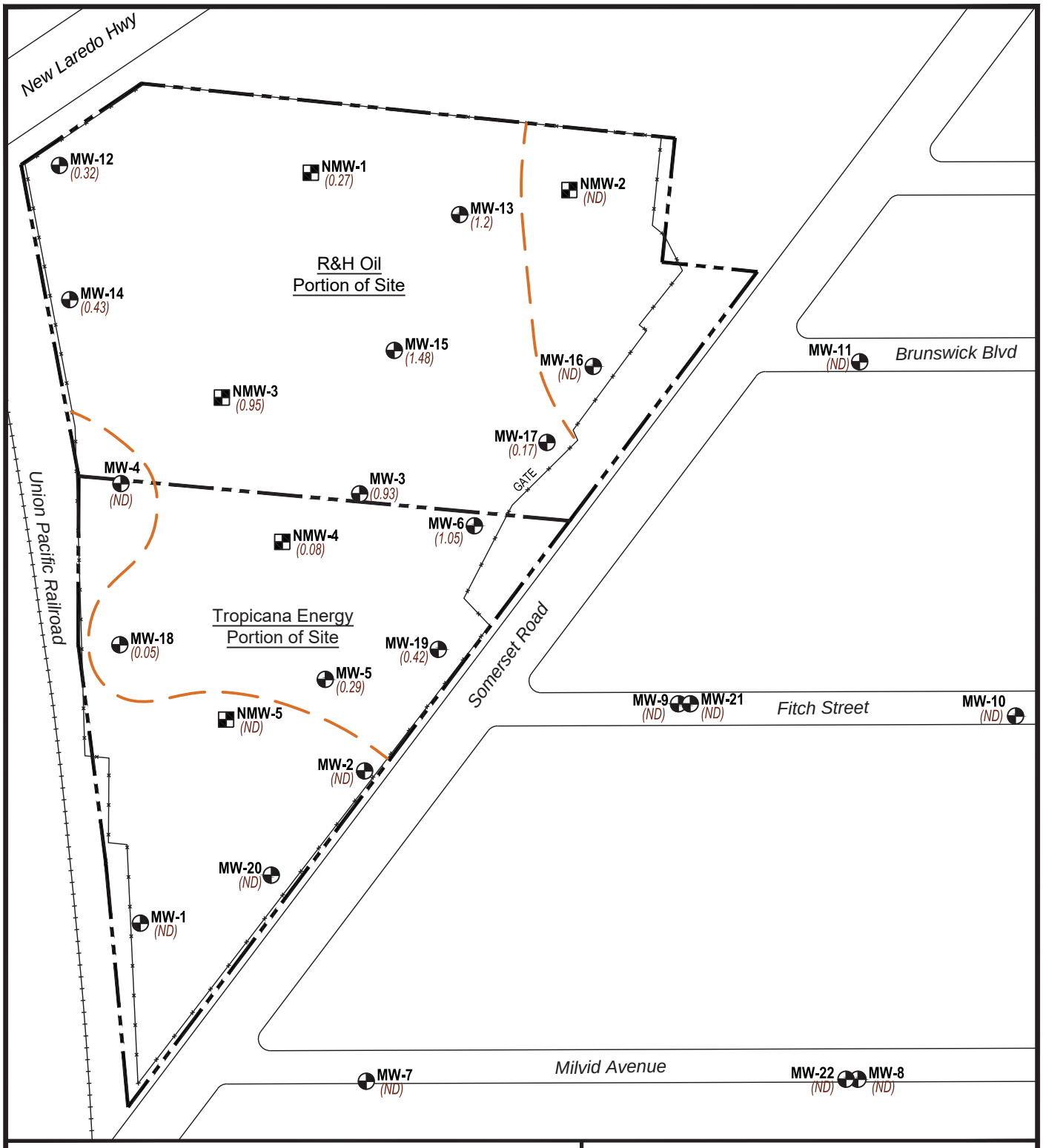
R&H OIL/TROPICANA ENERGY SITE

Figure 67

MEASURED IN-WELL LNAPL THICKNESS - AUGUST 23, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.48) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

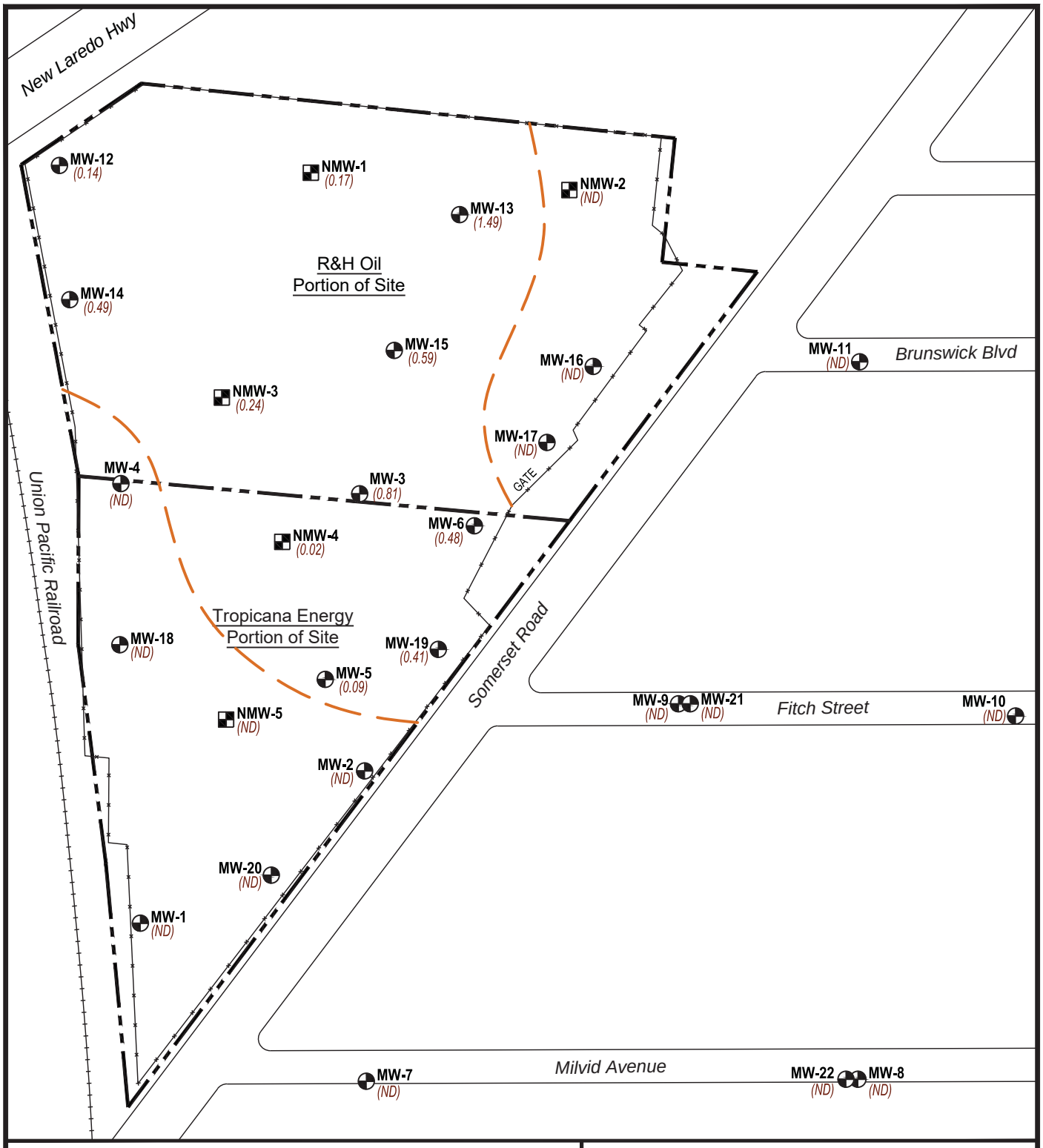
R&H OIL/TROPICANA ENERGY SITE

Figure 68

MEASURED IN-WELL LNAPL THICKNESS - SEPT. 26, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (1.21) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

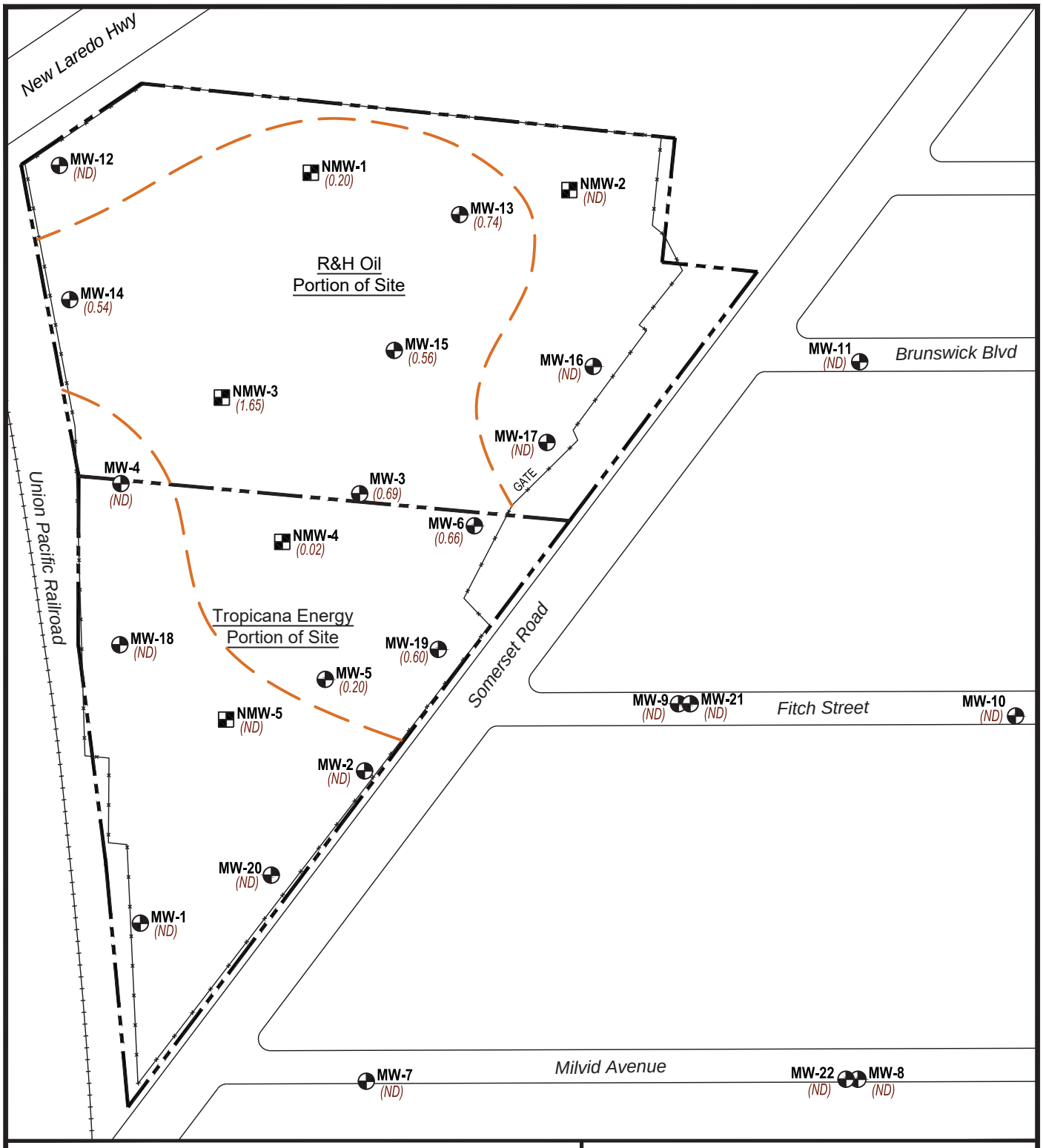
R&H OIL/TROPICANA ENERGY SITE

Figure 69

MEASURED IN-WELL LNAPL THICKNESS - OCT. 24, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.60) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

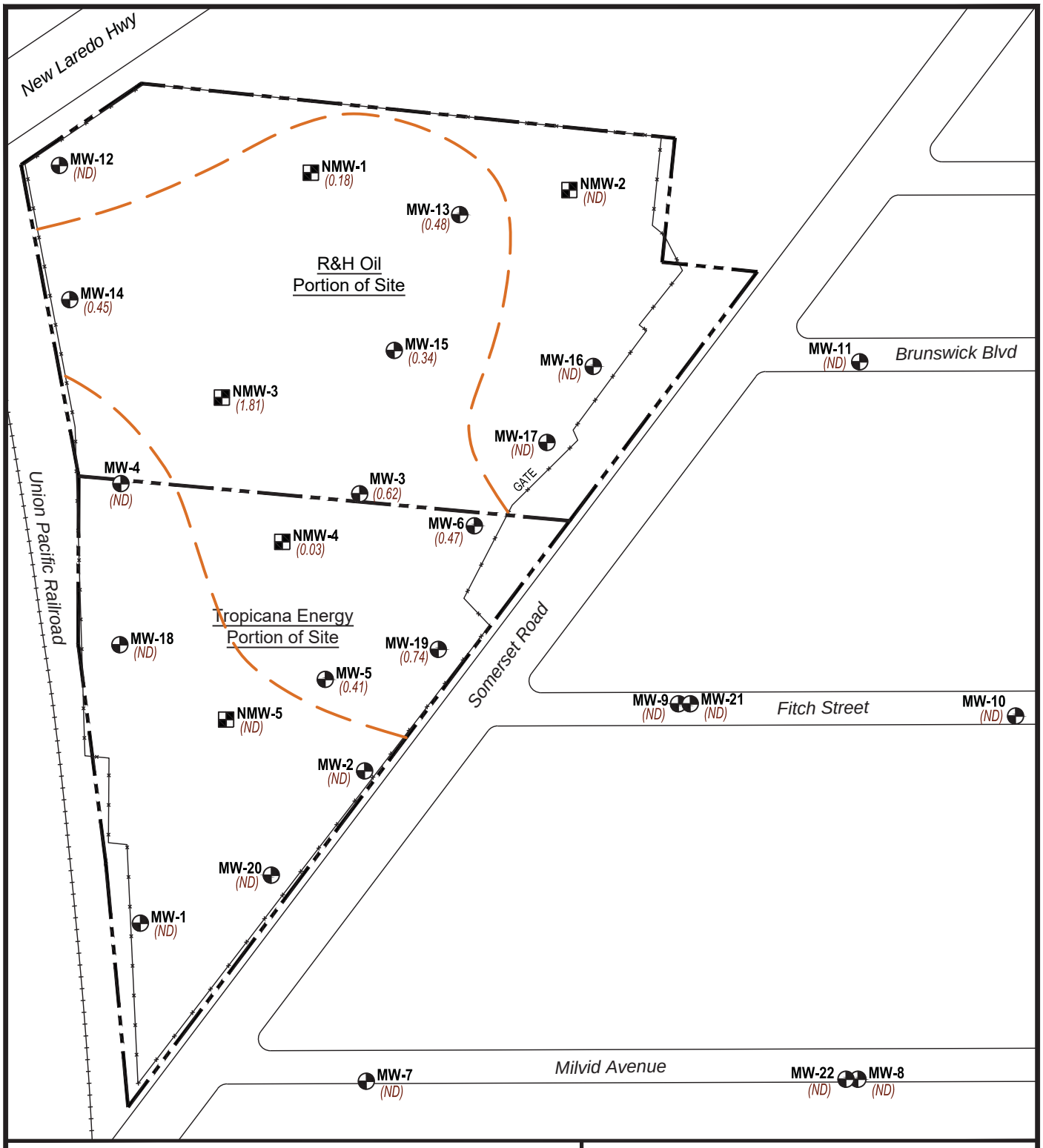
R&H OIL/TROPICANA ENERGY SITE

Figure 70

MEASURED IN-WELL LNAPL THICKNESS - NOV. 27, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.74) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

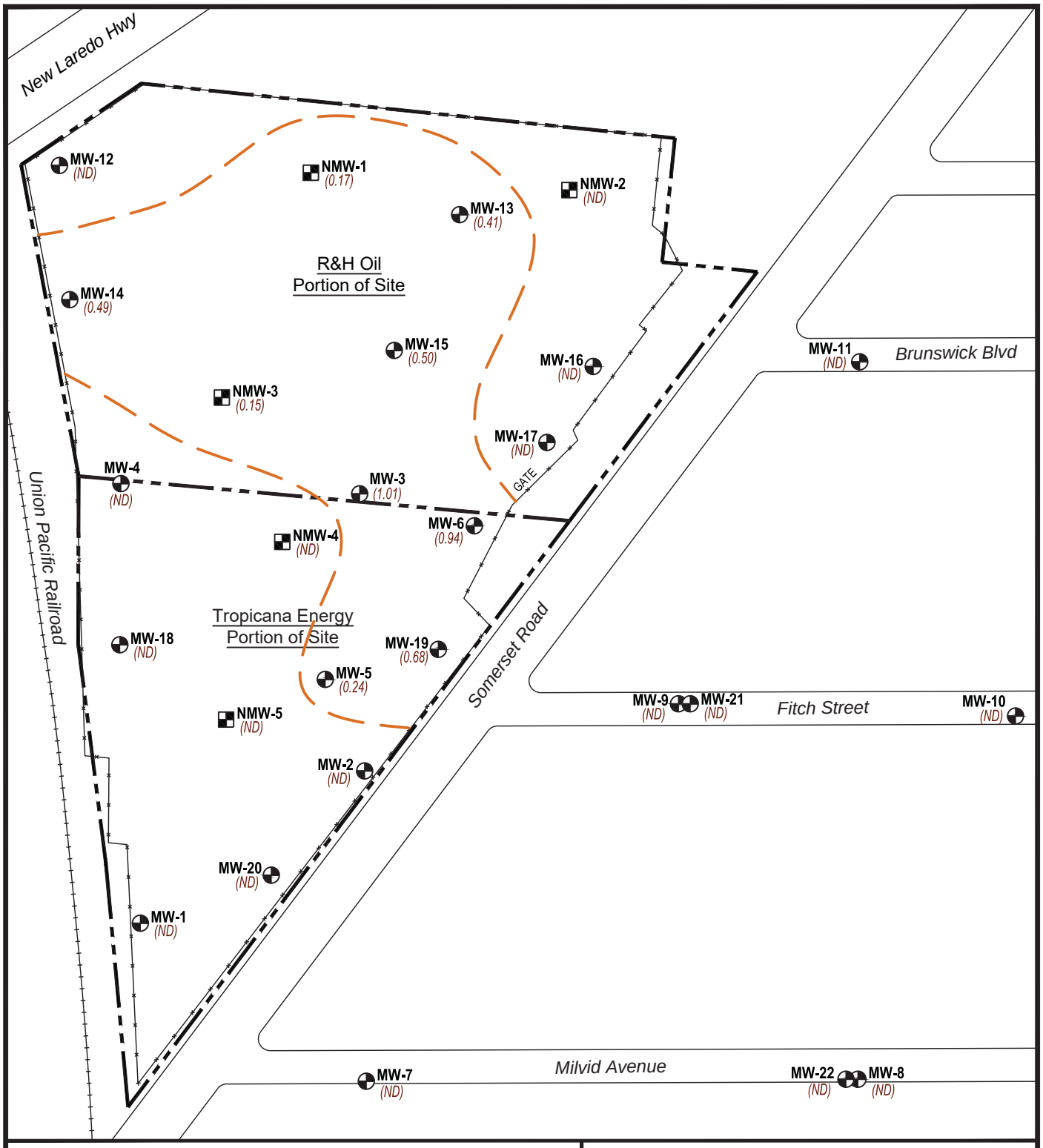
R&H OIL/TROPICANA ENERGY SITE

Figure 71

MEASURED IN-WELL LNAPL THICKNESS - DEC. 11, 2012

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.74) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

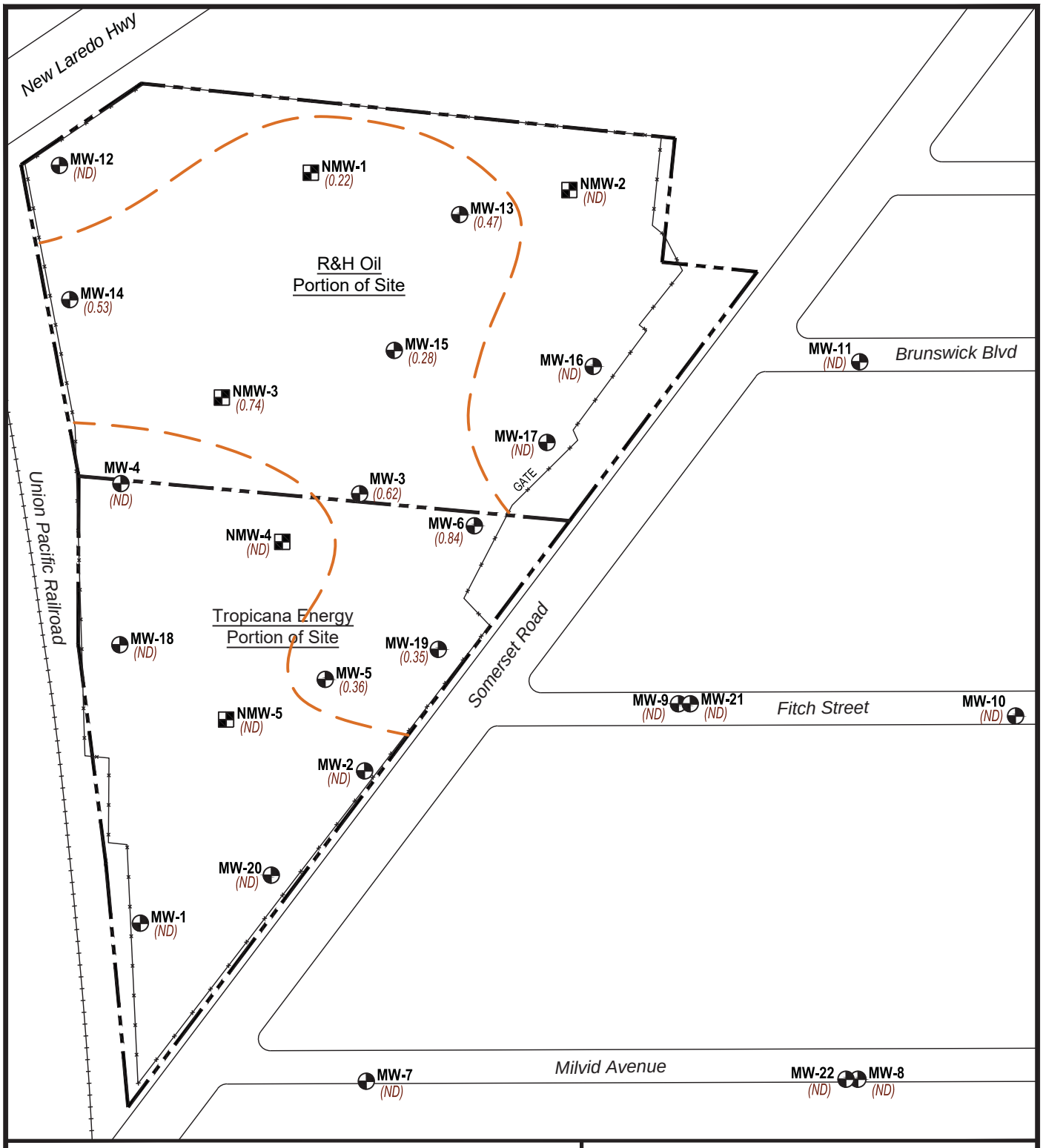
R&H OIL/TROPICANA ENERGY SITE

Figure 72

MEASURED IN-WELL LNAPL THICKNESS - JAN. 16, 2013

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.35) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

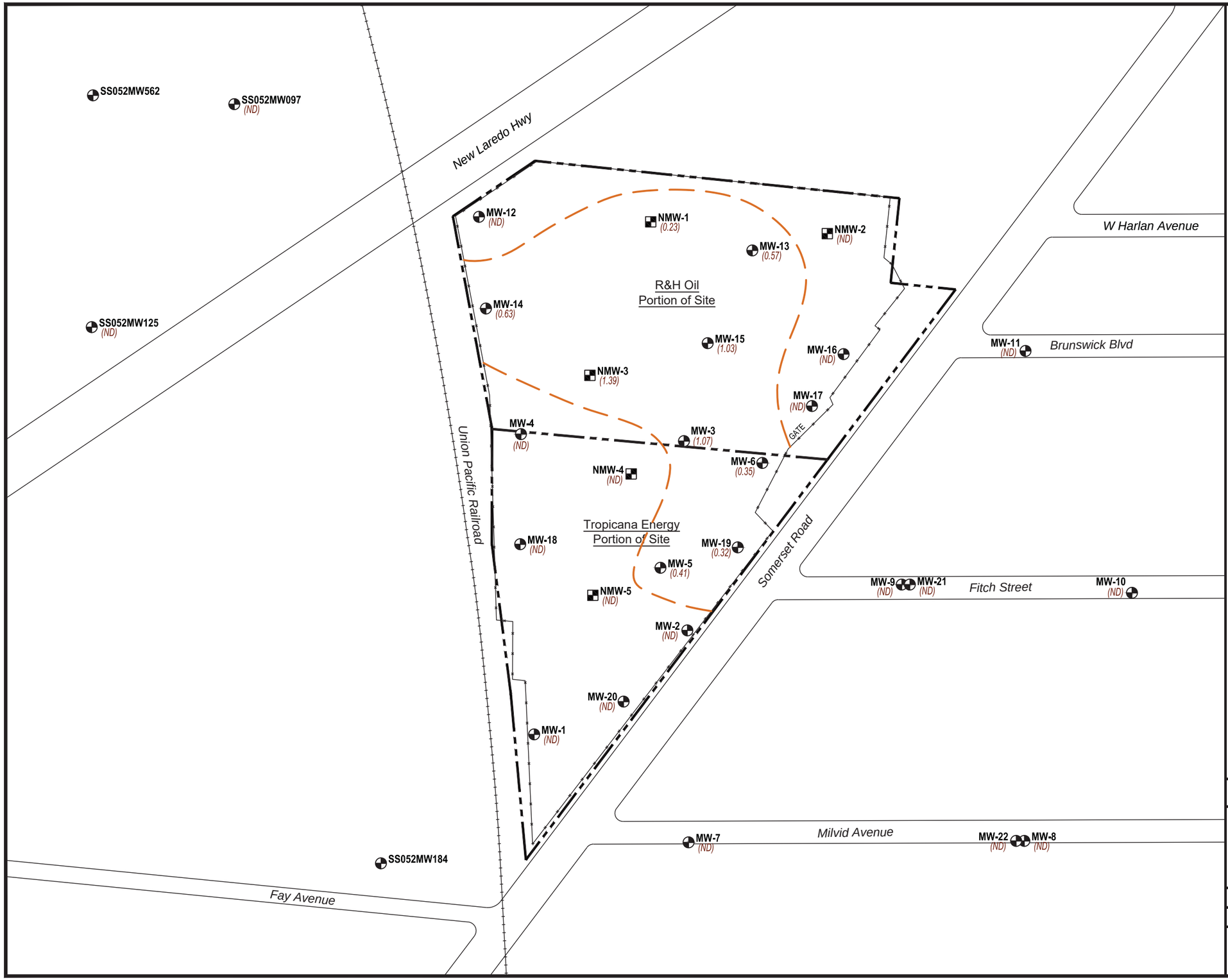
R&H OIL/TROPICANA ENERGY SITE

Figure 73

MEASURED IN-WELL LNAPL THICKNESS - FEB. 20, 2013

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.36) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

Note:
See RI Table 5 for summary data.

N

Approx. Scale in Feet

0 60 120

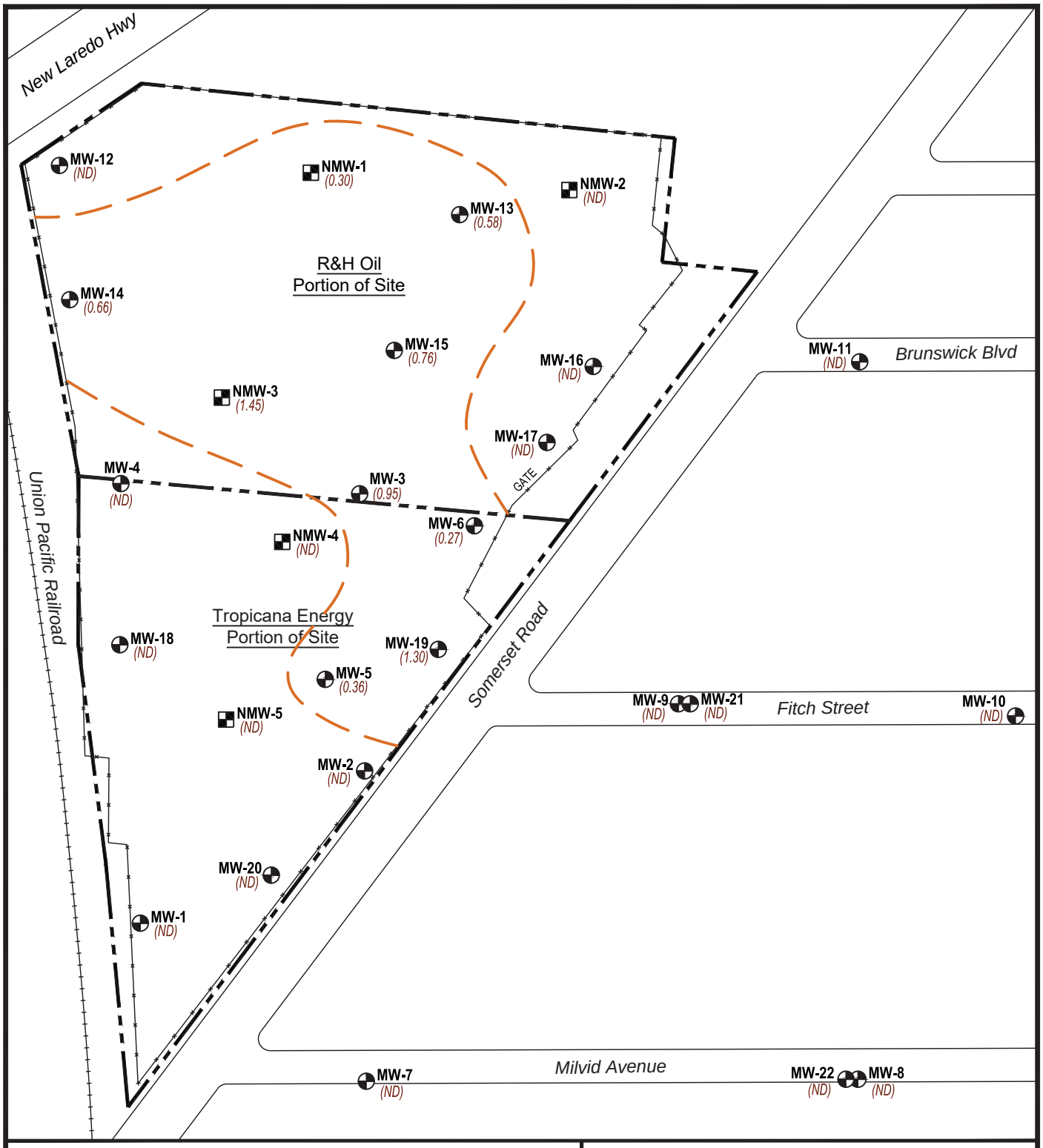
R&H OIL/TROPICANA ENERGY SITE

Figure 74

MEASURED IN-WELL LNAPL THICKNESS - APRIL 21, 2014

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.36) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

N

Approx. Scale in Feet

0 60 120

Note:
See RI Table 5 for summary data.

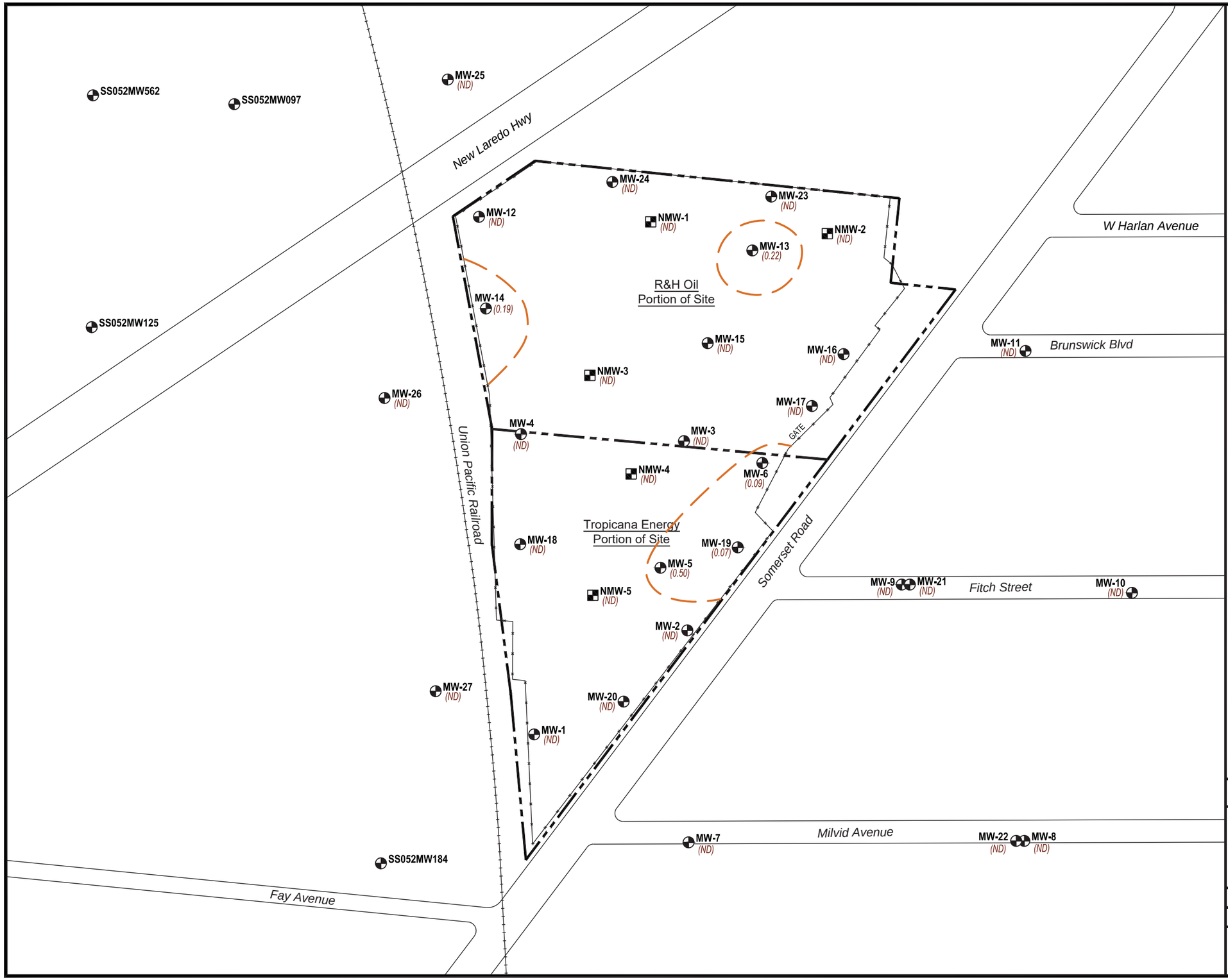
R&H OIL/TROPICANA ENERGY SITE

Figure 75

MEASURED IN-WELL LNAPL THICKNESS - DEC. 18, 2014

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.36) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

Note:
See RI Table 5 for summary data.

N

Approx. Scale in Feet

0 60 120

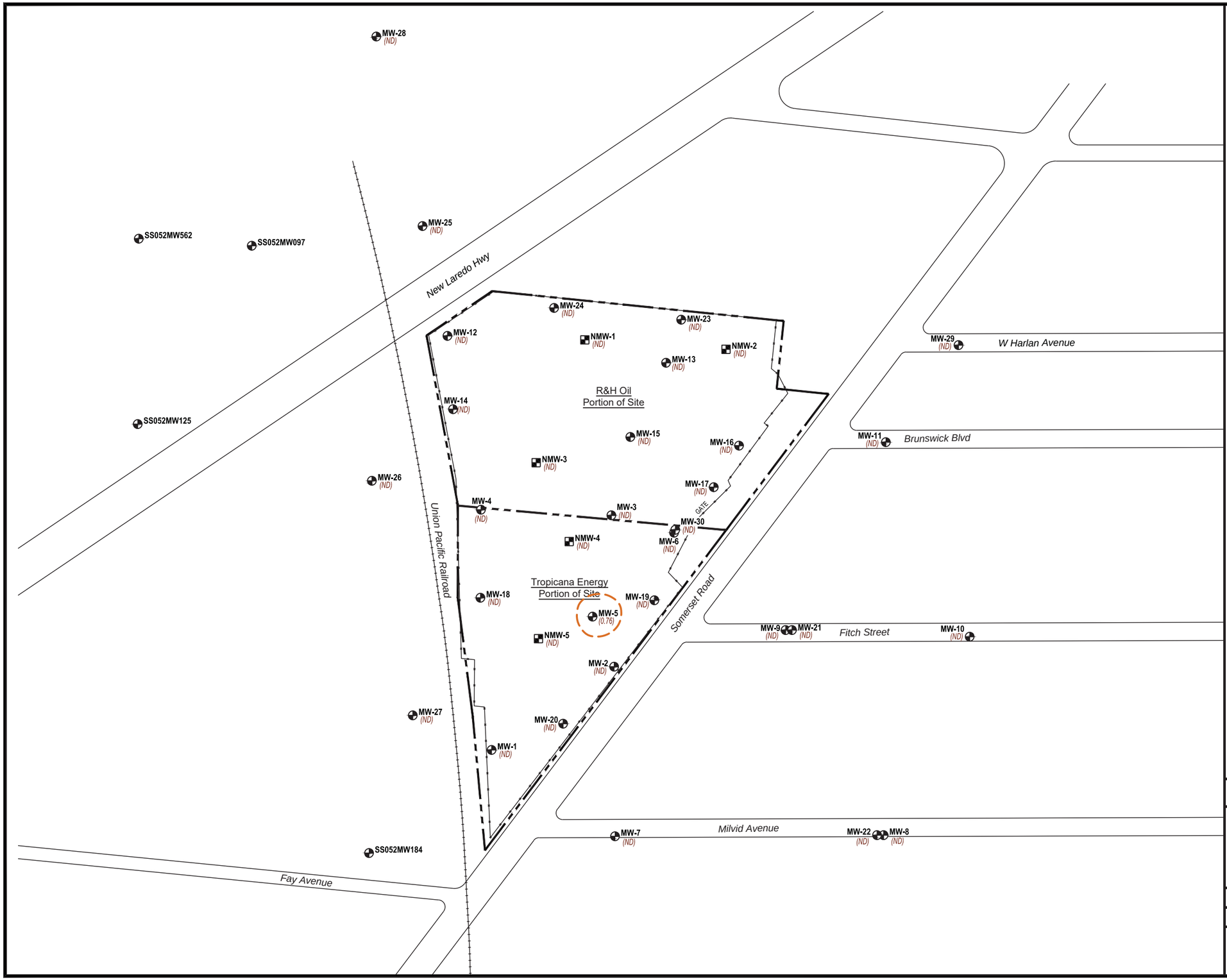
R&H OIL/TROPICANA ENERGY SITE

Figure 76

MEASURED IN-WELL LNAPL THICKNESS - MAY 4, 2015

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- (0.36) Measured LNAPL Thickness in Well (Ft)
- (ND) No LNAPL Observed in Well
- Inferred Limit of LNAPL Based on In-well Thickness

Note:
See RI Table 5 for summary data.

N

Approx. Scale in Feet

0 75 150

R&H OIL/TROPICANA ENERGY SITE

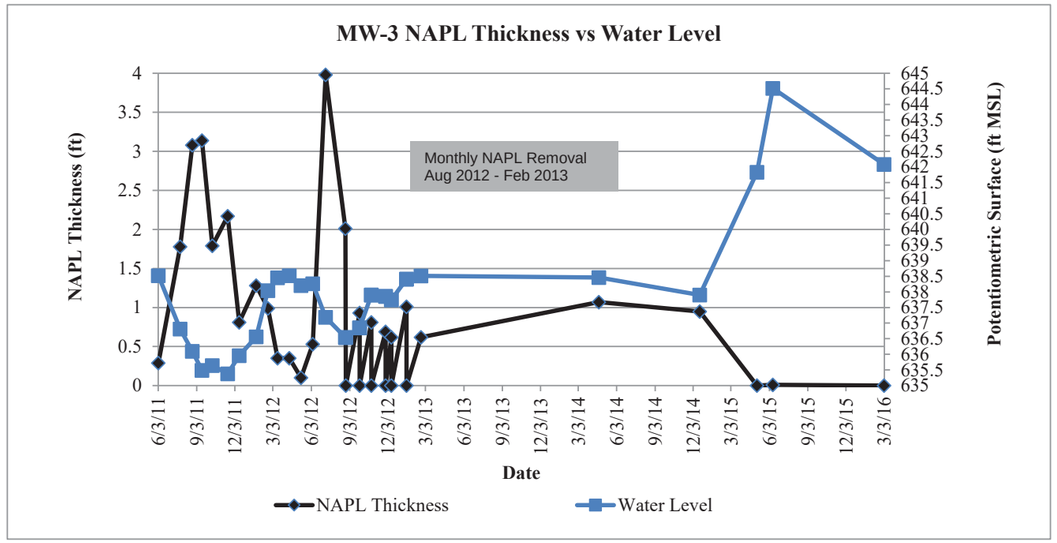
Figure 77

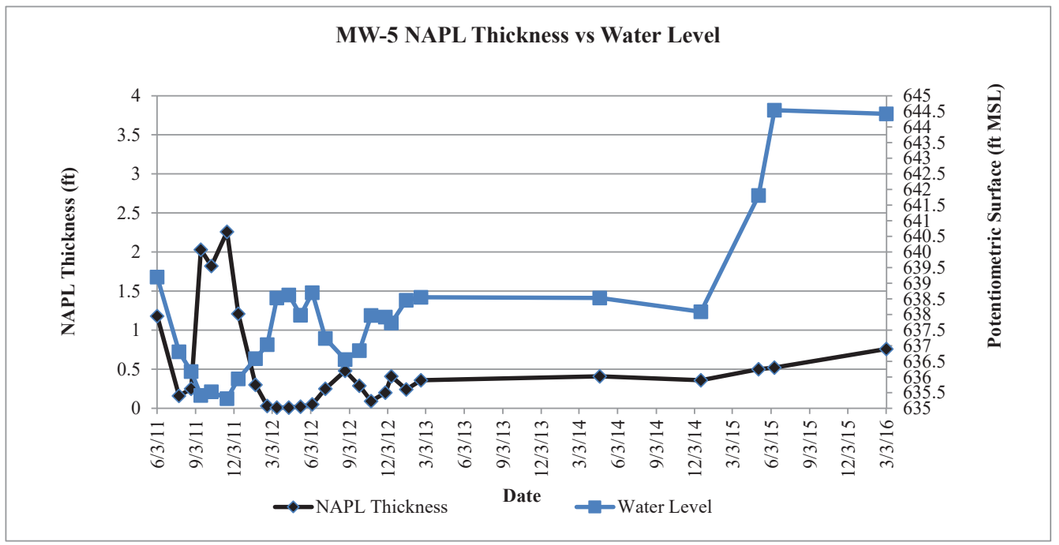
MEASURED IN-WELL LNAPL THICKNESS - MARCH 3, 2016

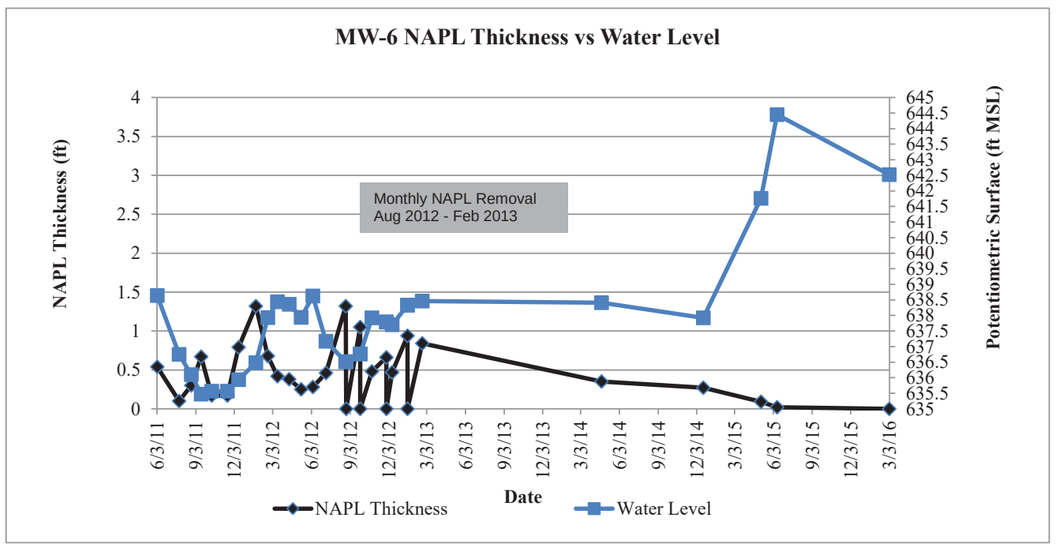
PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

FIGURE 78
GROUNDWATER AND NAPL HYDROGRAPHS
R&H Oil/Tropicana Energy Site, San Antonio, Texas







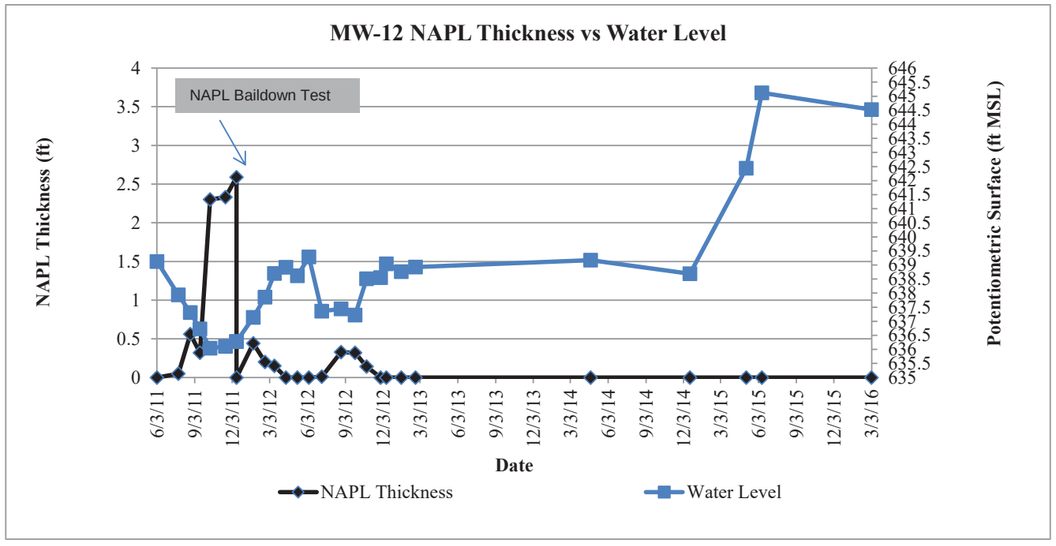
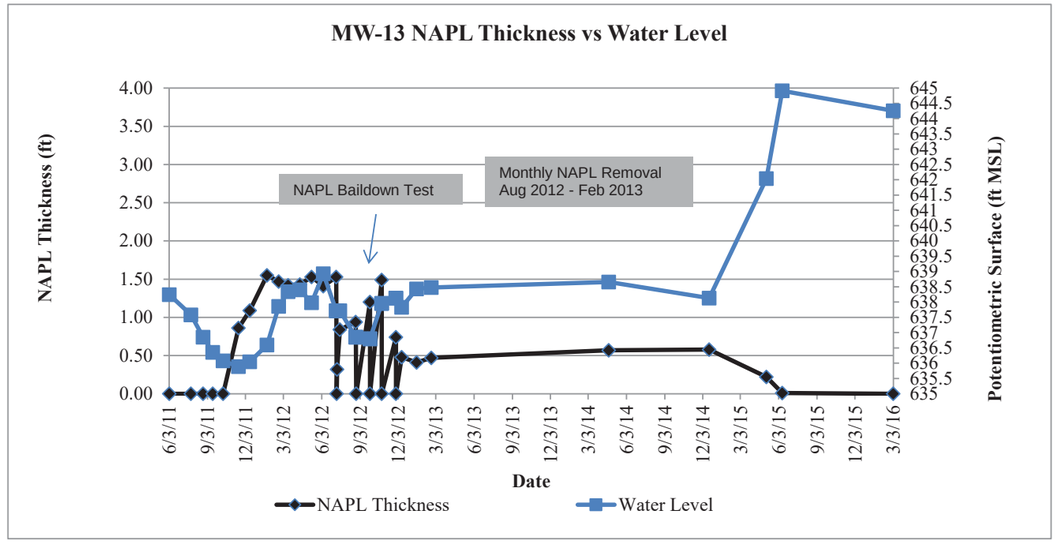
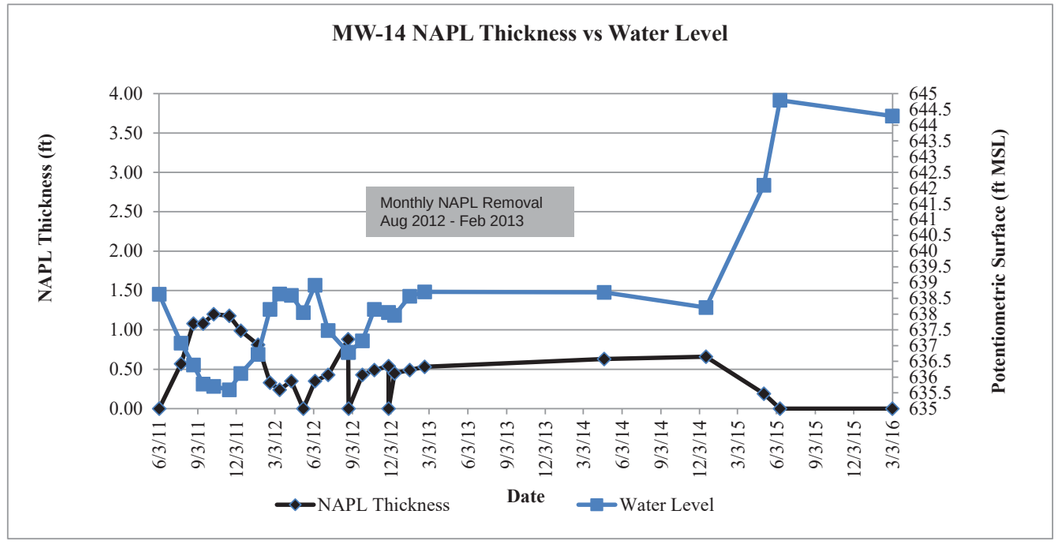
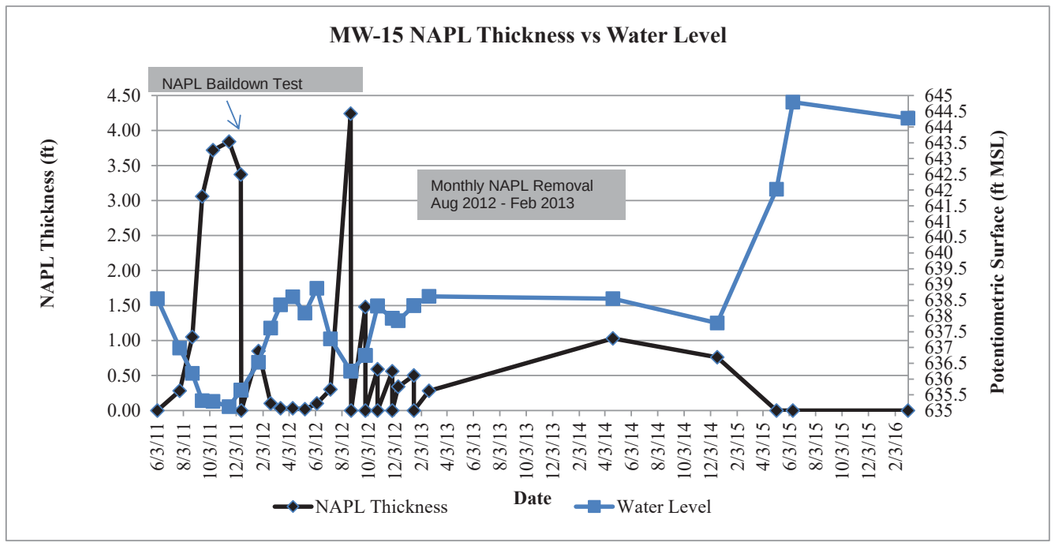


FIGURE 78
GROUNDWATER AND NAPL HYDROGRAPHS
R&H Oil/Tropicana Energy Site, San Antonio, Texas







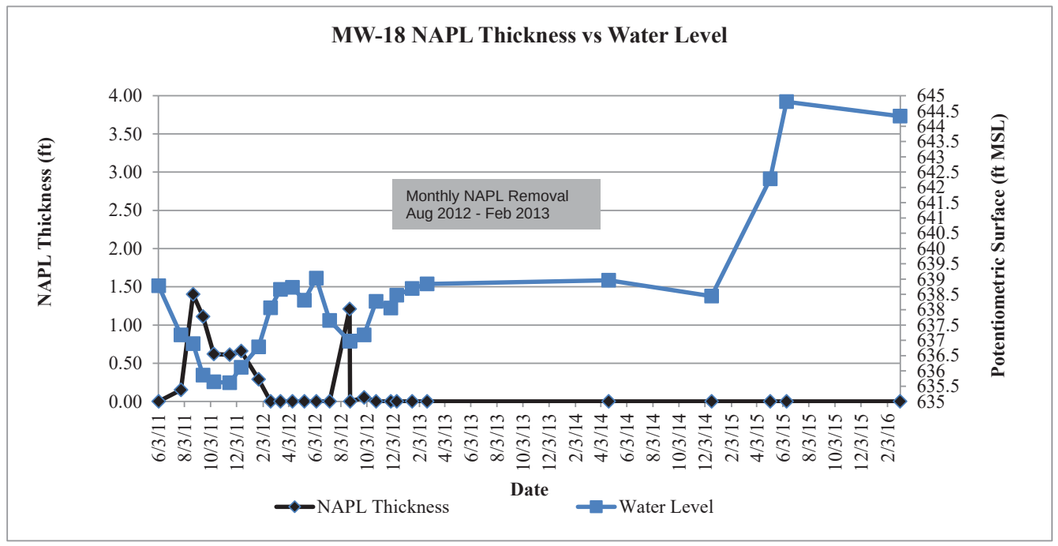
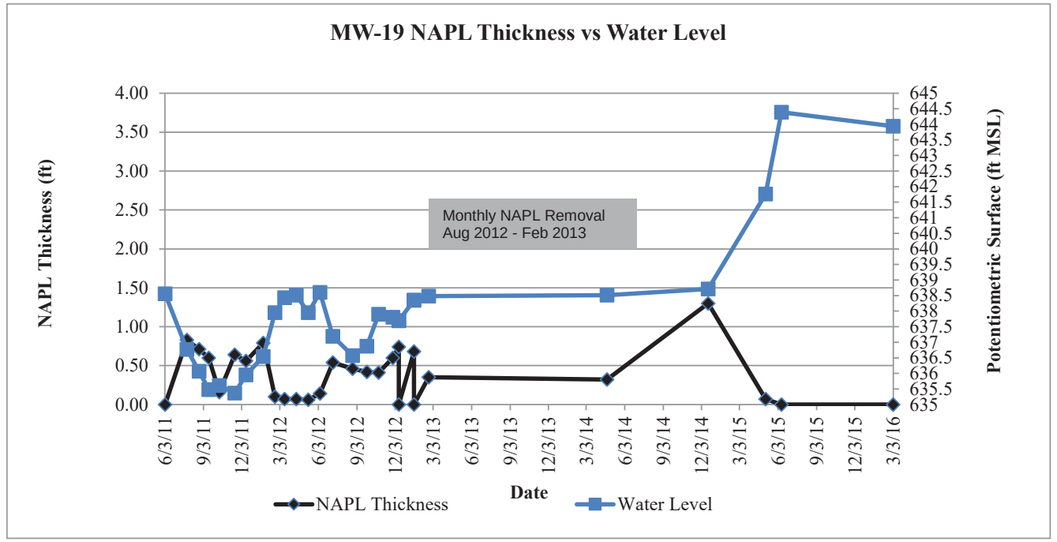
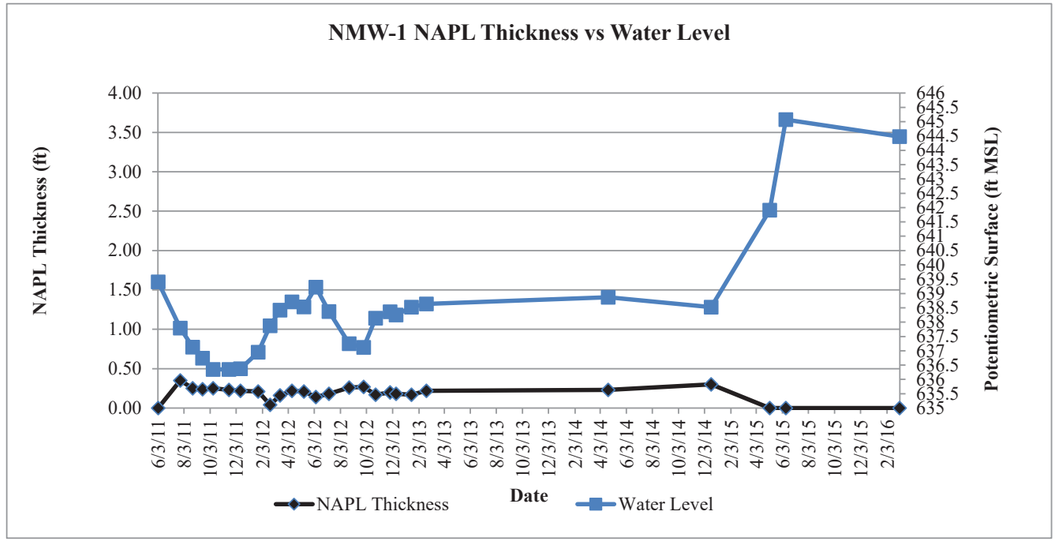
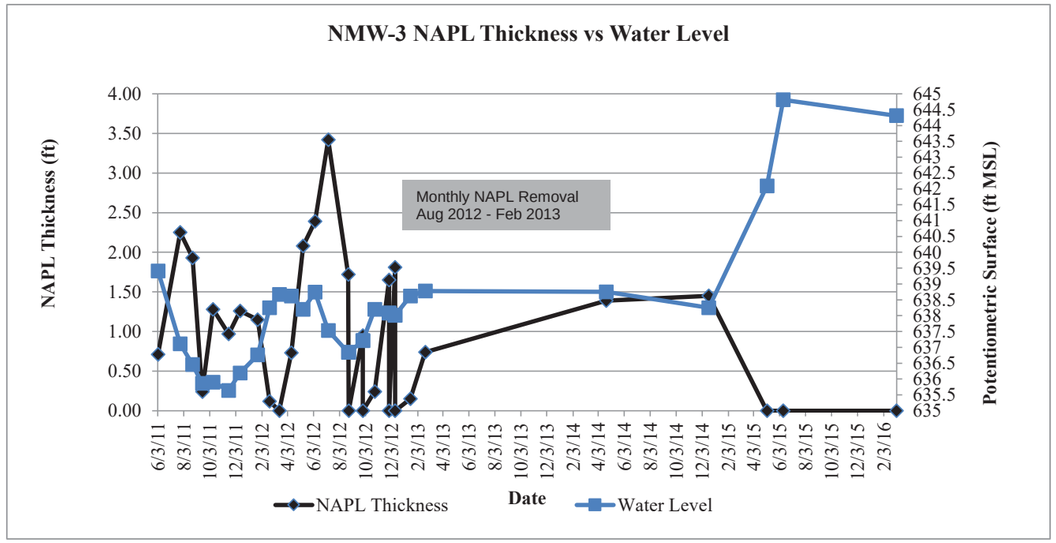
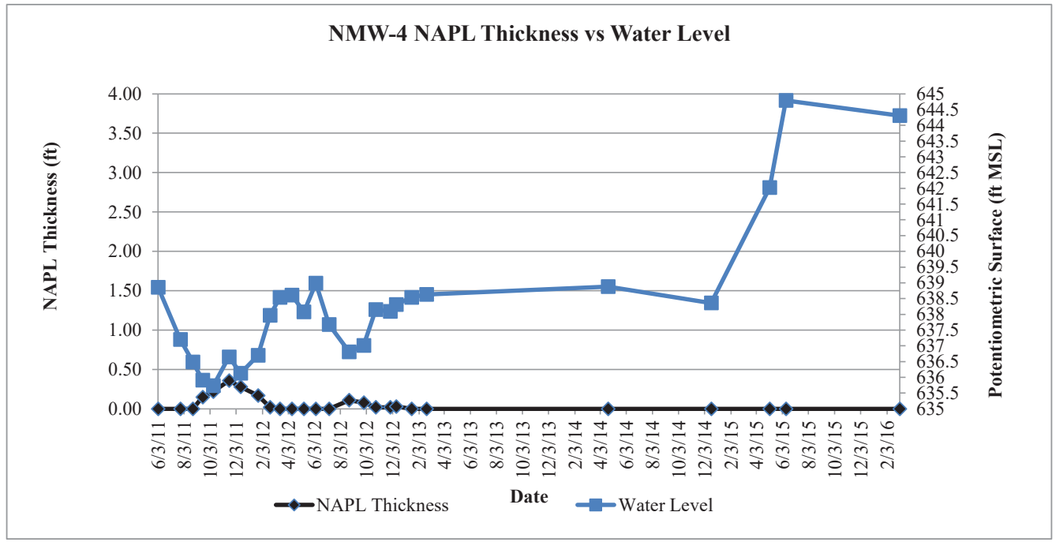


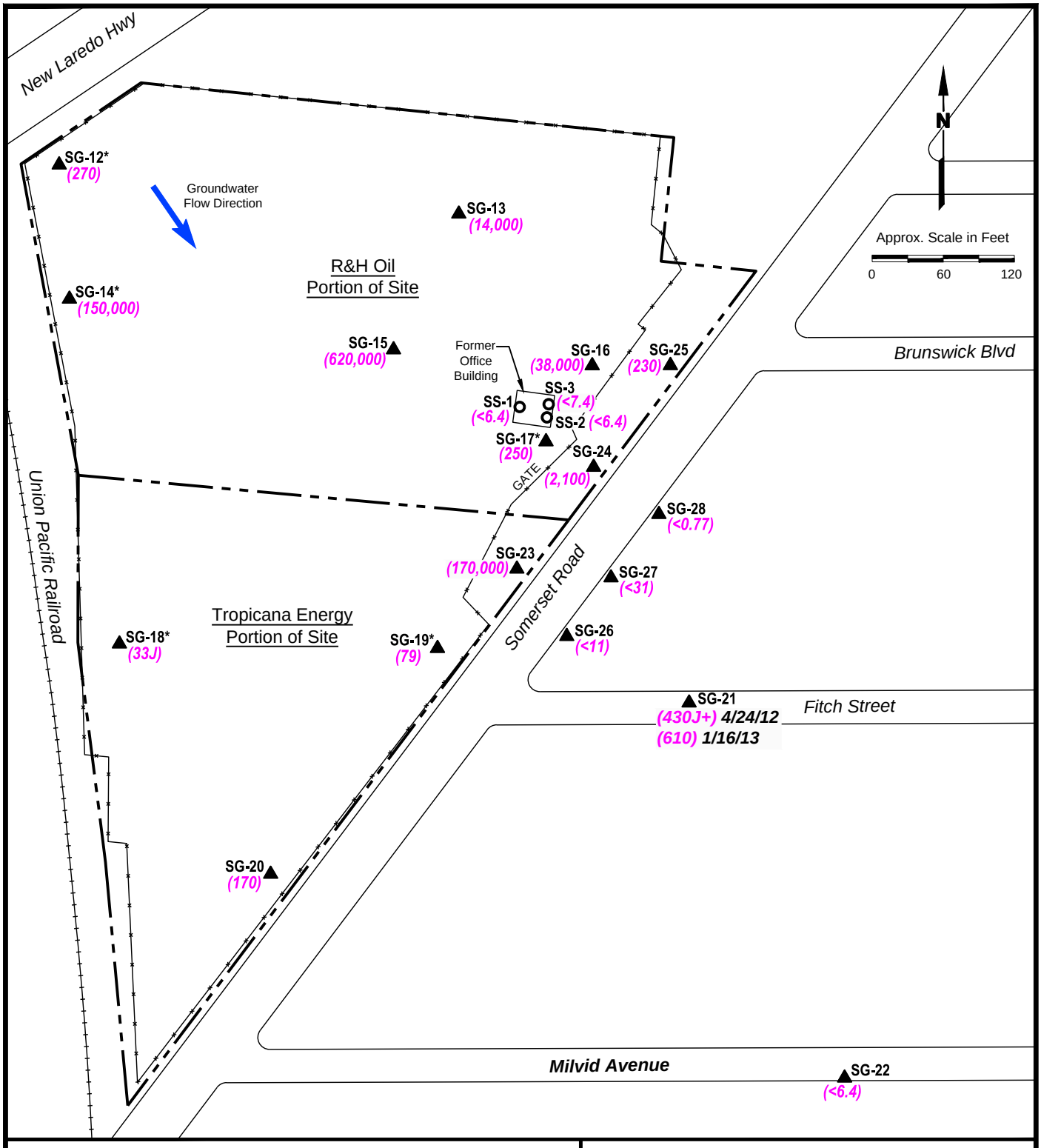
FIGURE 78
GROUNDWATER AND NAPL HYDROGRAPHS
R&H Oil/Tropicana Energy Site, San Antonio, Texas











EXPLANATION

- Site Boundary Fence
- Property Boundary
- ▲ Soil Gas Sample Location
- O Sub Slab Sample Location
- (170) Benzene Concentration (ug/m^3)

Notes:
1. Soil gas locations are co-located with wel locations MW-12 through MW-20.
2. Soil gas sample points installed at 5-6 feet below ground surface (bgs) except for SG-13 (3.5-4.5 ft bgs) and SG-18 (3-4 ft bgs).
3. Complete sample results are presented on Table 36.
4. * LNAPL present in adjacent monitoring well during soil gas sampling event.
5. J = Estimated value
   J+ = Estimated value with a potentially high bias
6. ug/m^3 = Micrograms per cubic meter

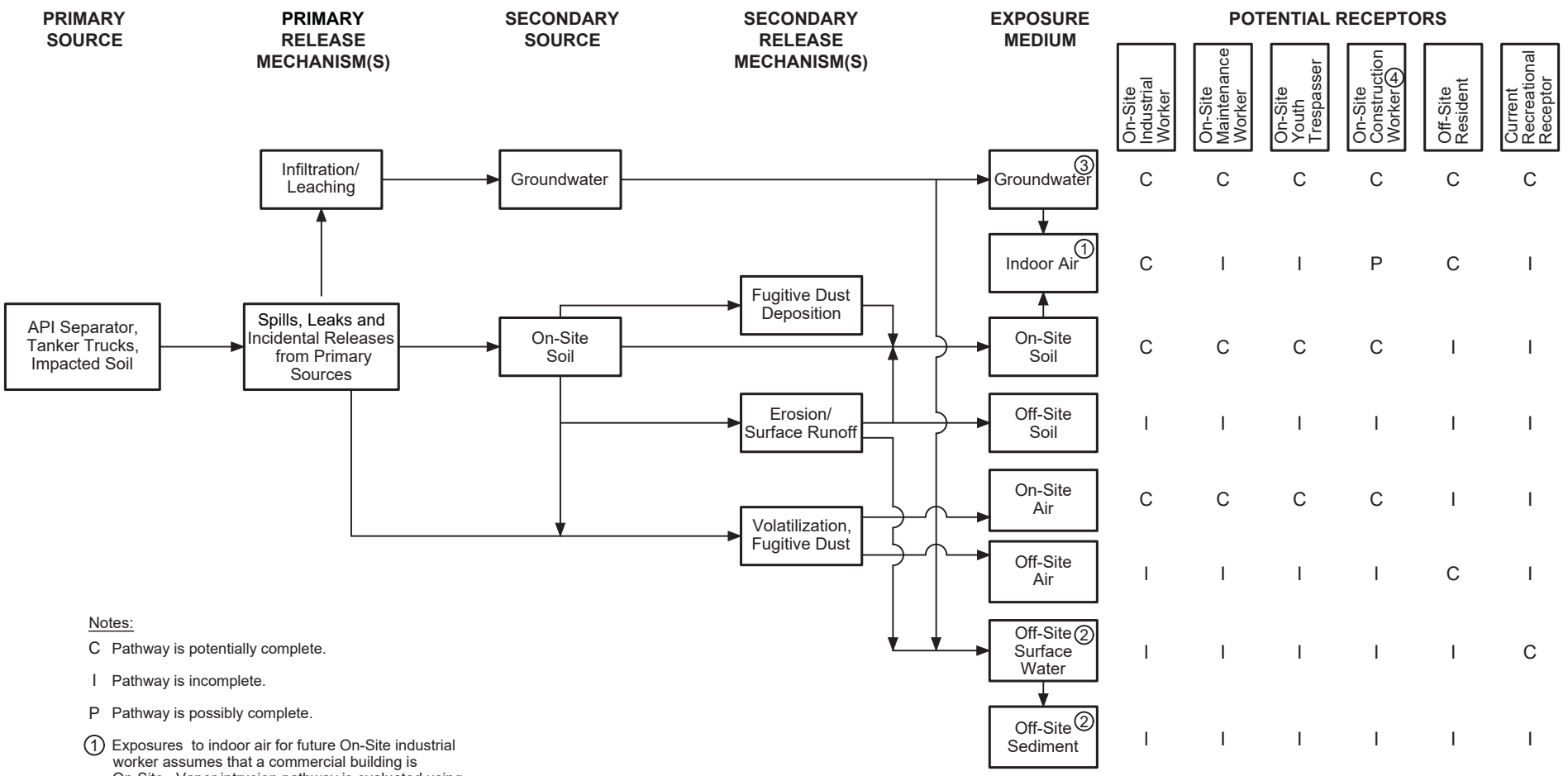
R&H OIL/TROPICANA ENERGY SITE

Figure 79

BENZENE CONCENTRATIONS IN SOIL GAS & SUB-SLUB SAMPLES

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Notes:

C Pathway is potentially complete.

I Pathway is incomplete.

P Pathway is possibly complete.

(1) Exposures to indoor air for future On-Site industrial worker assumes that a commercial building is On-Site. Vapor intrusion pathway is evaluated using soil gas data.

(2) Groundwater does not discharge to surface water. Surface water in the drainage ditch is from runoff. Drainage ditch is intermittent and sediment is not applicable.

(3) Per EPA request, this hypothetical pathway is conservatively evaluated through a direct comparison to drinking water standards. A City of San Antonio ordinance prohibiting groundwater use effectively precludes exposure via this pathway.

(4) Construction worker exposure during excavation activities.

R&H OIL/TROPICANA ENERGY SITE

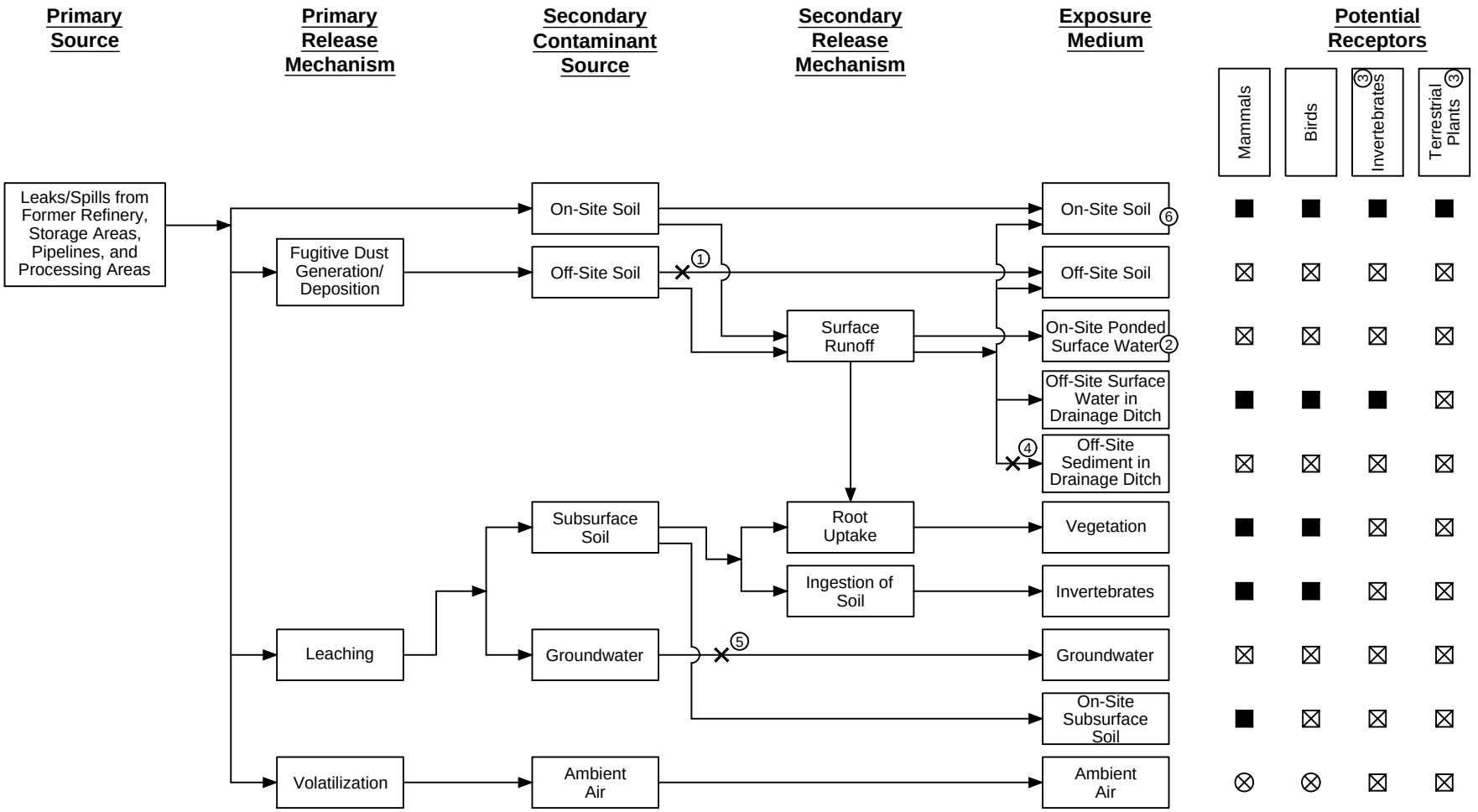
Figure 80

HUMAN HEALTH CONCEPTUAL SITE MODEL

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: TNN	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



LEGEND

- ■ Pathway is complete
- ⊠ Pathway is incomplete
- ⊗ Pathway is potentially complete, not evaluated

See RI Table 36 for summary data.

NOTES:

① The off-site soil migration pathway is not significant transport pathway based on site-specific information. See text for additional discussion.
② On-site ponded water pathways are considered incomplete since it is only present after heavy rainfall.
③ Because of the lack of quality habitat at the Site, soil exposures are unlikely but are evaluated for plants and soil invertebrates at the Site for completeness and conservatism.
④ Because of the ephemeral nature of the ditch, "true" sediments are not present and therefore, sediment exposure scenarios and related screening levels are not applicable.
⑤ The depth to groundwater precludes exposure to most, if not all, receptors.
⑥ Surface soil exposure to reptiles is likely a complete pathway; however, Site conditions limit frequency of exposure. A qualitatively discussion is provided in the SLERA.

R&H OIL/TROPICANA ENERGY SITE

Figure 81

ECOLOGICAL CONCEPTUAL SITE MODEL

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

APPENDIX A

PHOTOGRAPHIC LOG

APPENDIX A-1

PHOTOGRAPHS OF CURRENT CONDITIONS

Photograph 1. North part of Site showing buildings remaining on Site, standing near center looking East (January, 2014).

Photograph 2. South portion of Site (September, 2015).

Photograph 3. North part of Site, standing near center looking northwest (May, 2011).

Photograph 4. Southern portion of the Site, showing fence line along Somerset Road (October, 2015).

Photograph 5. Southern portion of the Site, looking south along western fence line on western side of property prior to a mowing event (October, 2009).

Photograph 6. On south side of berm on southern portion of the Site, looking north prior to a mowing event (October, 2009).

Photograph 7. Looking north along ditch that runs on both sides of railroad tracks, just west of the Site (April, 2006).

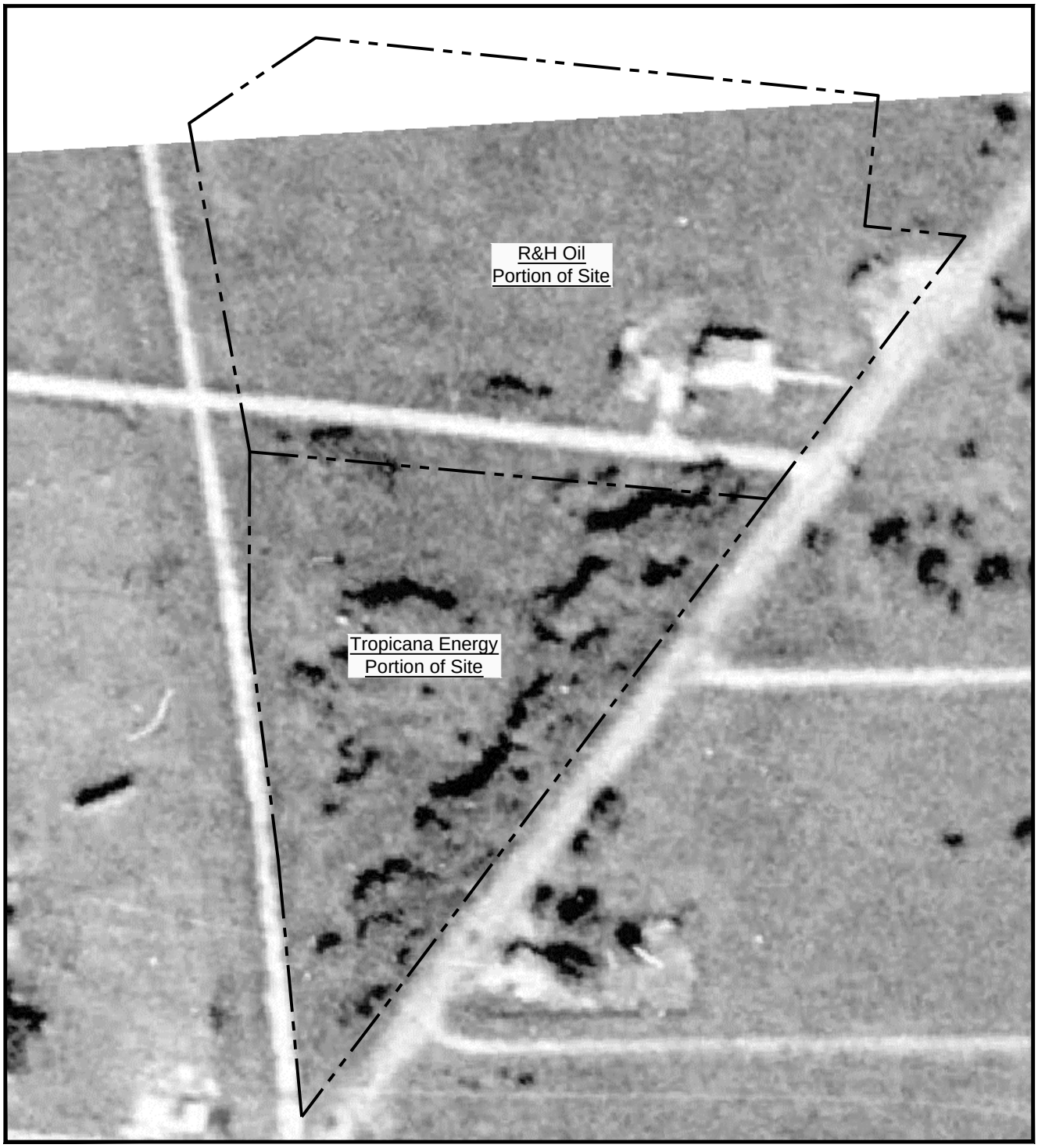
Photograph 8. Ditch running on the west-side of railroad tracks and east of junk yard, just before the culvert that connects the two sides of the ditch near Former Fitch Avenue (April, 2006).

Photograph 9 Drainage ditch west of the Site (April, 2015).

Photograph 10. Drainage ditch west of Site following rain event, (May, 2012).

APPENDIX A-2

HISTORICAL AERIAL PHOTOGRAPHS



N

Approx. Scale in Feet

0 60 120

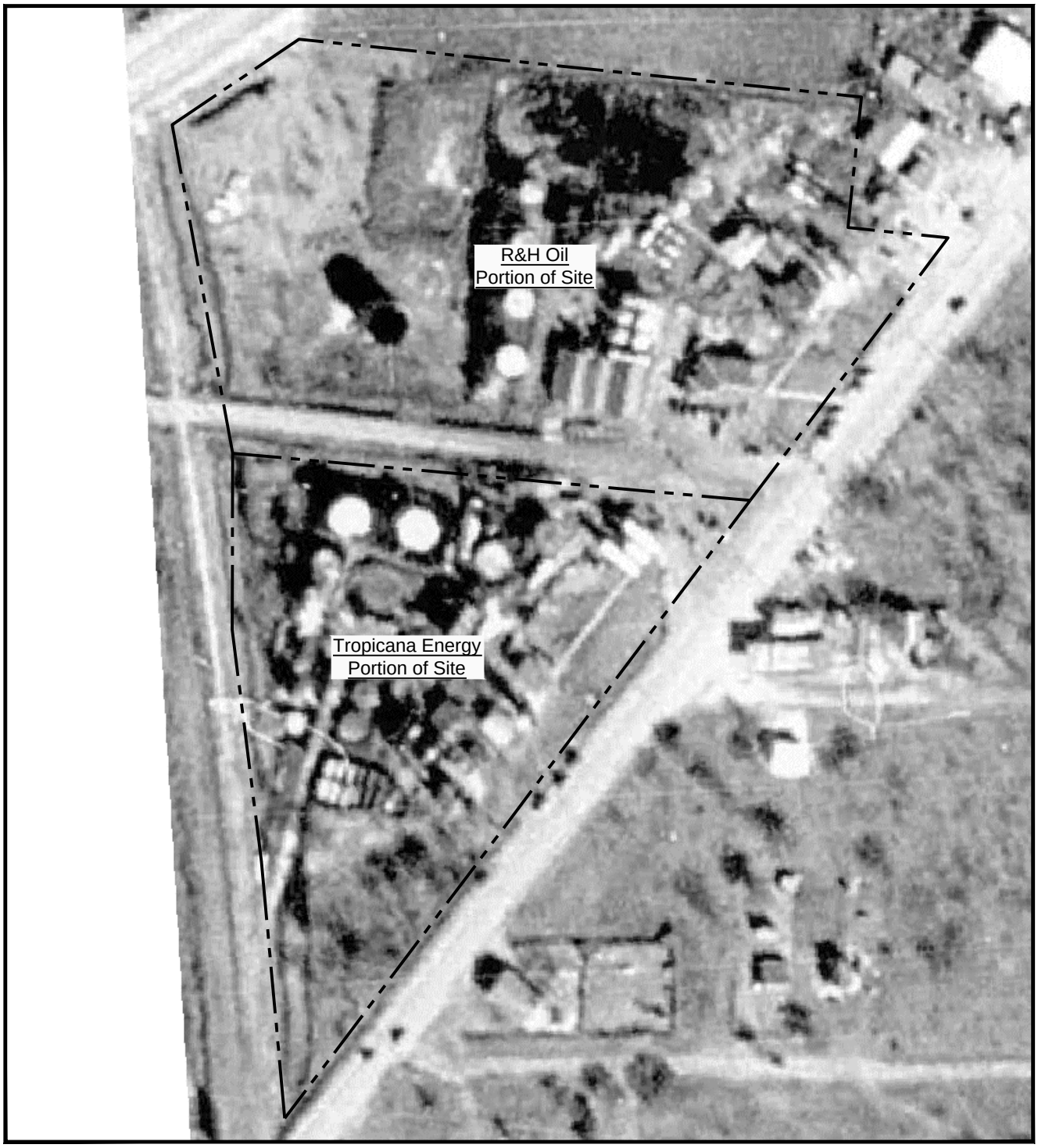
R&H OIL/TROPICANA ENERGY SITE

1929 AERIAL PHOTOGRAPH

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



N

Approx. Scale in Feet

0 60 120

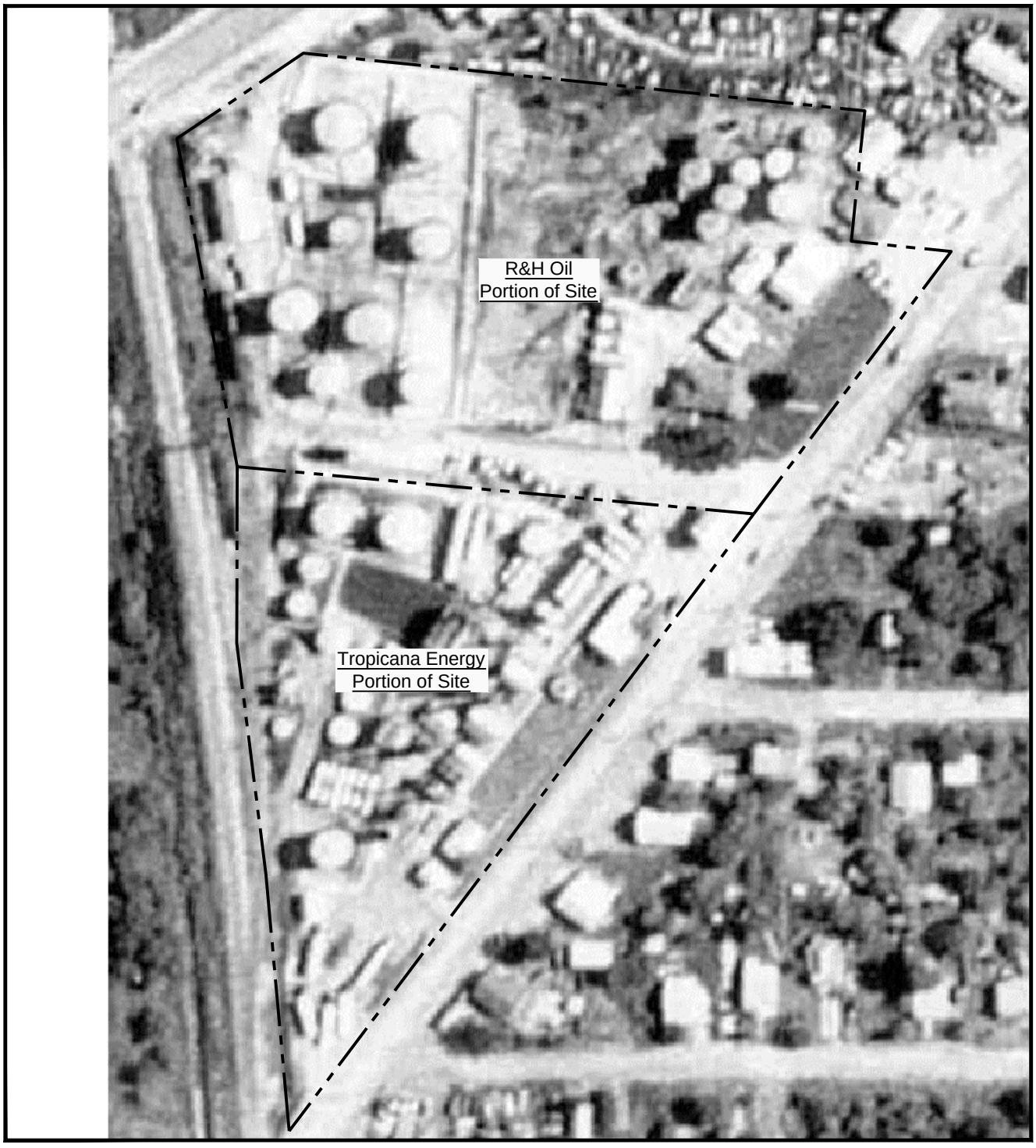
R&H OIL/TROPICANA ENERGY SITE

1939 AERIAL PHOTOGRAPH

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



N

Approx. Scale in Feet

0 60 120

R&H OIL/TROPICANA ENERGY SITE

1957 AERIAL PHOTOGRAPH

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

N

Approx. Scale in Feet

0 60 120

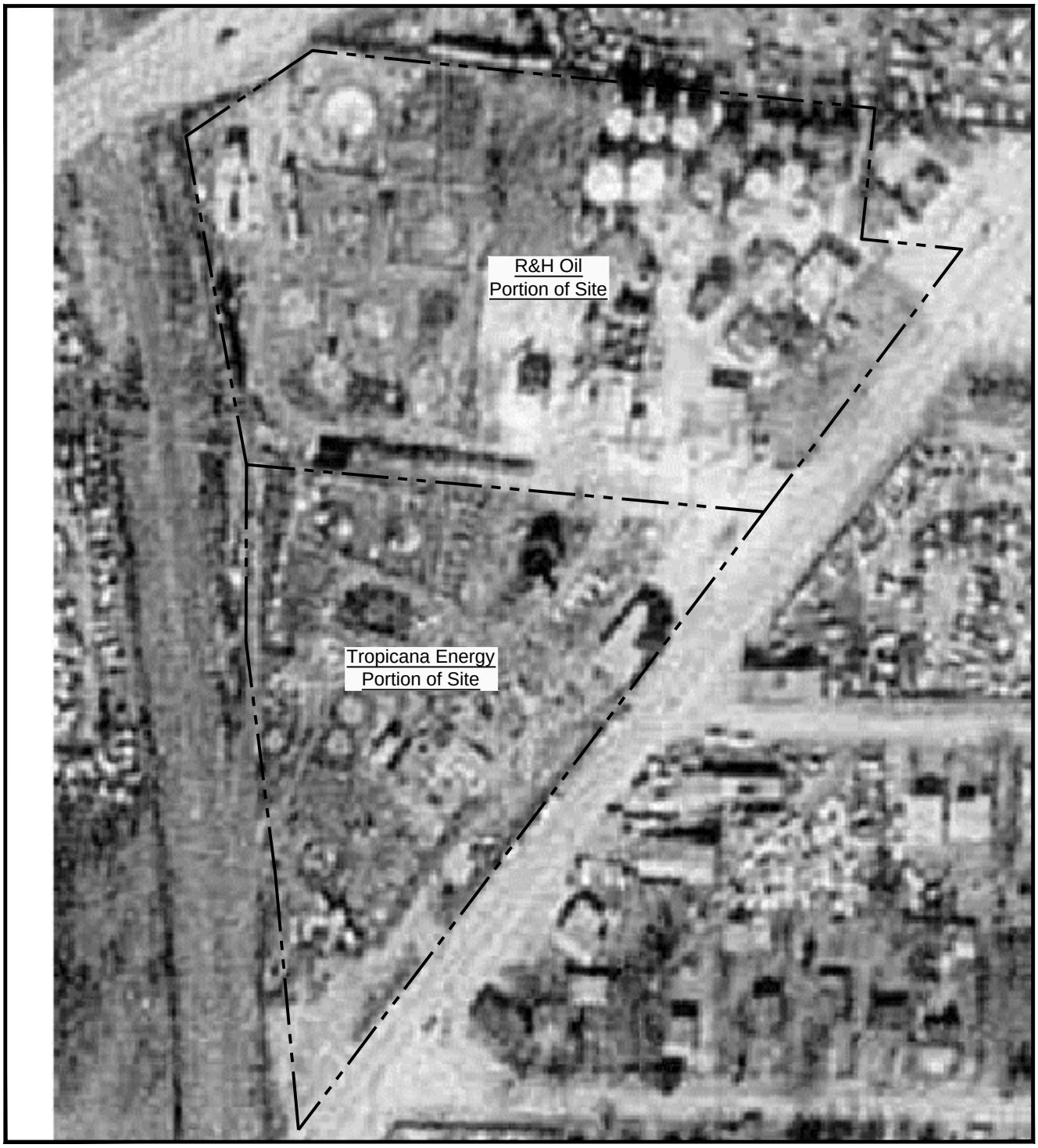
R&H OIL/TROPICANA ENERGY SITE

1962 AERIAL PHOTOGRAPH

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



N

Approx. Scale in Feet

0 60 120

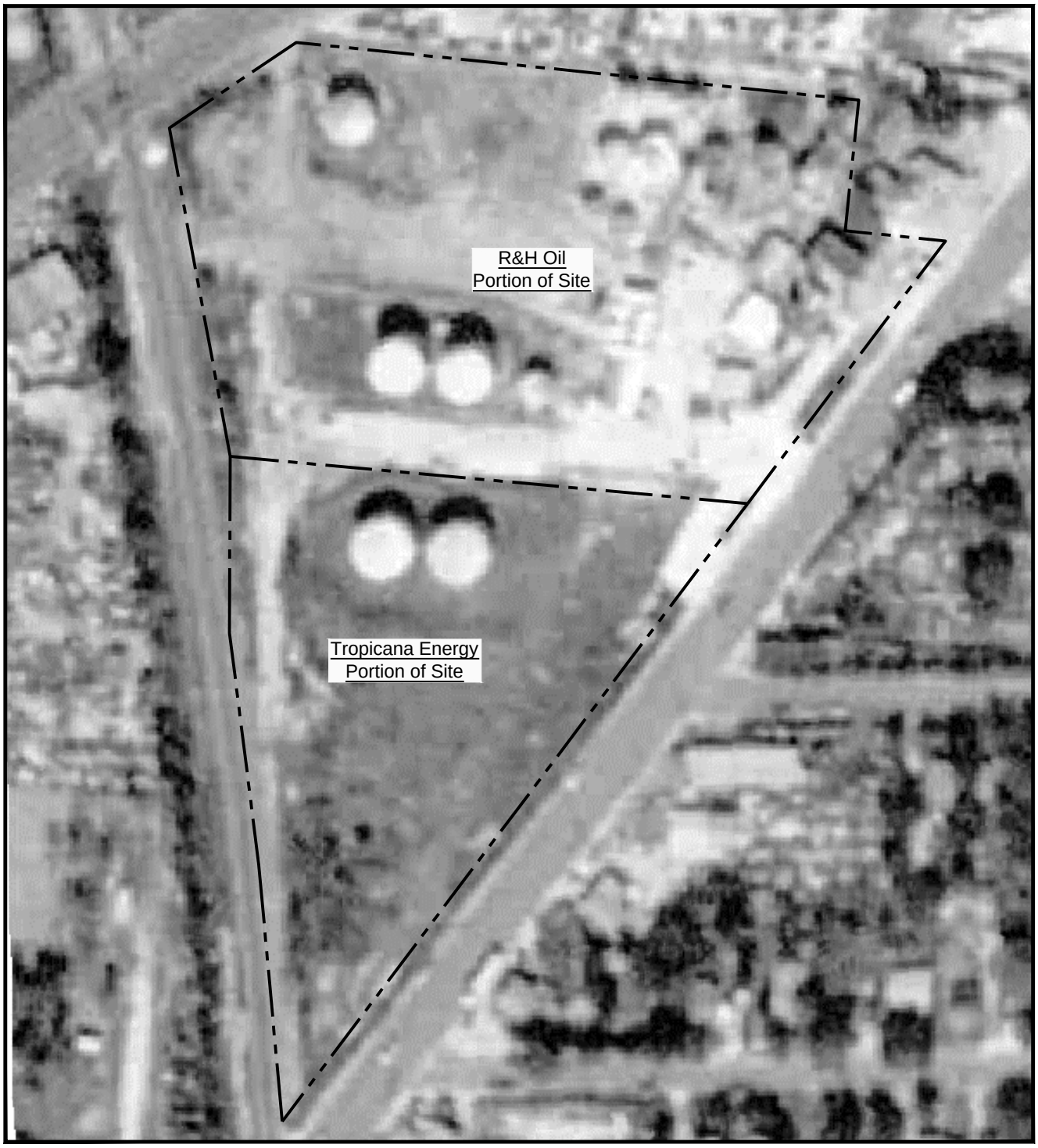
R&H OIL/TROPICANA ENERGY SITE

1973 AERIAL PHOTOGRAPH

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



N

Approx. Scale in Feet

0 60 120

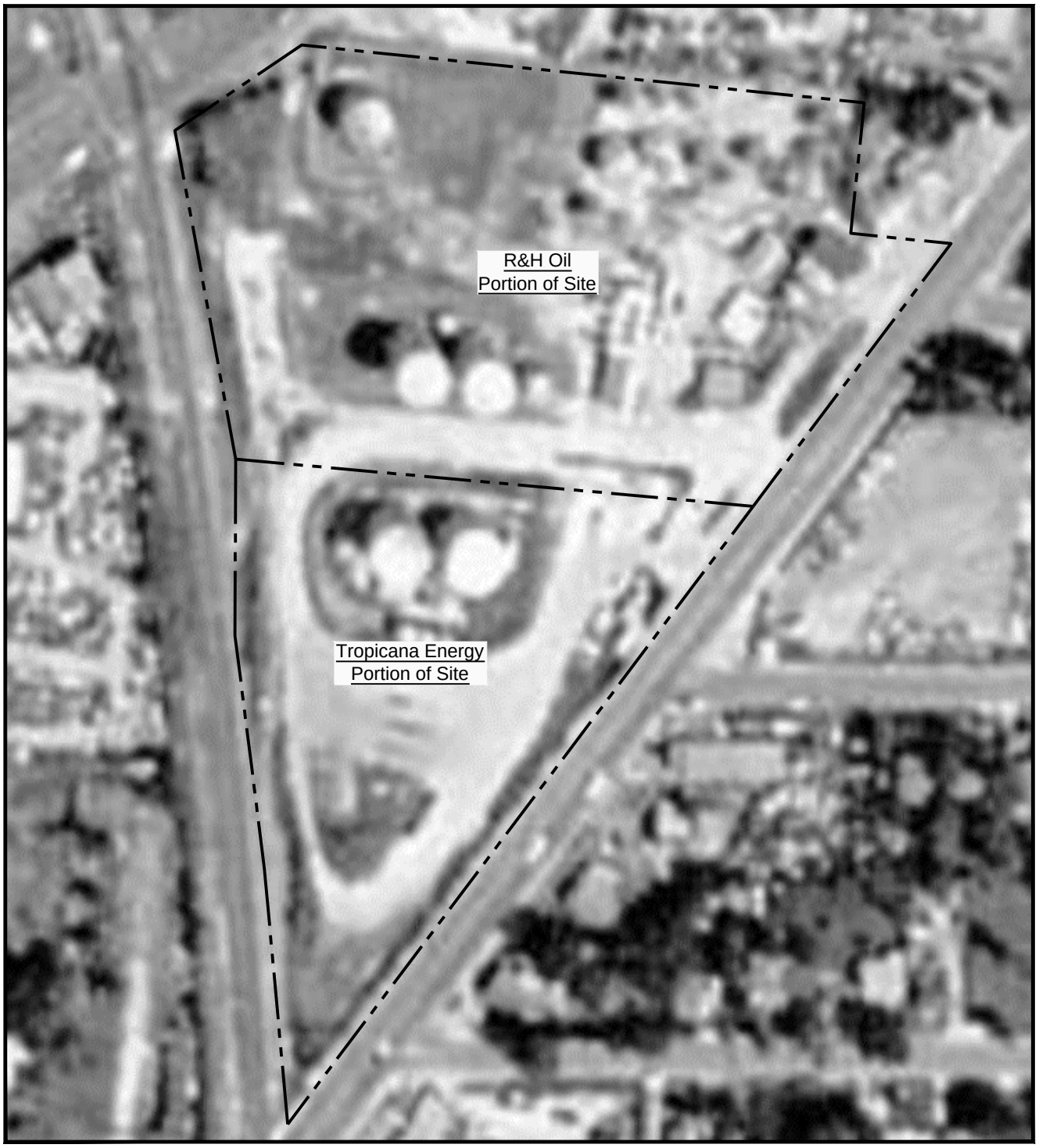
R&H OIL/TROPICANA ENERGY SITE

1987 AERIAL PHOTOGRAPH

PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



N

Approx. Scale in Feet

0 60 120

R&H OIL/TROPICANA ENERGY SITE

1991 AERIAL PHOTOGRAPH

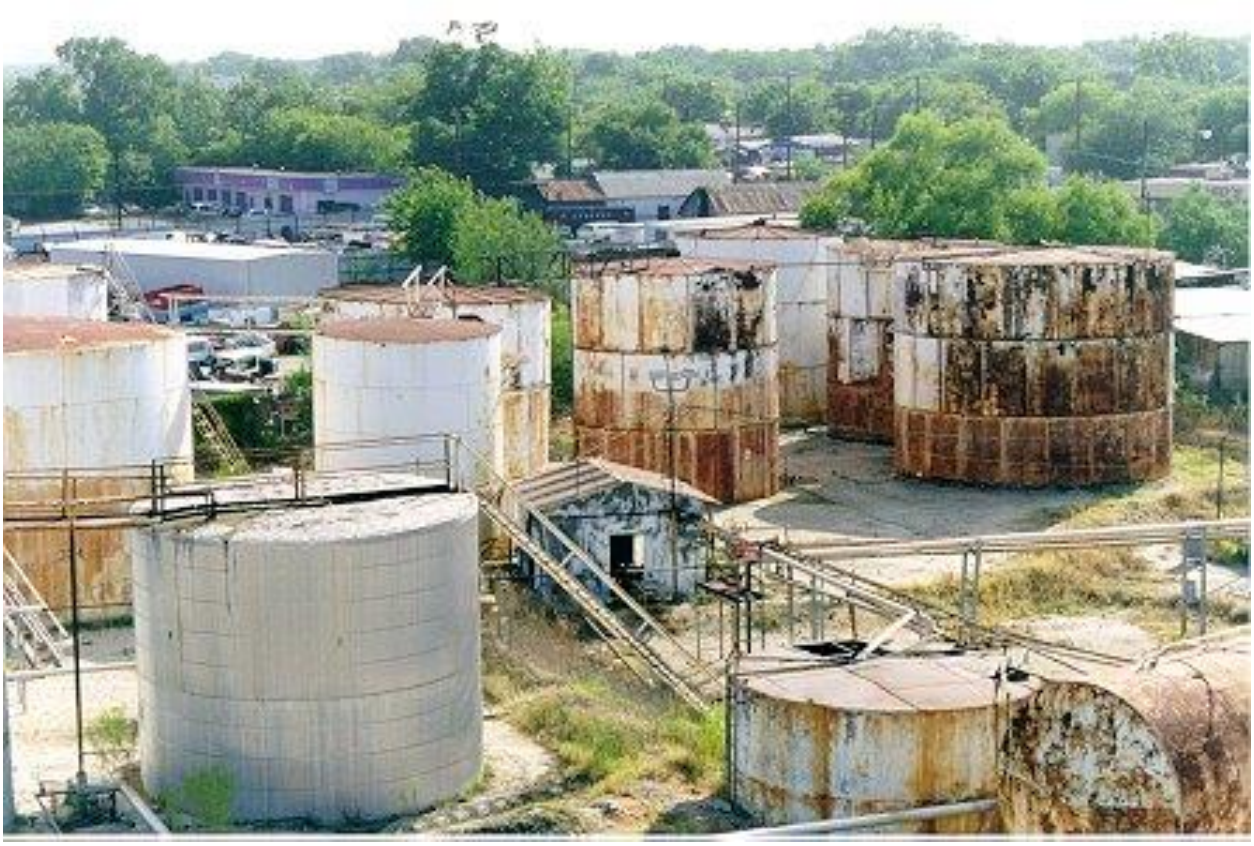
PROJECT: 1651	BY: AJD	REVISIONS
DATE: APR., 2016	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

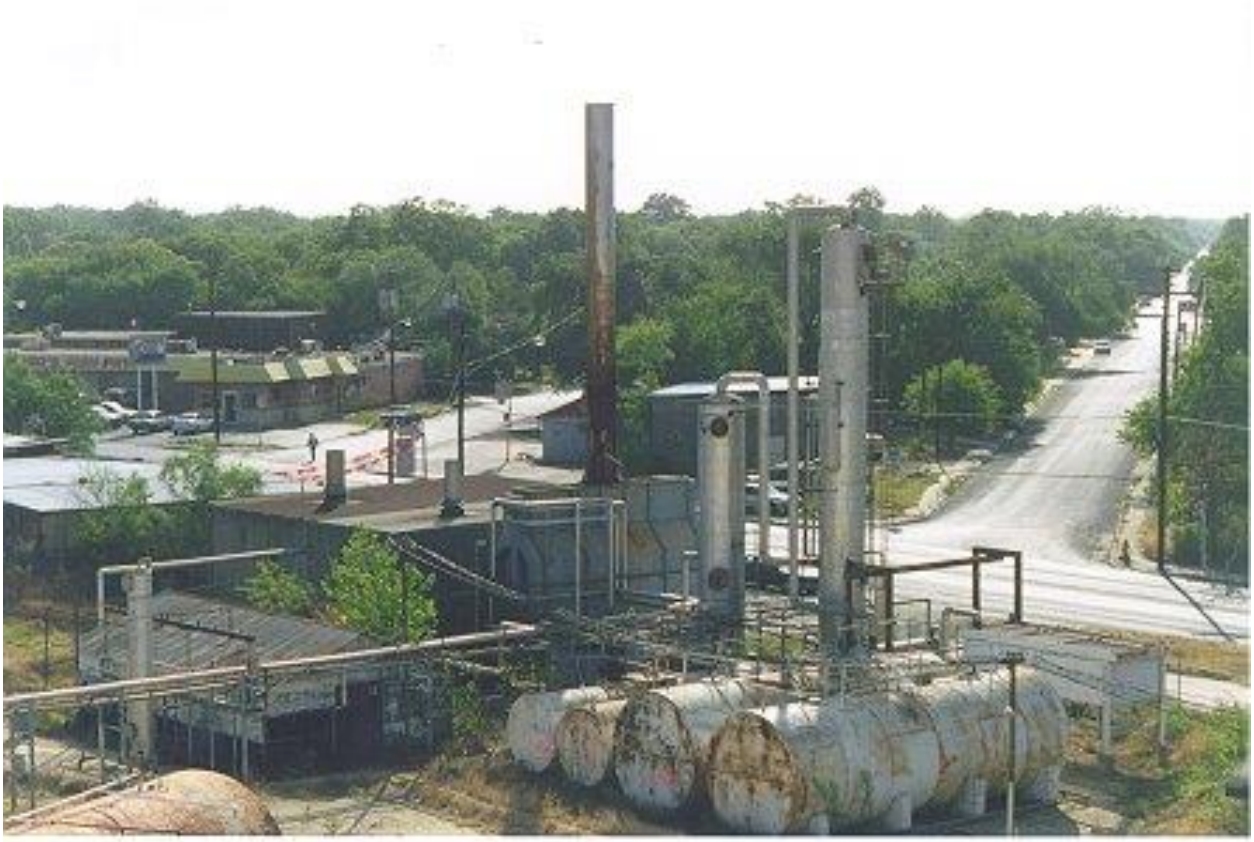
APPENDIX A-3

PHOTOGRAPHS PRIOR TO REMOVAL ACTION IN 2001

(From R&H Oil/Tropicana Energy Site Update presentation, Chris Villarreal, February 5, 2003)



Tanks in R&H Portion of Site



R&H Oil Process Area

Tropicana Energy Portion of the Site

APPENDIX A-4

PHOTOGRAPHS OF REMOVAL ACTION IN 2001 AT R&H OIL PORTION OF THE SITE

(From Removal Report for R&H Oil Company, Roy F. Weston, Inc., January 2002)

4x4

SUNSHINE EQUIPMENT

APPENDIX A-5

PHOTOGRAPHS OF REMOVAL ACTION IN 2001 AT TROPICANA ENERGY PORTION OF THE SITE

(From Removal Report for Tropicana Energy Company Inc., Roy F. Weston, Inc., January 2002)

APPENDIX B

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT (SLERA)

FOR THE
R&H OIL/TROPICANA ENERGY SITE
SAN ANTONIO, TEXAS

PREPARED BY:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Drive Suite 4004
Round Rock, Texas 78664
(512) 671-3434

AUGUST 5, 2013

TABLE OF CONTENTS

Page

LIST OF TABLES iii

LIST OF FIGURES iv

LIST OF APPENDICES iv

1.0 INTRODUCTION 1
1.1 PURPOSE AND SCOPE 3
1.2 GENERAL SITE INFORMATION AND HISTORY 4
1.3 LAND USE AND SETTING 4

2.0 SCREENING-LEVEL PROBLEM FORMULATION AND ECOLOGICAL EFFECTS EVALUATION (STEP 1) 6
2.1 ENVIRONMENTAL SETTING 6
2.1.1 Terrestrial Habitat 6
2.1.2 Aquatic Habitat 7
2.1.3 Plant and Animal Species 8
2.2 NATURE AND EXTENT OF POTENTIAL CHEMICALS OF CONCERN 9
2.3 POTENTIALLY COMPLETE EXPOSURE PATHWAYS AND PRELIMINARY CONCEPTUAL SITE MODEL 10
2.4 THREATENED AND ENDANGERED SPECIES 11
2.5 ASSESSMENT AND MEASUREMENT ENDPOINTS 11
2.5.1 Terrestrial Assessment Endpoints 12
2.5.2 Aquatic Habitat Assessment Endpoints 12
2.5.3 Measurement Endpoints 13

3.0 SCREENING-LEVEL PRELIMINARY EXPOSURE ESTIMATE AND HAZARD QUOTIENT CALCULATION (STEP 2) 14
3.1 RECEPTORS OF POTENTIAL CONCERN 14
3.1.1 Terrestrial Receptors 15
3.1.2 Aquatic Receptors 15
3.2 SCREENING-LEVEL COMPARISONS TO BENCHMARKS 15
3.2.1 Initial Screening Comparison 16
3.2.2 Acute Screening Levels for Soil 18

4.0 UNCERTAINTY ANALYSIS FOR STEPS 1 AND 2 20
4.1 EXPOSURE ANALYSIS UNCERTAINTY 20
4.1.1 General Exposure Analysis Uncertainties 20
4.1.2 Receptor-Specific Uncertainties 21
4.1.3 Chemical-Specific Uncertainties 22
4.2 EFFECTS CHARACTERIZATION UNCERTAINTY 22
4.2.1 Uncertainties with Plant Soil Screening Values 23
4.2.2 Uncertainties with Invertebrate Soil Screening Values 24
4.3 RISK CHARACTERIZATION UNCERTAINTY 25

5.0 SUMMARY AND CONCLUSIONS 27
5.1. POTENTIAL ECOLOGICAL RISKS ASSOCIATED WITH SOIL 28
5.2. POTENTIAL ECOLOGICAL RISKS ASSOCIATED WITH SURFACE WATER 28
5.3 SCIENTIFIC MANAGEMENT DECISION POINT 29

6.0 REFERENCES 30

LIST OF TABLES

Table	Title
1	Soil Sampling Results: Total Petroleum Hydrocarbons
2	Soil Sampling Results: Metals
3	Surface Soil Sampling Results: Volatile Organic Compounds
4	Shallow Soil Sampling Results: Volatile Organic Compounds
5	Surface Soil Sampling Results: Semi-Volatile Organic Compounds
6	Shallow Soil Sampling Results: Semi-Volatile Organic Compounds
7	Ditch Surface Water Sampling Results Compared to Screening Levels
8	Summary of Detected Compounds in Surface Soil (0 to 0.5 ft. bgs)
9	Summary of Detected Compounds in Shallow Soil (approx. 2 to 5 ft. bgs)
10	Summary of Detected Compounds in Ditch Surface Water
11	Summary of Compounds by Media with Screening Level Exceedances
12	Comparison of Background Concentrations to Site Concentrations and Chronic Screening Levels in Soil
13	Upstream Ditch Surface Water Sampling Results Compared to Downstream
14	Mammalian and Avian Toxicity Reference Values (TRVs) for Limited Exposures (Acute)
15	Hazard Quotients for Potential Acute Risks from Soil
16	SLERA Summary for Soil

LIST OF FIGURES

Figure	Title
1	Site Location Map
2	Site Topographic Map
3	Drainage Ditch Location
4	Site Soil Sample Location Map
5	Surface Water Sample Locations
6	Ecological Conceptual Site Model

LIST OF APPENDICES

Appendix	Title
A	Informal and Formal Comments on Draft and Final SLERA from EPA, TCEQ and EPA's Contractor
B	Site Photographs
C	US Fish and Wildlife Letter Regarding Protected and Endangered Species at Kelly Air Force Base
D	PRO UCL Statistical Calculations for Surface and Shallow Soil
E	US EPA Ecological Soil Screening Level Documentation

LIST OF ACRONYMS

AE	Assessment Endpoint
AFB	Air Force Base
ARAR	Applicable or Relevant and Appropriate Requirement
Bgs	Below Ground Surface
BHHRA	Baseline Human Health Risk Assessment
COPEC	Chemicals of Potential Ecological Concern
ERA	Ecological Risk Assessment
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
HQ	Hazard Quotient
HPAH	High-molecular weight Polynuclear Aromatic Hydrocarbons
HRS	Hazard Ranking System
LOAEL	Lowest Observed Adverse Effect Level
LPAH	Low-molecular weight Polynuclear Aromatic Hydrocarbons
mg/kg	Milligrams per Kilogram
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
PBW	Pastor, Behling & Wheeler, LLC
PAH	Polynuclear Aromatic Hydrocarbons
PPM	Part Per Million
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROPC	Receptor of Potential Concern
SOW	Statement of Work
SLERA	Screening-Level Ecological Risk Assessment
SSL	Soil Screening Level
SVOC	Semi-Volatile Organic Compound
TCEQ	Texas Commission on Environmental Quality
TNRCC	Texas Natural Resource Conservation Commission
TRV	Toxicity Reference Value
TWDB	Texas Water Development Board
UCL	95th percentile Upper Confidence Limit
VOC	Volatile Organic Compound

1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) proposed the former R&H Oil/Tropicana Energy Site in San Antonio, Bexar County, Texas (the Site) to the National Priorities List (NPL) in June 2001; however, the Site has not been listed on the NPL. On March 12, 2010, the EPA and Respondents entered into an Administrative Settlement Agreement and Order on Consent (Settlement Agreement) requiring the Respondents to conduct a Remedial Investigation and Feasibility Study (RI/FS) for the Site. Pursuant to Paragraphs 21 through 28 of the Statement of Work (SOW) for the RI/FS, included as Appendix B of the Settlement Agreement, an RI/FS Work Plan (PBW, 2010a) and a Sampling and Analysis Plan (PBW, 2010b) were prepared for the Site. These documents were submitted on September 24, 2010 and approved by EPA on November 23, 2010.The Respondents participating in the Settlement Agreement for the RI/FS are:

Bridgestone Americas Tire Operations, LLC
Department of State Health Services
Perkin Elmer Automotive Research, Inc. (f/k/a EG&G Automotive Research (Perkin Elmer, Inc.))
Exxon Mobil Corporation
Flint Group Incorporated
National Radiator Company, a dissolved Texas corporation
BAE Systems Resolution, Inc. (f/k/a Santana Resolution Corporation)
Structural Metals, Inc.

For the purposes of the RI/FS, the above Respondents are collectively referred to as the R&H Oil Company Site Group.

The SOW for the RI/FS requires that an Ecological Risk Assessment (ERA) be conducted for the Site. The SOW specifies that the Respondents follow EPA's *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997). This guidance document proposes an eight-step approach for conducting a scientifically-defensible ERA:

1. Screening-Level Problem Formulation and Ecological Effects Evaluation;
2. Screening-Level Preliminary Exposure Estimate and Risk Calculation;

3. Baseline Risk Assessment Problem Formulation;
4. Study Design and Data Quality Objectives;
5. Field Verification of Sampling Design;
6. Site Investigation and Analysis of Exposure and Effects;
7. Risk Characterization; and
8. Risk Management.

Briefly, Steps 1 and 2 of the process are scoping phases of the ERA in which existing information is reviewed to preliminarily identify the ecological components that are potentially at risk, the chemicals of potential ecological concern (COPECs), and the transport and exposure pathways that are important to the ERA. This process is conducted using conservative assumptions to avoid underestimating risk or omitting receptors or COPECs, and constitutes the Screening-Level Ecological Risk Assessment (SLERA). Step 3 is the Baseline Risk Assessment Problem Formulation that uses the results of the SLERA to identify methods for risk analysis and characterization, resulting in the identification of ERA data needs for the RI/FS. Steps 4 through 7 include formalization of the data needs, data collection, and data analysis for the risk characterization. Risk management activities are the eighth step in the process.

Pastor, Behling & Wheeler, LLC (PBW), on behalf of the R&H Oil Company Site Group, is conducting the tasks required in the Settlement Agreement. Environmental samples were collected as per the approved RI/FS Work Plan (PBW, 2010a) and analyzed according to the Quality Assurance Project Plan (PBW, 2010b) that was developed to support the Work Plan. In response to informal comments from EPA and TCEQ (EPA, 2012) on the draft SLERA (PBW, 2012), three additional surface soil samples (0 to 0.5 ft below ground surface) were collected to provide additional information that the urban drainage ditch to the west of the Site has not been impacted by potential historical surface runoff from the Site. Soil, groundwater, soil vapor, and surface water samples were collected as part of the RI. Environmental data were previously provided to EPA as part of the Bi-Monthly Progress Reports and will also be included in the RI Report.

Of the environmental media studied at the Site, soil and surface water are the only media of potential concern for ecological receptors because it is unlikely that ecological receptors will contact other media at the Site. As discussed in the approved Work Plan (PBW, 2010a), sediment from the drainage ditch immediately west of the Site was not sampled since, due to the ephemeral

nature of the ditch, "true" sediments are not present and therefore sediment exposure scenarios and related screening levels are not applicable. Soil between the property line and the drainage ditch was sampled. Human health risks are evaluated separately for the media that are applicable to human receptors at and near the Site in a Baseline Human Health Risk Assessment (BHHRA).

It should be noted that this Final SLERA is responsive to all of EPA and TCEQ's informal comments on the Draft SLERA (EPA, 2012) with the exception of several of the comments from EA Engineering (provided through EPA). Appendix A provides these informal comments. As discussed with EPA and TCEQ during a phone call on September 19, 2012, EPA and TCEQ agreed that PBW need not respond to several of EA Engineering's comments because they were inconsistent with the overall risk assessment approach of this project given the limited habitat at the Site. Specifically, no revisions to the SLERA were made based on EA Engineering's comments #3, 5, 6, and 10. In addition, pH data were not collected as part of the RI and, as such, there are no pH data to report (in regards to EPA comment #6, EPA, 2012 which is provided in Appendix A).

Additionally, this Final SLERA is responsive to EPA, TCEQ and EA Engineering formal comments dated April 10, 2013, April 19, 2013 and June 18, 2013. These comments were discussed on June 28, 2013 with EPA, TCEQ and EA Engineering. Appendix A contains these comments and the formal responses. The responses include information on where the document revisions are located within this SLERA.

1.1 PURPOSE AND SCOPE

The purpose and scope of this document is to summarize the analytical data for environmental media sampled during the RI and to conduct a SLERA based on those data. The SLERA is a conservative assessment and serves to evaluate the need and, if required, the level of effort necessary to conduct a baseline ecological risk assessment. Per EPA guidance (EPA, 1997), the SLERA provides a general indication of the potential for ecological risk (or lack thereof) and may be conducted for several purposes including: 1) to estimate the likelihood that a particular ecological risk exists; 2) to identify the need for site-specific data collection efforts; or 3) to focus site-specific ecological risk assessments where warranted. This report provides documentation for whether further assessment (i.e., proceeding with the baseline ecological risk assessment) is necessary.

1.2 GENERAL SITE INFORMATION AND HISTORY

The Site area totals approximately six to seven acres and is comprised of two contiguous tracts: a northern tract located at 403 Somerset Road and a southern tract located at 507 Somerset Road in San Antonio, Bexar County, Texas (see Figure 1) (the address of the southern tract was formerly listed as 419 Somerset Road in the proposed NPL listing of the Site). The northern tract has been previously referred to as the R&H Oil Company and/or the Eldorado Refining and Marketing, Inc. site. The southern tract has been referred to as the Tropicana Energy Company site. Both tracts together are considered "the Site" for the purposes of this report and evaluation.

An understanding of the Site's operating history was developed through review of the R&H Oil Company Site Screening Report and the HRS Documentation Record as described in the Work Plan (PBW, 2010a). Removal actions were conducted at the Site prior to the start of the RI as described in the Work Plan (PBW, 2010a). Thus, the data collected represent current and future risks associated with the Site absent any additional actions in the future. This SLERA, however, does not attempt to identify any potential historical ecological impacts prior to the removal actions.

1.3 LAND USE AND SETTING

The Site is located approximately five miles southwest of downtown San Antonio. Land use north and west of the Site is primarily commercial/industrial, including the former East Kelly Air Force Base (AFB) to the west, and multiple light industrial, auto salvage, repair, and/or service station facilities to the northeast and southwest. The Site is bordered to the north by an auto service center and to the west by Union Pacific Railroad railroad tracks, an auto repair and parts establishment, and East Kelly AFB. Residential, commercial, and industrial development is present to the south and east, and Somerset Road is adjacent to the Site to the east. U.S. Census data from 1990 indicated a total population of 4,085 within a one mile radius of the Site with 96.6% minority and 52% economically stressed (EPA, 2003a).

The City of San Antonio land use zoning classification for the Site is light industrial (CSADSD, 2013; CSA 2009). According to the City's Unified Development Code (CSA, 2012), the Light Industrial District "provides for a mix of light manufacturing uses, office parts, flex-space and limited retail."

Numerous Site visits have been conducted from 2006 through the present time to evaluate existing land use characteristics, observe and characterize wildlife and terrestrial habitats, for Site maintenance (e.g., fence repair, mowing, etc.) purposes, and during the RI sampling events. The Site is surrounded by a security fence which has been improved, maintained, and repaired as part of site maintenance activities. Prior to starting the investigation, the fence was in disrepair and evidence of trespassing into the Site was observed on multiple occasions.

Roughly one-third of the Site is comprised of gravel parking lots, paved road, and extensively re-worked soil and bare patches of soil. The remaining portion of the Site is a routinely maintained grass lot with several grassy containment berms still present. A few small scrub shrubs/trees have grown along the fence line. Given the industrial nature of the surrounding area, the physical location of the Site as well as the physical characteristics of the Site (i.e., compacted soils, gravel beds/road base areas), and zoning restrictions in the area, the property will be used for industrial/commercial purposes in the future. In addition, given the physical limitations of the Site such as the compacted soils and gravel beds/road base areas, it is unlikely that the Site would serve as quality ecological habitat in the future. Ecological restoration of the existing Site would require significant effort in planning and implementation. The restoration would have to include rework of the soil, addition of soil, placement of plants, water source and a commitment to the viability of the restoration over an extended period of time. (e.g., plant replacement if plants die). The R&H Oil Company Site Group is pursuing the appointment of a receiver to the property which, if granted, will allow institutional controls and restrictive covenants to be placed on the property thereby limiting future land use to commercial/industrial.

2.0 SCREENING-LEVEL PROBLEM FORMULATION AND ECOLOGICAL EFFECTS EVALUATION (STEP 1)

Problem formulation establishes the goals, scope and focus of the SLERA by describing the physical features of the site, the communities of potential receptors present at the site, the selection of assessment and measurement endpoints, and potential exposure pathways. This information serves as the basis for the conceptual site model (described further in Section 2.3 and shown in Figure 6), which is used to focus the remaining steps of the SLERA.

2.1 ENVIRONMENTAL SETTING

As described previously, the Site is an inactive industrial property in a heavily industrialized urban area and has managed vegetation, disturbed soil, and some impermeable and ecologically insignificant media (pavement, driveways, asphalt covering, buildings, and other concrete pads). The Site and adjacent areas do not provide unique habitat or foraging areas for wildlife species nor is the Site believed to be used for critical life stages. No significant ecological resources have been identified for the Site or adjacent properties. Based on these observations, the habitat present at the Site has been determined to be of low ecological quality as discussed below.

2.1.1 Terrestrial Habitat

After operations at the Site ceased in the late 1980s or early 1990s, and after EPA removal actions were performed in 2001, the Site became overgrown. In 2007, the R&H Oil Company Site Group, through PBW, contracted for repair/upgrade of the Site perimeter fencing and gate system, removal of general debris, cutting of overgrowth, and mowing of the Site. Since that time the Site has been maintained by a regular mowing and maintenance program. Currently existing Site features include two unused buildings (in very poor condition), several berms, and a short section of abandoned railroad track.

Photographs of the Site and a drainage ditch area adjacent to the western boundary of the Site are shown in Appendix B, along with a map of the Site identifying the general area of the photographs. As shown in these photographs, the ground surface at the Site consists of gravel or grass covered areas with no trees and minimal undisturbed habitat. The portions of the Site that could potentially serve as ecological habitat are small in area, heavily disturbed because of the

regular ground maintenance and previous removal activities, and generally unattractive to wildlife. There are no forested, brush land, wetland, or undisturbed field areas that would serve as valuable terrestrial habitat. As such, small mammal and bird use is expected to be minimal. Given the general absence of attractive habitat on the Site and the urban setting in general, the Site is not conducive to any appreciable use by resident wildlife.

As shown on the Site topographic map in Figure 2, the Site is relatively flat, with the limited elevation changes over the Site less than five feet and generally associated with the bermed areas. Rainfall runoff from much of the Site, particularly the northern tract, is controlled by berms in former Site operational areas. Outside of these bermed areas, runoff is generally to the east toward Somerset Drive.

Runoff from the narrow area west of the bermed areas, on the western edge of the Site, is toward a shallow drainage ditch adjacent to the western perimeter of the Site. Some ponding of rainwater occurs in the low-lying areas of the Site after rainfall. It is likely that these low-lying areas are the result of previous soil removal activities at the Site. Regardless, there is no visual evidence of erosion from surface runoff leaving the Site. Much of the area west of the berms is vegetated and ground surface cover reduces the erosion potential by reducing the velocity of overland flow, inhibiting generation of erodible material and inhibiting the transport of eroded material from elsewhere. Low slope, such as the slope at this Site, results in low overland runoff flow velocities which, in turn, limit the soil erosion potential of an area. The soils at the Site are predominantly clay and clay soils have a relatively low erosive potential. Due to the low slope, extent of vegetative cover on the western (ditch-side) of the Site, soil type, and insignificant erodible impacts, the transport of affected soil to the off-site ditch is not expected to be a complete transport pathway for the Site.

2.1.2 Aquatic Habitat

The location and path of the drainage ditch west of the Site is shown on Figure 3. The ditch originates north of the Site and collects drainage from East Kelly AFB and other industrial properties (e.g., auto salvage yards, auto repair facilities, etc.) to the north. As such, the ditch contains a substantial amount of debris including trash, tires, rubble, and other urban refuse (see photographs in Appendix B). An evaluation of the ditch and downstream areas was performed as part of the Ecological Risk Assessment performed for the Former Kelly AFB (CH2M-Hill, 2004).

As noted therein, the ditch is typically dry and, farther downstream, mostly concrete lined. The ditch drains to Sixmile Creek which originates approximately 2,000 feet south of the Site near the intersection of Wabash and Wagner Streets where other storm drains contribute to the cumulative flow (Figure 3). The Kelly evaluation noted the urban nature of Sixmile Creek at that point and characterized the creek as "an intermittent stream, located in a disturbed area, that meets acute water quality criteria specified in Table 1 of §30 TAC 307.6; lacks appreciable instream, edge, and riparian habitat, forage and shelter in or along the watercourse" (CH2M-Hill, 2004).

During the past six years of inspection and investigation activities by PBW personnel and other contractors at the Site, it was noted that there was very little to no water present in the ditch directly to the west of the Site much of the time and, as such, the ditch is believed to be intermittent. Surface water sampling was conducted, however, after a storm event since water was typically not present in the ditch otherwise. The occasional presence of standing water that accumulates after periods of rainfall is shown on the August 31, 2010 photographs in Appendix A. The primary vegetation found along the ditch is terrestrial plants and weeds. As noted previously, surface drainage and runoff from a limited portion of the Site may flow toward the ditch depending on specific rainfall/runoff conditions. Although there is no evidence of soil erosion on-Site, COPECs entrained in soil particles may have potentially migrated to the ditch.

2.1.3 Plant and Animal Species

In the vegetated areas of the Site the single dominant vegetation type is grassland, with most plants not exceeding 4 to 6 inches in height because of mowing. The grassland community is composed of a limited variety of native grasses and other opportunistic herbaceous groundcover species that are typical to this area of Texas. A variety of small shrubs and trees are present on the fence line, most notable are new growth mesquite and acacia trees.

During previous Site visits and sampling events, no terrestrial mammals have been observed on-site with the exception of feral dogs. Birds, such as the American robin, mockingbird, dove and killdeer, were observed at the Site on various visits. Amphibians were not quantitatively evaluated in this SLERA because the habitat present at the Site would not support amphibian life since they need a consistent water source/body to lay eggs and for juvenile development and there is little quantitative exposure or toxicity data to use to evaluate potential exposure and risk. Reptiles were not quantitatively evaluated because there is a lack of exposure and toxicity data

for these species although, like mammals and birds, it is unlikely that they are consistently present at the Site.

Any wildlife possibly present at the Site are likely urban tolerant species given the setting, location, and past/current uses of the Site. Since there is some vegetative cover at the Site around the fence line, it is possible that small ranging mammals and some avian species might inhabit and/or forage at the Site although it is unlikely that the Site serves as a significant ecological resource. In addition, regular ground maintenance makes the Site unsuitable for widespread foraging, and nesting, and this is supported by the lack of observable wildlife during Site activities. These visits have, however, occurred during the day, which typically would reduce the chances of seeing small ranging mammals and other wildlife since many are less active during the day.

2.2 NATURE AND EXTENT OF POTENTIAL CHEMICALS OF CONCERN

Data related to the nature and extent of potential chemicals of concern in ecologically-relevant media (e.g., soil and surface water) at the Site were obtained as part of the RI. Unless otherwise noted, the samples were analyzed for the full suite of analytes as specified in the approved RI Work Plan (PBW, 2010a). Figure 4 and 5 respectively provide sample locations for the soil and surface water samples collected as part of the RI.

A COPEC in this report is any compound measured above the detection limit in at least one sample. All COPECs are evaluated further in the SLERA. Tables 1 through 7 provide the analytical data for the compounds detected in at least one sample collected at the Site as well as for all compounds analyzed for given the specified analytical method. The detection limit is listed if that compound was not detected in a particular sample. Also provided in Tables 2 through 7 are the ecological screening levels used for comparative purposes in the SLERA.

Seventeen surface soil samples (0 to 0.5 ft below ground surface (bgs)) and 14 shallow soil samples (2 ft to 5 ft bgs) were collected at the Site. Deeper samples were also collected as part of the RI but were not evaluated as part of this SLERA since ecological receptors are most likely not in contact with soils deeper than 5 ft bgs. Five surface water samples were collected in the drainage ditch adjacent to the Site. Two of the samples (SW-4 and SW-5) were collected

upstream of the Site while samples SW-1, SW-2, and SW-3 were collected immediately west of the R&H Oil portion of the Site prior to the ditch crossing under the railroad tracks at the culvert.

Based on informal comments received from EPA on September 5, 2012 (EPA, 2012) on the Draft SLERA (PBW, 2012) as provided in Appendix A and subsequent discussions between EPA, TCEQ, and PBW on behalf of the R&H Oil Company Site Group, three additional surface soil samples were collected at the western fenceline to support the SLERA and provide additional information that the urban drainage ditch to the west of the Site has not been impacted by potential historical surface runoff from the Site. The data for these samples are provided in Tables 1, 2, 3 and 5, and sample locations are shown on Figure 4 (SB-1, SB-2, and SB-3).

2.3 POTENTIALLY COMPLETE EXPOSURE PATHWAYS AND PRELIMINARY CONCEPTUAL SITE MODEL

Based on the Site history and the potential exposure and receptors most likely to occur at the Site, the SLERA is focused on the surface and shallow soils at the Site as well as surface water in the nearby drainage ditch. The identification of potentially complete exposure pathways is performed to evaluate the exposure potential and the risk of effects on ecosystem components and helps guide the risk assessment. In order for an exposure pathway to be considered complete, it must contain 1) a source of the compound; 2) a mechanism for transport of the compound from the source (this is not always true with direct contact pathways); 3) a potential point of contact between the receptor and the compound; and 4) a route of exposure from the contact point to the receptor. Exposure pathways are considered complete only if all of the components are present. If one or more of the criteria are not met, there is no mechanism for exposure of the receptor to the compound. Potentially complete pathways evaluated in the SLERA are shown in the conceptual site model (Figure 6).

The potentially complete exposure pathways for the Site include direct contact with surface and shallow soil on-site, and surface water at the drainage ditch. (Surface water in the drainage ditch was evaluated although as discussed in previous sections, there is no evidence to suggest that the Site-related constituents have migrated to the ditch.) In general, biota can be exposed to chemical stressors through direct exposure to abiotic media (soil or surface water), or through ingestion of forage or prey that have accumulated compounds from these media. Exposure routes are the mechanisms by which a chemical may enter a receptor's body. Possible exposure routes include

1) absorption across external body surfaces such as cell membranes, skin, integument, or cuticle from the soil or water; and 2) ingestion of food and incidental ingestion of soil or surface water along with food. Potential impacts from these complete exposure pathways are the focus of the SLERA.

2.4 THREATENED AND ENDANGERED SPECIES

There are no known occurrences of federal or state listed threatened or endangered plant or animal species, or natural communities within the Site boundaries, and none have been observed at the Site during numerous site visits and sampling events. Given the urban setting and absence of attractive habitat on the Site, it is unlikely that the Site is used by resident wildlife, including common, threatened, or endangered species. According to the Zone 4 Ecological Risk Assessment Report for the Former Kelly AFB (CH2M-Hill, 2004), there are no known occurrences of federal or state listed threatened, or endangered plant or animal species in the vicinity. A letter from the US Fish and Wildlife Service supporting this conclusion for the Kelly AFB site is provided in Appendix C.

2.5 ASSESSMENT AND MEASUREMENT ENDPOINTS

Assessment endpoints (AE) are explicit expressions of the ecological resource to be protected for a given receptor of potential concern (EPA, 1997). AEs define both the valued ecological entity at the site and the characteristic of the entity to protect, such as individual survival, population success, etc. Identification of assessment endpoints is necessary to focus the SLERA on relevant receptors rather than attempting to evaluate risks to all potentially affected ecological receptors. Typically each AE includes a guild or a functional group within an ecosystem rather than one particular species.

EPA defines measurement endpoints (MEs) as “a measureable ecological characteristic that is related to the valued characteristic chosen as the AE and is a measure of biological effects (e.g., mortality, reproduction, growth)” (EPA, 1997). As such, MEs comprise the specific metrics measured to protect the assessment endpoints and can include a measure of exposure or effect and are frequently quantified observations that can be compared to a control to predict adverse responses to site-specific COPEC concentrations.

Several of the metals measured in Site soil (i.e., chromium, copper, lead, mercury, nickel, selenium, and zinc) are considered to be bioaccumulative by the Texas Commission on Environmental Quality (TCEQ) (TCEQ, 2001 and 2006), however, potential impacts to upper trophic levels were not evaluated due to the lack of habitat that would support sustained foraging and prey consumption. Assessment and measurement endpoints are discussed for each habitat and receptor group in the subsections below.

2.5.1 Terrestrial Assessment Endpoints

The general absence or low quality of terrestrial habitat at the Site reduces the environmental value and excludes it from being classified as a significant environmental resource. Therefore, no AEs were developed for soil invertebrates or plants but rather the AEs focus on higher level organisms such as mammalian and avian herbivores, omnivores or carnivores that may use the Site infrequently. Note that soil invertebrate and plant screening values were used in this SLERA for conservatism in the screening process. The environmental value of this area is related to its ability to provide intermittent support to mammalian and avian receptors over a short exposure duration since the Site is not conducive to chronic use and habitation. As such, the terrestrial assessment endpoint for the Site includes:

- Mammalian and avian survival following episodic use of the Site is the value to be preserved in the terrestrial ecosystem.

2.5.2 Aquatic Habitat Assessment Endpoints

As previously noted in the approved RI/FS Work Plan, the lack of true aquatic habitat, sediment or wetlands in the drainage ditch near the Site reduces the environmental value and excludes it from being classified as a significant environmental resource. It was established in the approved Work Plan (PBW, 2010a) that "true" sediment is not present in the drainage ditch given the ephemeral nature of the ditch. Therefore, an AE for sediment was not developed in the SLERA.

Acute water quality standards were included as an AE to evaluate potential impacts to aquatic life that may be present in surface water episodically; the acute values reflect the intermittent nature of the ditch and the potentially poor water quality that flows through this urban drainage. The environmental value of the surface water in this area was also evaluated based on its ability to

support wildlife over short exposure duration since chronic use and habitation are unlikely and not supported by the habitat quality at the Site. The AEs for surface water include:

- Aquatic life survival following episodic use of the surface water in the drainage ditch is the value to be preserved in the ditch.
- Mammalian and avian survival following episodic exposure to surface water in the ditch is the value to be preserved in the ditch.

2.5.3 Measurement Endpoints

The MEs for the Site are the measurements of spatial distribution of chemical concentrations in soil and surface water to assess acute exposure concentrations for potentially exposed receptors. Tables 8 and 9 summarize the compounds that were measured above their detection limits and identify the number of samples that exceed the chronic screening level for that compound. Maximum soil concentrations of chemicals measured in environmental media were compared to ecological benchmarks for the purposes of the screening-level problem formulation and ecological effects characterization (Step 1) of the SLERA. Those compounds with measured concentrations that exceeded mammalian and avian benchmarks based on chronic exposure (even though this is not a realistic exposure scenario) were then evaluated for the potential to be acutely toxic. This step was done to eliminate the majority of measured compounds since soil screening levels for acute toxicity are not readily available.

Since water in the ditch is ephemeral and the ditch does not represent consistent aquatic habitat, the surface water samples were evaluated by comparing maximum measured surface water concentrations against screening criteria for wildlife receptors (Sample, 1996). These criteria were developed to represent a level of no toxicity for the most sensitive mammalian or avian species following exposure to surface water via daily water consumption. It should be noted that given the ephemeral nature of surface water in the ditch, it is unlikely that an avian or mammalian receptor would ingest surface water over an extended period similar to the one modeled for the benchmark value calculation. In addition, surface water concentrations were also compared to acute aquatic life water quality criteria to evaluate potential impacts to aquatic life in the ditch. Table 10 summarizes the compounds that were measured above their detection limits in surface water and identifies the number of samples that exceed the screening levels for that compound.

3.0 SCREENING-LEVEL PRELIMINARY EXPOSURE ESTIMATE AND HAZARD QUOTIENT CALCULATION (STEP 2)

The screening-level exposure and risk calculation description presented in this section of the SLERA corresponds to Step 2 of the EPA guidance (EPA, 1997). Step 2 includes a quantitative assessment of potential ecotoxicity and the result of Step 2 is a decision on whether additional ecological risk evaluation is necessary.

This section describes the ecological benchmarks used to evaluate the data, and provides a summary of the comparison between Site data and the benchmarks. The benchmarks were chosen to conservatively represent the assessment endpoints since they are generally protective of the most relevant or sensitive endpoint for a variety of species. The chemicals with no ecological benchmarks are discussed in the uncertainty section (Section 4.0).

In addition, polynuclear aromatic hydrocarbons (PAHs) were evaluated as individual compounds, and grouped as high-molecular weight (HPAH) or low-molecular weight (LPAH) as defined by TCEQ in Box 3-6 of the TCEQ ecological risk guidance (TCEQ, 2001). It should be noted; however, if an individual PAH was not measured above the detection limit in any samples for that media, it was not included in the total HPAH or LPAH estimate.

Soil and surface water sample data were compared to ecological soil screening values as shown in Tables 2 through 7 for all analytes, while Tables 8, 9 and 10 provide all compounds measured in at least one sample. These screening values were obtained from various sources which were identified in the approved RI Work Plan (PBW, 2010a) and subsequent discussions with EPA and TCEQ.

3.1 RECEPTORS OF POTENTIAL CONCERN

Several representative groups of wildlife were identified as receptors of potential concern (ROPCs) for use in the SLERA. Each receptor represents a terrestrial or aquatic community of species or group of species (i.e., feeding guild) with similar habitat use and feeding habits that could potentially contact the media of concern in the low-quality habitats at the Site.

3.1.1 Terrestrial Receptors

- Mammalian and Avian Receptors. Due to the amount of industrial activities previously conducted at the Site, and the current Site maintenance program, the areas of quality terrestrial habitat at the Site are limited. A general avian and mammalian carnivore, herbivore and insectivore were chosen to represent this class of species that may infrequently visit the Site.

3.1.2 Aquatic Receptors

- Mammalian and Avian Surface Water Consumers. Birds and small mammals, such as rodents, that may use the occasional surface water present in the drainage ditch were chosen to represent the most likely exposed species for surface water. The surface water, when present, could potentially be used as a drinking water source by mammals and birds that are tolerant of urban environments.

- Aquatic Life. Aquatic receptors were evaluated on an intermittent (or acute) basis since the ephemeral nature of the surface water prevents it from providing consistent habitat to support a resident aquatic population (i.e., there is no chronic exposure for aquatic life). The aquatic life surface water risk-based exposure limits (dated January 19, 2011) are considered Applicable or Relevant and Appropriate Requirements (ARARs) because these screening values are published under 30 TAC 307.

3.2 SCREENING-LEVEL COMPARISONS TO BENCHMARKS

Potential exposure of ecological receptors to COPECs is generally quantified in the exposure analysis. Since the potential for exposure to COPECs at the Site is limited based on the low-quality habitat, intake (or dose) has not been quantified. Instead, a comparison of maximum site concentrations to screening levels was conducted. These screening levels were described previously and are summarized by constituent in Tables 2 through 7. Table 11 summarizes all compounds by media with at least one exceedance of a screening level.

In general, COPEC concentrations observed in surface and shallow soils at the Site and surface water samples from the adjacent drainage ditch were very low. Tables 8 and 9 provide summary

statistics for all compounds measured in surface and shallow soil. The basic unit of exposure is the exposure point concentration (EPC), defined as the concentration of a chemical in a specific environmental medium at the point of contact for a receptor. The maximum detected concentration was used in the initial screening comparison, while the 95% UCL was used in the SLERA to calculate hazard quotients (HQs) in the acute screening level comparison.

Appendix D provides the statistical calculations for these data. The EPA's ProUCL Version 4.1 software program (EPA, 2010) was used to test the distributions of the data for each compound and dataset and calculate parametric, and distribution-free (i.e., nonparametric) 95% UCL concentrations and summary statistics from data sets including non-detect concentration values.

If a soil COPEC was determined to exceed the chronic benchmark, the COPEC was evaluated using acute screening criteria (Section 3.2.2). This additional step was unnecessary for surface water since the screening level used for aquatic life was an acute value and none of the measured concentrations exceeded the chronic wildlife surface water screening levels shown on Table 7.

3.2.1 Initial Screening Comparison

- Surface Soil and Shallow Soil. Chromium, copper, lead, manganese, mercury, vanadium, and zinc were measured in at least one sample above their respective screening level as shown in Table 2 and further evaluated in Section 3.2.2. It should be noted that the screening values are based on chronic soil exposure to plants, soil invertebrates, mammalian and avian receptors. Although screening values for avian receptors were compared to shallow soil concentrations, it is unlikely that ecological receptors would be exposed to soils at that depth. However unlikely, this comparison was conservatively conducted in the SLERA.

  Several VOCs and SVOCs were measured at low levels in surface and shallow soil; however, none were measured in excess of their screening criteria when screening levels were available (Tables 3 through 6). PAHs were measured in several surface soil samples in excess of the screening criteria for HPAH compounds but not for LPAHs.

  It should be noted that there are three screening levels for both mammalian and avian receptors representing an herbivore, insectivore, and carnivore. For both mammalian and

avian receptors, the insectivore-based chronic screening level was the lowest value available and was the value used in this initial screening comparison. For copper, lead, vanadium and zinc, the screening levels for the herbivore and carnivore were generally much higher.

- Surface Water in Drainage Ditch. Several inorganic compounds were measured above their detection limits in the surface water samples from the drainage ditch but none were measured at concentrations exceeding the Freshwater Acute Screening Level or the Wildlife Screening Values. Acetone and dibenzofuran were measured at estimated (J flagged) concentrations. It should be noted that acetone is a common laboratory contaminant. The measured acetone concentrations in all five samples (upstream of the Site as well as adjacent to the Site) were below the screening levels. Chromium, copper, lead, nickel and zinc risk based acute screening levels were adjusted using the hardness from the nearest classified segment (1911) on the San Antonio River. No additional evaluation is necessary for surface water from the drainage ditch since no measured concentrations exceeded their respective initial screening levels.

- Consideration of Background Concentrations. Table 12 provides a summary of the plant, invertebrate, mammalian and avian chronic soil screening levels, the Texas-Specific Background Value and area-specific data collected for the Kelly Air Force Base Background Study (SAALC, 1999) concentrations, and minimum, maximum, average, and the 95th percentile upper confidence limit on the mean concentrations for chromium, copper, lead, manganese, mercury, vanadium, zinc and HPAHs. Chromium, manganese, and vanadium were not evaluated further in the SLERA because the maximum concentrations measured at the Site were below one or both background concentrations.

- Consideration of Upstream and Downstream Surface Water Samples. Table 13 provides the surface water sampling results for the two upstream sample locations and the three downstream sample locations in the drainage ditch. In general, the measured concentrations between the upstream samples were no different than the downstream samples and, as such, no trends were identifiable. This information provides evidence that site-related COPECs have not migrated from the Site to the ditch.

3.2.2 Acute Screening Levels for Soil

Toxicity Reference Values (TRVs) are the concentration of chemicals in an environmental media given assumed exposure conditions below which no significant ecological effects are anticipated. The chronic soil screening levels used in this SLERA were based on chronic screening level TRVs. The chronic soil screening level for a compound is generally the lowest value available for that compound and endpoint based on a set of criteria and assumptions developed by EPA (EPA, 2003b).

Because assumed chronic exposure for mammalian and avian receptors is unlikely for this Site given the lack of quality habitat, TRVs were developed for mammalian and avian receptors by calculating the geometric mean of reproduction, growth and survival endpoints for the acute studies (i.e., less than 15 days of exposure). Appendix E provides the relevant data for short-term (less than 15 days of exposure) studies where reproduction, growth, and survival endpoints were evaluated. It is believed that these short-term studies are more applicable to the limited or episodic nature of exposure by avian and mammalian receptors at the Site. Table 14 summarizes the geometric mean for TRVs developed from No Observable Adverse Effects Level (NOAEL) data and from Lowest Observable Adverse Effects Level (LOAEL) data. Using a NOAEL-based TRV provides an estimate below which it is unlikely that adverse effects would occur while using a LOAEL-based TRV provides an estimate of a point where some toxicity may be observed on reproduction, growth and/or survival.

Acute soil screening levels were calculated by multiplying the chronic soil screening level (SSL) to the acute TRV and dividing this value by the chronic TRV. This accounts for the exposure assumptions inherent in the derivation of the chronic soil screening level. Since the chronic soil screening level was used to represent the insectivore for both the avian and mammalian ROPC, the resulting acute soil screening level represents the insectivore as well. The calculated acute SSL are shown in Table 14 for both acute NOAEL and LOAEL endpoints.

Predictions of the likelihood for adverse effects, if any, are based on hazard quotients (HQs) (EPA, 1997). The HQs in this SLERA were calculated by dividing the 95% UCL for each compound by the acute soil screening level (inherent are the assumptions of exposure used by EPA, 2003b) for each of the receptors and endpoints.

NOAEL - HQ = 95%UCL/ NOAEL SSL, and
LOAEL - HQ = 95% UCL/LOAEL SSL

The HQ is typically estimated by dividing the estimated dose by the TRV but the above calculation is mathematically the same since the SSL includes the EPA's assumptions of foodchain uptake and dose as well as the TRV. The HQ value of 1 is considered the threshold for indicating that adverse effects may occur. An HQ less than a value of 1 (to one significant figure) indicates that adverse impacts to wildlife are considered unlikely (EPA, 1997). An HQ greater than 1 is an indication that further evaluation may be necessary to evaluate the potential for adverse impacts to wildlife. HQs equal to 1 using TRVs that are based on NOAELs should be considered protective. However, HQs equal to 1 using TRVs that represent LOAELs may indicate a potential for low-level effects.

Table 15 provides the HQs for acute risks to mammalian and avian receptors from episodic or infrequent exposure to soil at the Site. All LOAEL-based HQs were below 1 while some of the NOAEL-based HQs for lead and zinc were slightly above 1. This evaluation shows that COPECs present in soil at the Site do not pose an adverse acute risk to transient mammalian and avian receptors.

4.0 UNCERTAINTY ANALYSIS FOR STEPS 1 AND 2

This section describes the uncertainties associated with the methodology and results of the SLERA. Risk assessments (both ecological and human) necessarily require assumptions and extrapolations within each step of the analysis which can lead to uncertainty in predicted risks. These uncertainties are generally the result of limitations in the available scientific data used in the exposure and risk models as well as their applicability to the Site. Accordingly, the key assumptions and uncertainties are thought to have the greatest influence on the ecological risks predicted for the Site and, as such, they are presented with a qualitative description of how the uncertainty may affect the evaluation and conclusions. This provides the risk manager with the appropriate context for understanding the level of confidence with the risk assessment results.

There are two principle sources of uncertainty – those resulting from natural variability and those resulting from data limitations. Both types of uncertainty are discussed as they relate to the three major steps of the SLERA: exposure assessment, effects characterization, and risk characterization. The characterization of uncertainty is a component of the ERA process (EPA, 1997) and, as such, identifiable uncertainty and variability are described below.

4.1 EXPOSURE ANALYSIS UNCERTAINTY

This section primarily focuses on the uncertainties in the exposure analysis resulting from data limitations. There are three general categories of uncertainty that are discussed in this section: general exposure analysis uncertainties, receptor-specific uncertainties (i.e., uncertainties that are related to the receptors evaluated), and chemical specific uncertainties.

4.1.1 General Exposure Analysis Uncertainties

General exposure analysis uncertainties are those components of the exposure analysis that have not been or could not be well characterized for the assessment endpoints evaluated. Due to the conservative nature of the SLERA, it is believed that the overall impact of uncertainties related to the exposure analysis may result in an overestimate of risk.

Data collected at the Site satisfied the goals described in the Work Plan (PBW, 2010a) and, as will be described in the RI report, adequately characterized the nature and extent of chemicals of

potential concern at the Site. Overall, the data were determined to be of high quality. Data were collected and analyzed in accordance with approved procedures specified in the RI/FS Field Sampling Plan (PBW, 2010b) and were validated in accordance with approved validation procedures specified in the Quality Assurance Project Plan (QAPP) (PBW, 2010b). Very few of the data for any of the analytes were found to be unusable (ie., "R-flagged"). Some of the data are qualified (ie., "J-flagged") as estimated because the measured concentration is above the sample detection limit but below the sample quantitation limit and/or due to minor quality control deficiencies. According to the *Guidance for Data Useability in Risk Assessment (Part A)* (EPA, 1992), data that are qualified as estimated should be used for risk assessment purposes and, therefore, these data were used in the SLERA.

A point-by-point comparison was performed to evaluate localized effects for potential adverse chronic affects to mammalian and avian receptors as well as potential acute affects to surface water receptors. This results in a conservative evaluation that likely overestimates true risks to the episodic exposure likely represented by the conditions at the Site and in the ditch.

4.1.2 Receptor-Specific Uncertainties

Receptor-specific uncertainties include those parameters in the dose equation that have not been directly measured for receptors at the Site. The direct comparison of conservative screening levels for various potential receptors at the Site reduces the likelihood of underestimating risks. Additional uncertainty may have occurred due to the species chosen to represent a guild and potential differences in their exposure patterns. It is believed, however, that the species chosen as the ROPC in the evaluation is similar enough to other species within a guild so that all are protected in the risk assessment process. The lack of quality habitat reduces the significance of receptor-specific uncertainty since there are few receptors likely to be present at the Site. It is difficult to predict the impact this uncertainty may have on overall risk predictions and conclusions but it is believed that the evaluation was adequately conservative.

Amphibians and Reptiles – Because of the lack of sustainable aquatic habitat, it is unlikely that amphibians would be present at the Site. Reptiles, such as urban tolerant snakes, could be present on the Site. The assessment of reptiles and amphibians in an ecological risk assessment is significantly limited by the lack of technical information available on environmental exposures to these species and resulting toxicity. Studies that are available involve pesticide and other organic

compounds mainly involving crocodilians and turtles. Many of the experimental studies involve contamination of eggs to determine effects on embryo development. Much of the toxicity testing has been performed for pest control purposes for fumigants, sprays and foggers that have little relevance to environmental exposures (Fryday and Thompson, 2009). There is the possibility that the reptiles could be present in or around the Site, however, this assumption is speculative and based on the assessment of birds and mammals evaluated in the SLERA, risks would be expected to be minimal.

4.1.3 Chemical-Specific Uncertainties

Chemical-specific uncertainties are those factors that are assumed for specific chemicals and generally relate to the use of screening levels as well as fate and transport modeling parameters and assumptions. These uncertainties should be considered in weighing the importance of the predicted risks for that chemical. Given the simplistic nature of this evaluation and the lack of fate and transport modeling up the food chain, it is believed that there are few chemical-specific uncertainties as it relates to the exposure analysis in this SLERA.

4.2 EFFECTS CHARACTERIZATION UNCERTAINTY

The use of chemical-specific screening levels to assess potential risks, which was the basis for this SLERA because of the urban/industrial nature of the Site and lack of quality habitat, is inherently conservative given the nature of their derivation. The lack of screening values for certain COPECs (such as total petroleum hydrocarbons) imparts uncertainty on the evaluation although it is difficult to determine the significance of the uncertainty. It appears, however, that screening values were available for the more toxic (relatively) and prevalent compounds (both frequency and concentration) at the Site which serves to reduce the uncertainty.

Using toxicity data from short-term exposure studies to estimate acute TRVs for growth, reproduction and survival endpoints is a reasonable surrogate for evaluating the episodic exposure that may occur at the Site given the lack of quality habitat at the Site. Using both the NOAEL and LOAEL TRVs provide a range of toxicity that allows for greater understanding of the potential for toxic effects. The geometric mean estimated to represent the TRV is dependent on the various data points used in the calculation and uncertainty can be imparted when the results of the studies are highly variable or when there are limited studies/data for a given compound. It

was noted that there were few studies available to evaluate the acute toxicity to mammals for HPAHs, while there were no data available for avian receptors. There were numerous studies of acute exposure duration for copper, lead and zinc although the variability within the lead NOAELs and LOAELs provided for a fairly large range of data points.

4.2.1 Uncertainties with Plant Soil Screening Values

As shown on Tables 2, 11 and 16, there are detected concentrations that exceed the chronic plant benchmarks for lead, mercury and zinc. There are significant uncertainties associated with using these benchmark screening values to determine ecological risk, especially for mercury. Additional information for each of these metals is provided below:

Lead – The lead benchmark protective of the terrestrial plant community is from the EPA's *Soil Screening Levels for Lead* (EPA, 2005) and is a geometric mean of the maximum acceptable toxicant concentrations values for four test species (loblolly pine, red maple, clover and ryegrass) under various test conditions (pH and percent organic matter) and is equal to 120 mg/kg dry weight. The individual toxicity values ranged from 22 mg/kg for ryegrass to 316 mg/kg for clover. The EPA chose data from tests performed using soil conditions favoring high bioavailability or upland aerobic soils (low pH and organic matter). The preferred endpoint for plant was biomass production, as it is normally the most sensitive measurement. Other studies listed in EPA (2005) but not used in the development of the SSL list no-effect levels as high as 1,000 mg/kg and low-effect levels as low as 50 mg/kg. The variability of the data suggests toxicity to a plant community is difficult to assess based on studies using one plant species under controlled test conditions. The applicability of this benchmark concentration as protective of all terrestrial plants at the Site is highly uncertain and is most likely overly conservative.

Mercury – The plant benchmark for mercury of 0.3 mg/kg was taken from Efroymson (1997a). This document is a compilation of various studies with analysis provided on the toxicity studies used to develop the recommended soil benchmark. The confidence in the mercury plant benchmark is low because it is based on a secondary reference which did not provide sufficient detail for analysis. Efroymson (1997a) states: "there were no primary reference data describing toxicity of mercury to plants grown in soil. Kabata-Pendias and Pendias (1984) report unspecified toxic effects on plants grown in surface soil with the addition of 0.3 part per million (ppm) mercury." Efroymson (1997a) describes another study (Panda et al., 1992) which evaluated the phytotoxicity of mercury from the solid waste deposits of a chloralkali plant. After

exposure of barley to mercury waste for 7 days, seedling height was reduced by 19% at 64 ppm mercury in soil. Germination of barley was reduced by 20% at 103 ppm. The no-effect concentration was 34.9 ppm. Although Efroymson (1997a), and ultimately TCEQ (2006), recommended the 0.3 mg/kg value as the soil screening value for protection of plants in soil, this value is conservative and highly uncertain.

Zinc –The zinc benchmark protective of the terrestrial plant community is from the EPA's *Soil Screening Levels for Zinc* (EPA, 2007b) and is a geometric mean of the maximum acceptable toxicant concentrations values for three test species (soybean, oats and lettuce) under different test conditions (pH and percent organic matter) and is equal to 160 mg/kg dry weight. The individual toxicity values ranged from 143 mg/kg for oats to 173 mg/kg for lettuce. The preferred endpoint for plant was growth. Other studies listed in EPA (2007a) but not used in the development of the SSL list no-effect levels as high as 475 mg/kg and low-effect levels as low as 20 mg/kg. The variability of the data suggests toxicity to a plant community is difficult to assess based on studies using one plant species under controlled test conditions. The applicability of this benchmark concentration as protective of all terrestrial plants at the Site is highly uncertain and is most likely overly conservative.

4.2.2 Uncertainties with Invertebrate Soil Screening Values

As shown on Tables 2, 11 and 16, there are detected concentrations that exceed the chronic invertebrate benchmarks for mercury and zinc. There are significant uncertainties associated with using these values to determine ecological risk, especially for mercury. Additional information for each of these metals is provided below:

Mercury – The invertebrate benchmark for mercury of 0.1 mg/kg was taken from Efroymson (1997b). This document is a compilation of various studies with analysis provided on the toxicity studies used to develop the recommended soil benchmark. The confidence in the mercury invertebrate benchmark is low because it is based on limited data available for review. A safety factor of 5 was applied to the 0.5 ppm lowest effect concentration because it caused a 65% reduction in earthworm survival. Abbasi and Soni (1983) assessed the effect of mercury on survival and reproduction of the earthworm (*Octochaetus pattoni*). Survival and cocoon production were reduced 65% and 40% at 0.5 ppm mercury, the lowest concentration tested. Although Efroymson (1997b), and ultimately TCEQ (2006), recommended the 0.1 mg/kg value

as the soil screening value for protection of invertebrates in soil, this value is conservative and highly uncertain.

Zinc - The zinc benchmark protective of the terrestrial invertebrate community is from the EPA's *Soil Screening Levels for Zinc* (EPA, 2007b) and is a geometric mean of the maximum acceptable toxicant concentrations values for species of springtail (*Folsomia candida*) and multiple species of nematode under different test conditions (pH and percent organic matter) and is equal to 120 mg/kg dry weight. The individual toxicity values ranged from 35 mg/kg to 355 mg/kg. The preferred endpoints were reproduction and population. Other studies listed in EPA (2007a) but not used in the development of the SSL list no-effect levels between 533 mg/kg and 85 mg/kg. The variability of the data suggests toxicity to an invertebrate community is difficult to assess based on studies using invertebrate species under controlled test conditions. The applicability of the benchmark concentration of 120 mg/kg as protective of all terrestrial invertebrates at the Site is highly uncertain and is most likely overly conservative.

4.3 RISK CHARACTERIZATION UNCERTAINTY

This section discusses uncertainties related to the risk characterization and the methodology used to estimate risk. The most significant general uncertainty associated with risk characterization is how exposure to multiple chemicals was evaluated. Except for PAHs, which are discussed below, the measurement of the cumulative effects of multiple chemicals to the various receptors at the Site was not appropriate since these chemicals, for the most part, act via different mechanisms of toxicity. However, no evidence was found in the scientific literature to suggest that the toxicity of the compounds measured at the Site should be considered additive. Likewise, some toxic effects from metals are antagonistic but these effects were not considered either since the exact mechanism is not well understood toxicologically nor is there an accepted method for quantifying this type of interaction in the risk assessment.

For PAHs, potential effects were assumed to be additive and, as such, risks were estimated for total PAHs, LPAHs, HPAHs, and for individual PAH compounds as well. This multi-pronged evaluation increases the confidence in the risk predictions as it provides for several lines of evidence to draw conclusions.

Comparing maximum Site concentrations to properly-established screening levels represents a conservative approach that adequately accounts for the uncertainty that may have resulted in an underestimation of risk.

5.0 SUMMARY AND CONCLUSIONS

The SLERA is to be used to assess the need and, if required, the level of effort required to conduct a baseline ecological risk assessment, or to determine that no further action is necessary. The SLERA is also to be used to focus subsequent phases of the investigation by eliminating compounds from further evaluation (EPA, 1997). This section presents the summary and conclusions of the SLERA.

The Site area totals approximately six to seven acres and is located approximately five miles southwest of downtown San Antonio. Land use north and west of the Site is primarily commercial/industrial, including the former East Kelly Air Force Base (AFB) to the west, and multiple light industrial, auto salvage, repair, and/or service station facilities to the northeast and southwest. The Site is bordered to the north by an auto service center and to the west by Union Pacific Railroad railroad tracks and beyond the tracks and the auto service center are an auto repair and parts establishment and East Kelly AFB, respectively. Residential, commercial, and industrial development is present to the south and east, with Somerset Road directly adjacent to the Site to the east.

As described previously, the Site is an inactive industrial property in a heavily industrialized urban area and has managed vegetation, disturbed soil, and some impermeable and ecologically insignificant media (pavement, driveways, asphalt covering, buildings, and other concrete pads). The Site and adjacent areas do not provide unique habitat or foraging areas for wildlife species nor is the Site believed to be used for critical life stages. No significant ecological resources have been identified for the Site or adjacent properties. Based on these observations, the habitat present at the Site has been determined to be of low ecological quality.

Because of the low quality of habitat and surrounding urban/industrial land use, it is unlikely that there is chronic and consistent exposure to higher trophic level organisms at the Site. As such, the focus of this assessment was to evaluate the potential for episodic exposure to mammals and birds occasionally contacting surface and shallow soils at the Site and surface water in the nearby ditch. In addition, the potential for intermittent exposure to aquatic life receptors in the ditch surface water was also evaluated.

Per the RI/FS Work Plan and additional discussions with EPA and TCEQ, seventeen surface soil samples (0 to 0.5 ft below ground surface (bgs)) and 14 shallow soil samples (2 ft to 5 ft bgs) were collected at the Site. Deeper soil and groundwater samples were also collected as part of the RI but were not evaluated as part of this SLERA since ecological receptors are most likely not in contact with soils deeper than 5 ft bgs nor is it likely that they will contact groundwater at the Site. Five surface water samples were collected in the drainage ditch adjacent to the Site. Two of the samples (SW-4 and SW-5) were collected upstream of the Site while samples SW-1, SW-2, and SW-3 were collected immediately west of the R&H Oil portion of the Site prior to the ditch crossing under the railroad tracks at the culvert. Based on the data quality objectives identified in the RI/FS Work Plan, the nature and extent of chemicals of potential concern at the Site was defined.

5.1. POTENTIAL ECOLOGICAL RISKS ASSOCIATED WITH SOIL

Acute (episodic) exposure to mammalian and avian ROPCs to COPECs in surface and shallow soil was the AE identified for the surface soil and shallow soil at the Site since chronic exposure is unlikely. HQs were calculated for the most sensitive mammalian and avian receptor (i.e., insectivores) as shown in Table 15. Table 16 provides a summary of the soil risk assessment including summarizing the screening assessment, background evaluation and trophic assessment. All LOAEL-based acute SSLs and most NOAEL-based acute SSLs were below 1 using the 95% UCL concentration of COPECs for those compounds (copper, lead, zinc, and HPAHs) that were not screened out during the comparison to chronic SSLs. This suggests that COPECs measured in surface and shallow soil at the Site were below levels where acute toxicity might be observed. Therefore, it is unlikely that potential soil exposure at the Site would result in adverse ecological risks.

5.2. POTENTIAL ECOLOGICAL RISKS ASSOCIATED WITH SURFACE WATER

Based on the comparison to screening levels derived for mammals and avian receptors drinking surface water, which was the AE identified for the occasional surface water in the drainage ditch adjacent to the Site, concentrations of COPECs measured at the Site were below levels where toxicity might be observed. Therefore, adverse ecological risks to mammals and birds with potential surface water exposure in the ditch adjacent to the Site are unlikely. No compounds were measured in the ditch surface water at a level that exceeded the acute water quality criteria

for that compound. As such, it is unlikely that surface water occasionally present in the ditch results in an adverse impact to aquatic life.

5.3 SCIENTIFIC MANAGEMENT DECISION POINT

Consistent with EPA guidance (EPA, 1997), the SLERA concludes with a Scientific Management Data Point with four possible decisions for this point:

1. There is adequate information to conclude that ecological risks are negligible and therefore there is no need for remediation on the basis of ecological risk;
2. The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue to Step 3;
3. The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted (i.e., continue to Step 3); or
4. There is adequate information to support a risk management decision such as taking action to eliminate an identified exposure pathway.

The SLERA indicates that there is adequate information to conclude that ecological risks associated with the Site are negligible for the exposure and receptors evaluated in the SLERA. As such, there is no need to evaluate ecological risks further or proceed to Steps 3 through 8 of the ERA process. Likewise, it is unnecessary to develop remedial action objectives to protect ecological receptors at this Site because adverse ecological risks are unlikely.

6.0 REFERENCES

Abbasi, SA and R. Soni, 1983. "Stress-induced enhancement of reproduction in earthwork *Octochaetus pattoni* exposed to chromium (vi) and mercury (ii) – implications in environmental management." *International Journal of Environmental Studies*, 22:1, 43-47.

CH2M-Hill, 2004. Final Zone 4 Ecological Risk Assessment Report – United States Air Force Installation Restoration Program, Former Kelly Air Force Base, San Antonio, Texas. Prepared for Air Force Real Property Agency. March.

City of San Antonio (CSA), 2009. Ordinance 2009-06-18-0539. Amending the Official Zoning Map of the City of San Antonio by Amending Chapter 35, Unified Development Code, Section 35-304, of the City Code of San Antonio, Texas by Changing the Zoning District Boundary of Certain Properties. Case No. Z2009081 CD. SG: 06-18-09, Item No. Z-5. Amended.

City of San Antonio (CSA), 2012. Unified Development Code Section 35-310.12. Codified through Ordinance 2012-11-08-0877, effective November 8, 2012

City of San Antonio Development Services Department (CSADSD), 2013. Internet Mapping Application System Maps. July.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten, 1997a. *Toxicological benchmarks for screening contaminants of potential concern for effects on terrestrial plants: 1997 revision*. ES/ER/TM-85/R3. Oak Ridge National Laboratories, Oak Ridge, TN.

Efroymson, R.A., M.E. Will, and G.W. Suter II, 1997b. *Toxicological benchmarks for contaminants of potential concern for effects on soil and litter invertebrates and heterotrophic process: 1997 revision*. ES/ER/TM-126/R2. Oak Ridge National Laboratories, Oak Ridge, TN.

Fryday, S. and H. Thompson, 2009. *Compared Toxicity of Chemicals to Reptiles and Other Vertebrates.* Final Report. The Food and Environment Research Agency. UK. August.

Kabata-Pendias, A. and H. Pendias, 1984. *Trace Elements in Soils and Plants*. CRC Press, Inc. Boca Raton, Florida.

Panda, K.K.M. Lenka, and B.B. Panda, 1992. Monitoring and assessment of mercury pollution in the vicinity of chlorakali plant II. Plant-availability, tissue-concentration and genotoxicity of mercury from agricultural soil contaminated with solid waste assessed in barley (*Hordeum vulgare L.) Environ. Pollut*. 76:33-42.

Pastor, Behling & Wheeler, LLC (PBW), 2010a. *Remedial Investigation/Feasibility Study (RI/FS) Work Plan*, R&H Oil/Tropicana Energy Site, San Antonio, Texas. September 24.

Pastor, Behling & Wheeler, LLC (PBW), 2010b. *Final Sampling and Analysis Plan – Quality Assurance Project Plan*, R&H Oil/Tropicana Energy Site, San Antonio, Texas. September 24.

Pastor, Behling & Wheeler, LLC (PBW), 2012. *Draft Screening-Level Ecological Risk Assessment (SLERA)*, R&H Oil/Tropicana Energy Site, San Antonio, Texas. August 1.

Roy F. Weston, Inc. (Weston), 2002a. Removal Report for R&H Oil Company, San Antonio, Bexar County, Texas. January.

Roy F. Weston, Inc. (Weston), 2002b. Removal Report for Tropicana Energy Company, San Antonio, Bexar County, Texas. January.

Sample, BE, DM Opresko, and GW Suter II, 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision*. ES/ER/TM-86./R3 Prepared by the Oak Ridge National Laboratory. Oak Ridge, TN. June.

San Antonio Air Logistics Center (SAALC), 1999. Final Report – Addendum to Final Background Levels of Inorganics in soils at Kelly AFB. October.

Texas Commission on Environmental Quality (TCEQ), 2001. *Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas*. RG-263 (Revised). Toxicology and Risk Assessment Section. December.

Texas Commission on Environmental Quality (TCEQ), 2006. *Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas.* RG-263 (Revised). Remediation Division. January.

United States Environmental Protection Agency (EPA), 1992. *Guidance for Data Usability in Risk Assessment (Part A).* Final. Office of Emergency Planning and Remedial Response. 9285.7-09A. April.

United States Environmental Protection Agency (EPA), 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final*. Office of Solid Waste and Emergency Response. OSWER 9285.7-25. EPA 540-R-97-006. June.

United States Environment Protection Agency (EPA), 2003a. R&H Oil/Tropicana Site Update Presentation. February 5.

United States Environment Protection Agency (EPA), 2003b. *Guidance for Developing Ecological Soil Screening Levels*. OSWER Drective 9287.7-55. November.

United States Environmental Protection Agency (EPA), 2005. *Ecological Soil Screening Levels for Lead.* Interim Final. OSWER Directive 9285.7-70. March.

United States Environmental Protection Agency (EPA), 2007a. *Ecological Soil Screening Levels for Copper*. Interim Final. OSWER Directive 9285.7-68. February.

United States Environmental Protection Agency (EPA), 2007b. *Ecological Soil Screening Levels for Zinc.* Interim Final. OSWER Directive 9285.7-73. June.

United States Environmental Protection Agency (EPA), 2007c. *Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs).* Interim Final. OSWER Directive 9285.7-78. June.

United States Environmental Protection Agency (EPA). 2010. Software for Calculating Upper Confidence Limits, ProUCL Version 4.1. May.

United States Environmental Protection Agency (EPA), 2012. *EPA September 5, 2012 Comments on R&H Oil/Tropicana Energy Screening Level Ecological Risk Assessment (SLERA) Submitted August 1, 2012.* Informal Submission via email from Chris Villarreal of EPA to Tim Nickels of PBW. September 5, 2012.

TABLES

TABLE 1
SOIL SAMPLING RESULTS: TOTAL PETROLEUM HYDROCARBONS
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Sample Area:	R&H Oil West Side						R&H Oil East Side						Tropicana				
Sample Location:	MW-12	MW-14	NMW-3	SB-1	SB-2	SB-3	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																	
Sample Interval (ft bgs):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
C6-C12	<5	<4.7	<5	<4.5	<15	<13	<97	<28	<49	<5.3	<47	<4.7	<4.8	<4.7	<5.4	<5	<5.1
>C12-C28	**500**	<6.1	<6.4	**130**	**2,400**	**1,400**	**5,500**	**3,000**	**4,100**	**130**	**5,500**	**330**	<6.2	<6.1	<7	<6.5	<6.7
>C28-C35	**870**	<9.6	<10	**380**	**2,400**	**1,700**	**6,500**	**2,600**	**3,900**	**87**	**4,600**	**340**	<9.9	<9.7	<11	<10	<11
C6-C35 (Total)	**1,400**	<9.6	<10	**510**	**4,800**	**3,000**	**12,000**	**5,600 J**	**8,000 J**	**210 J**	**10,000**	**680**	<9.9	<9.7	<11	<10	<11
Shallow Soil																	
Sample Interval (ft bgs):	4-5	3-5	3-4	-	-	-	3-4	2-3	2-3	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
C6-C12	<5.4	<6.3	<5.9	NS	NS	NS	<59	<660	<64	<750	<61	<5.8	<5.4	<58	<5.3	<5.7	<5.3
>C12-C28	<7	<8.1	**640 J+**	NS	NS	NS	**4,000**	**48,000 J**	**5,400**	**70,000**	**3,200**	<7.5	<7.1	**3,600**	**390**	<7.4	<6.9
>C28-C35	<11	<13	**580 J+**	NS	NS	NS	**3,500**	**22,000 J**	**1,500**	**22,000**	<120	<12	<11	**1,800**	**170**	<12	<11
C6-C35 (Total)	<11	<13	**1,200 J**	NS	NS	NS	**7,500**	**70,000 J**	**6,800 J**	**92,000**	**3,200**	<12	<11	**5,400 J**	**560 J**	<12	<11

NOTES:
1. All units are mg/kg.
2. Samples analyzed by Texas TPH Method TX1005, aliphatic/aromatic fractionation by Method TX1006 not performed.
3. Extent Evaluation Values were not developed for TPH.
4. Detected compounds are presented in **bold** type.
5. < = Compound not detected at the indicated laboratory detection limit. J = Estimated value. J+ = Estimated value with a potential high bias.
6. bgs = Below ground surface. NS =Not sampled.

TABLE 2
SOIL SAMPLING RESULTS: METALS [(1)]
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Plant Soil Screening Level (mg/kg)[3,5]	Invertebrate Soil Screening Level (mg/kg)[3, 5]	Mammalian Soil Screening Level (mg/kg)[4,5]	Avian Soil Screening Level (mg/kg)[4,5]	Texas-Specific Background Value (mg/kg)	Kelly AFB Background Study (SAALC, 1999) (mg/kg)	R&H Oil West Side						R&H Oil East Side						Tropicana				
Sample Location:							MW-12	MW-14	NMW-3	SB-1	SB-2[6]	SB-3	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:							5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																							
Sample Interval (ft bgs):							0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Aluminum	NA	NA	NA	NA	30,000	NA	**8,400**	**620**	**720**	**9,600**	**9,300**	**8,200**	**6,300**	**4,800**	**5,300**	**14,000**	**960**	**1,500**	**5,300**	**950**	**10,000**	**5,100**	**10,000**
Arsenic	18	60	46	43	5.9	6.3	**4.8**	**0.51**	**0.77**	**4.1**	**7.9**	**6**	**4.3**	**3.8**	**5.6**	**5.8**	**1.4**	**4.3**	**2.8**	**1.2**	**5.2**	**2.7**	**4.5**
Barium	500	330	2,000	NA	300	150	**96**	**8.5**	**16**	**120**	**200**	**120**	**85**	**71**	**77**	**230**	**11**	**33**	**60**	**12**	**93**	**59**	**88**
Chromium	1	0.4	34	26	30	43	**16**	**2**	**1.9**	**13**	**17**	**12**	**9.6**	**15**	**11**	**12**	**2.7**	**6.7**	**6.6**	**1.8**	**13**	**8.7**	**20**
Cobalt	13	NA	230	120	7	9.9	**6**	**0.51**	**0.87**	**4**	**3.7**	**3.7**	**4.2**	**4.8**	**5.5**	**5.1**	**6.5**	**1.5**	**2.9**	**1.1**	**4.3**	**2.3**	**4.5**
Copper	70	80	49	28	15	30	**18**	**2.1**	**1.5**	**49 J**	**35 J**	**21 J**	**12**	**14**	**22**	**8.9**	**9.9**	**8.2**	**8.3**	**2.8**	**14**	**11**	**24**
Lead	120	1,700	56	11	15	33	**83**	**2.9**	**3.1**	**69**	**430**	**160**	**52**	**49**	**110**	**69**	**18**	**55**	**31**	**2.9**	**100**	**36**	**44**
Manganese	220	450	4,000	43,000	300	510	**170**	**28**	**90**	**270**	**190**	**220**	**170**	**120**	**280**	**260**	**33**	**110**	**220**	**45**	**240**	**160**	**230**
Mercury	0.3	0.1	NA	NA	0.04	NA	**0.22**	**0.0035**	**0.0037**	**0.098**	**0.37**	**0.27**	**0.08**	**0.15**	**0.055**	**0.024**	**0.018**	**0.03**	**0.051**	**0.0091**	**0.094**	**0.097**	**0.17**
Nickel	38	280	130	210	10	23	**7.6**	**0.99**	**1.4**	**8.3**	**10**	**8.4**	**8.4**	**6.4**	**8.5**	**8.6**	**3.3**	**3.1**	**6.5**	**3.1**	**8.5**	**6**	**17**
Selenium	0.52	4.1	0.63	1.2	0.3	NA	<0.28	<0.25	<0.27	<0.29	<0.34	<0.28	<0.26	<0.29	<0.27	<0.28	<0.26	<0.25	<0.27	<0.25	<0.28	<0.27	<0.27
Thallium	1	NA	NA	NA	NA	0.51	<0.3	<0.27	<0.29	<0.31	<0.36	<0.3	<0.28	<0.31	<0.29	<0.3	<0.28	<0.26	<0.29	<0.27	<0.3	<0.29	<0.29
Vanadium	2	NA	280	7.8	50	57	**17**	**3.3**	**3.1**	**16**	**20**	**20**	**18**	**12**	**16**	**25**	**5.6**	**9.3**	**13**	**5.6**	**19**	**13**	**20**
Zinc	160	120	79	46	30	73	**130**	**5**	**3.9**	**190**	**360**	**190**	**52**	**88**	**98**	**45**	**110**	**60**	**42**	**6.6**	**61**	**65**	**68**
Shallow Soil*																							
Sample Interval (ft bgs):							4-5	3-5	3-4	-	-	-	3-4	2-3	2-3	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
Aluminum	NA	NA	NA	NA	30,000	NA	**14,000**	**13,000**	**16,000**	NS	NS	NS	**16,000**	**14,000**	**16,000**	**2,200**	**13,000**	**17,000**	**12,000**	**17,000**	**16,000**	**16,000**	**12,000**
Arsenic	18	60	46	43	5.9	6.3	**3.6**	**3.8**	**4.3**	NS	NS	NS	**4.4**	**3.1**	**5.3**	**5.4**	**3.5**	**5.1**	**4**	**4.2**	**2.7**	**3.4**	**4.8**
Barium	500	330	2,000	NA	300	150	**130**	**100**	**92**	NS	NS	NS	**110**	**130**	**68**	**170**	**110**	**110**	**90**	**100**	**90**	**100**	**91**
Chromium	1	0.4	34	26	30	43	**12**	**11**	**14**	NS	NS	NS	**11**	**11**	**13**	**2**	**11**	**14**	**10**	**14**	**13**	**13**	**10**
Cobalt	13	NA	230	120	7	9.9	**4.9**	**5.3**	**5.1**	NS	NS	NS	**7.2**	**4.7**	**5.8**	**1.3**	**5.7**	**5.1**	**4.9**	**5.1**	**4.6**	**5.2**	**3.8**
Copper	70	80	49	28	15	30	**9.2**	**8.6**	**11**	NS	NS	NS	**9.9**	**8.5**	**9.4**	**18**	**8.6**	**9.1**	**9.1**	**12**	**12**	**9.2**	**11**
Lead	120	1,700	56	11	15	33	**13**	**11**	**44**	NS	NS	NS	**17**	**12**	**13**	**20**	**12**	**12**	**270**	**140**	**33**	**12**	**30**
Manganese	220	450	4,000	43,000	300	510	**320**	**390**	**250**	NS	NS	NS	**190**	**230**	**210**	**27**	**280**	**230**	**350**	**220**	**190**	**330**	**180**
Mercury	0.3	0.1	NA	NA	0.04	NA	**0.0067**	**0.0068**	**0.2**	NS	NS	NS	**0.013**	**0.0072**	**0.0083**	**0.017**	**0.0033**	**0.0061**	**0.0072**	**0.015**	**0.45**	**0.0026**	**0.031**
Nickel	38	280	130	210	10	23	**9**	**9.6**	**11**	NS	NS	NS	**12**	**12**	**11**	**6.1**	**9.4**	**11**	**9.5**	**11**	**14**	**10**	**8.9**
Selenium	0.52	4.1	0.63	1.2	0.3	NA	<0.29	<0.33	<0.32	NS	NS	NS	<0.33	<0.36	<0.34	0.71	<0.33	<0.32	<0.3	<0.31	<0.29	<0.31	<0.28
Thallium	1	NA	NA	NA	NA	0.51	<0.31	<0.36	<0.34	NS	NS	NS	<0.35	<0.38	<0.37	<0.43	<0.36	<0.34	<0.32	<0.33	<0.31	<0.33	<0.3
Vanadium	2	NA	280	7.8	50	57	**23**	**16**	**21**	NS	NS	NS	**18**	**24**	**26**	**4.2**	**17**	**24**	**36**	**21**	**23**	**25**	**31**
Zinc	160	120	79	46	30	73	**32**	**25**	**35**	NS	NS	NS	**60**	**30**	**30**	**8.3**	**30**	**30**	**23**	**40**	**110**	**30**	**31**

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Plant and Invertebrate Soil Screening Levels taken from EPA SSL documents and TCEQ (2006). EPA Eco SSL documents used primarily, followed by TCEQ (2006).
4. Mammalian and Avian Soil Screening Levels represent screening levels for chronic exposure to the most sensitive receptor in the class of receptor evaluated (EPA, 2003b).
5. Shading = Detected compound exceeds either of the screening levels.
   -- an ecological screening level is exceeded in the sample.
   -- both screening level and background are exceeded in the sample.
6. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. NA = Not applicable, no value provided. NS = Not sampled.
7. Re-analysis of this sample resulted in concentrations approximately 10 to 15 percent less than the original sample provided here. The results for the original sample was used in the SLERA, and the differences in concentrations are likely due to natural variability within a sample.

* It is unlikely that avian receptors at the Site would encounter shallow soil since it is from 2 to 5 ft. below ground surface.

TABLE 3
SURFACE SOIL SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Sample Area:					R&H Oil West Side						R&H Oil East Side						Tropicana				
Sample Location:	Plant Soil Screening Level (mg/kg)[3]	Invertebrate Soil Screening Level (mg/kg)[3]	Mammalian Soil Screening Level (mg/kg)[3]	Avian Soil Screening Level (mg/kg)[3]	MW-12	MW-14	NMW-3	SB-1	SB-2	SB-3	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:					5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																					
Sample Interval (ft bgs):					0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	<0.0016	<0.0015	<0.0015 J	<0.0027	<0.0026	<0.0022	<0.0026	<0.0014	<0.0016 J	<0.0023 J	<0.0023	<0.0017	<0.0028	<0.0016 J	<0.0018 J	<0.0021	<0.0014
1,1,1-Trichloroethane	NA	NA	NA	NA	<0.00086	<0.0008	<0.00079	<0.0014	<0.0014	<0.0012	<0.0014	<0.00073	<0.00084	<0.0012	<0.0012	<0.00088	<0.0015	<0.00084	<0.00094	<0.0011	<0.00072
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	0.001	<0.00094	<0.00093 J	<0.0017	<0.0016 J	<0.0014 J	<0.0016 J	<0.00085	<0.00098 J	<0.0014 J	<0.0014	<0.001 J	<0.0018	<0.00099 J	<0.0011 J	<0.0013	<0.00084
1,1,2-Trichloroethane	NA	NA	NA	NA	<0.00084	<0.00079	<0.00078 J	<0.0014	<0.0013	<0.0011	<0.0014	<0.00072	<0.00082 J	<0.0012 J	<0.0012	<0.00087	<0.0015	<0.00083 J	<0.00093 J	<0.0011	<0.00071
1,1-Dichloroethane	NA	NA	NA	NA	<0.001	<0.00094	<0.00093	<0.0017	<0.0016	<0.0014	<0.0016	<0.00085	<0.00098	<0.0014	<0.0014	<0.001	<0.0018	<0.00099	<0.0011	<0.0013	<0.00084
1,1-Dichloroethene	NA	NA	NA	NA	<0.0014	<0.0013	<0.0013	<0.0023	<0.0022	<0.0019	<0.0023	<0.0012	<0.0014	<0.002	<0.002	<0.0015	<0.0025	<0.0014	<0.0016	<0.0018	<0.0012
1,1-Dichloropropene	NA	NA	NA	NA	<0.00075	<0.0007	<0.00069 J	<0.0012	<0.0012	<0.001	<0.0012	<0.00064 J	<0.00073 J	<0.0011 J	<0.0011	0.00078	<0.0013	<0.00074 J	<0.00083 J	<0.00095	<0.00063
1,2,3-Trichloropropane	NA	NA	NA	NA	<0.0015 J	<0.0014	<0.0014	<0.0025	<0.0024 J	<0.0021 J	<0.0024 J	<0.0013	<0.0015	<0.0021	<0.0022	<0.0016 J	<0.0027	<0.0015	<0.0017	<0.0019	<0.0013
1,2,4-Trichlorobenzene	NA	20	NA	NA	<0.0023 J	<0.0021	<0.0021 J	<0.0038 J	<0.0036 J	<0.0031 J	<0.0037 J	<0.0019 J	<0.0022 J	<0.0032 J	<0.0032	<0.0024 J	<0.004	<0.0022 J	<0.0025 J	<0.0029	<0.0019
1,2,4-Trimethylbenzene	NA	NA	NA	NA	<0.0013	<0.001	<0.00098 J	<0.0018	<0.0017 J	<0.0014 J	<0.0017 J	<0.0009	<0.001 J	<0.0015 J	<0.0015	**0.0011 J**	<0.0019	<0.001 J	<0.0012 J	<0.0014	<0.00089
1,2-Dibromo-3-Chloropropane	NA	NA	NA	NA	<0.0028 J	<0.0026	<0.0026 J	<0.0046	<0.0045 J	<0.0038 J	<0.0045 J	<0.0024	<0.0028 J	<0.004 J	<0.004	<0.0029 J	<0.0049	<0.0028 J	<0.0031 J	<0.0036	<0.0024
1,2-Dibromoethane	NA	NA	NA	NA	<0.0012	<0.0011	<0.0011	<0.0019	<0.0019	<0.0016	<0.0019 J	<0.001	<0.0012	<0.0017	<0.0017	0.0012	<0.0021	<0.0012	<0.0013	<0.0015	<0.00099
1,2-Dichlorobenzene	NA	NA	NA	NA	<0.00093 J	<0.00087	<0.00085 J	<0.0015	<0.0015 J	<0.0013 J	<0.0015 J	<0.00078 J	<0.0009 J	<0.0013 J	<0.0013	<0.00096 J	<0.0016	<0.00091 J	<0.001 J	<0.0012	<0.00077
1,2-Dichloroethane	NA	NA	NA	NA	<0.001	<0.00098	<0.00096	<0.0017	<0.0016	<0.0014	<0.0017	<0.00088	<0.001	<0.0015	<0.0015	0.0011	<0.0018	<0.001	<0.0011	<0.0013	<0.00087
1,2-Dichloropropane	NA	700	NA	NA	<0.00082	<0.00077	<0.00076	<0.0014	<0.0013	<0.0011	<0.0013	<0.0007	<0.0008	<0.0012	<0.0012	0.00085	<0.0014	<0.00081	<0.0009	<0.001	<0.00069
1,3,5-Trimethylbenzene	NA	NA	NA	NA	<0.0019 J	<0.0017	<0.0017 J	<0.003	<0.0029 J	<0.0025 J	<0.003 J	<0.0016 J	<0.0018 J	<0.0026 J	<0.0026	<0.0019 J	<0.0032	<0.0018 J	<0.002 J	<0.0023	<0.0015
1,3-Dichlorobenzene	NA	NA	NA	NA	<0.00082 J	<0.00077	<0.00076 J	<0.0014	<0.0013 J	<0.0011 J	<0.0013 J	<0.0007 J	<0.0008 J	<0.0012 J	<0.0012	<0.00085 J	<0.0014	<0.00081 J	<0.0009 J	<0.001	<0.00069
1,3-Dichloropropane	NA	NA	NA	NA	<0.00073	<0.00068	<0.00067	<0.0012	<0.0011	<0.00099	<0.0012	<0.00062	<0.00071	<0.001	<0.001	0.00075	<0.0013	<0.00072	<0.0008	<0.00093	<0.00061
1,4-Dichlorobenzene	NA	NA	NA	NA	<0.00076 J	<0.00072	<0.0007 J	<0.0013	<0.0012 J	<0.001 J	<0.0012 J	<0.00065 J	<0.00075 J	<0.0011 J	<0.0011	<0.00079 J	<0.0013	<0.00075 J	<0.00084 J	<0.00097	<0.00064
2,2-Dichloropropane	NA	NA	NA	NA	<0.0021	<0.002	<0.0019	<0.0035 J	<0.0033 J	<0.0029 J	<0.0034	<0.0018	<0.0021	<0.003	<0.003	0.0022	<0.0037	<0.0021	<0.0023	<0.0027	<0.0018
2-Butanone (MEK)	NA	NA	NA	NA	<0.0022	<0.0021	<0.002	<0.0036	<0.0035	<0.003	<0.0035 J	<0.0019	<0.0021	<0.0031	<0.0031	0.0023	<0.0039	<0.0022	<0.0024	<0.0028	<0.0018
2-Chlorotoluene	NA	NA	NA	NA	<0.00079 J	<0.00074	<0.00072 J	<0.0013	<0.0012 J	<0.0011 J	<0.0013 J	<0.00067 J	<0.00077 J	<0.0011 J	<0.0011	<0.00081 J	<0.0014	<0.00078 J	<0.00086 J	<0.001	<0.00066
2-Hexanone	NA	NA	NA	NA	<0.0012	<0.0011	<0.0011	<0.0019	<0.0018	<0.0016	<0.0019 J	<0.00099	<0.0011	<0.0017	<0.0017 J	<0.0012 J	<0.002	<0.0012	<0.0013	<0.0015 J	<0.00098
4-Chlorotoluene	NA	NA	NA	NA	<0.00096 J	<0.0009	<0.00088 J	<0.0016	<0.0015 J	<0.0013 J	<0.0015 J	<0.00081 J	<0.00094 J	<0.0014 J	<0.0014	<0.00099 J	<0.0017	<0.00095 J	<0.0011 J	<0.0012	<0.0008
4-Isopropyltoluene	NA	NA	NA	NA	<0.0012 J	<0.0011	<0.0011 J	<0.0019	<0.0019 J	<0.0016 J	<0.0019 J	<0.001 J	<0.0012 J	<0.0017 J	<0.0017	<0.0012 J	**0.0079 J**	<0.0012 J	<0.0013 J	<0.0015	**0.001 J**
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	<0.0017	<0.0016	<0.0016	<0.0028	<0.0027	<0.0023	**0.004 J**	<0.0014	<0.0017	<0.0024	<0.0024 J	<0.0018 J	<0.003	<0.0017	<0.0019	<0.0022 J	<0.0014
Acetone	NA	NA	NA	NA	**0.074 J+**	**0.017 J-**	<0.0018	**0.086 J-**	**0.098 J-**	**0.062 J-**	**0.14 J-**	**0.11**	**0.1**	**0.029**	<0.0027	**0.059**	**0.11 J-**	<0.0019	<0.0021	**0.19**	**0.034 J-**
Benzene	NA	NA	NA	NA	**0.0016 J**	<0.00068	<0.0012	**0.002 J**	**0.0015 J**	**0.0016 J**	**0.0021 J**	**0.00062 J**	<0.0022	<0.0025	**0.0019 J**	**0.0026 J**	**0.0019 J**	<0.0014	<0.0016	**0.0013 J**	**0.00081 J**
Bromobenzene	NA	NA	NA	NA	<0.0011 J	<0.0011	<0.0011 J	<0.0019	<0.0018 J	<0.0016 J	<0.0018 J	<0.00097 J	<0.0011 J	<0.0016 J	<0.0016	<0.0012 J	<0.002	<0.0011 J	<0.0013 J	<0.0015	<0.00096
Bromodichloromethane	NA	NA	NA	NA	<0.00076	<0.00072	<0.0007	<0.0013	<0.0012	<0.001	<0.0012	<0.00065	<0.00075	<0.0011	<0.0011	0.00079	<0.0013	<0.00075	<0.00084	<0.00097	<0.00064
Bromoform	NA	NA	NA	NA	<0.0016 J	<0.0015	<0.0015 J	<0.0026	<0.0025 J	<0.0022 J	<0.0025 J	<0.0013 J	<0.0015 J	<0.0022 J	<0.0023	<0.0016 J	<0.0028	<0.0016 J	<0.0017 J	<0.002	<0.0013
Bromomethane	NA	NA	NA	NA	<0.00096	<0.0009	<0.00088	<0.0016 J	<0.0015 J	<0.0013 J	<0.0015	<0.00081	<0.00094	<0.0014	<0.0014	0.00099	<0.0017	<0.00095	<0.0011	<0.0012	<0.0008
Carbon disulfide	NA	NA	NA	NA	<0.00064	<0.0006	<0.00059	<0.001 J	<0.001 J	<0.00086 J	<0.001	<0.00054	<0.00062	<0.0009	<0.00091	0.00066	<0.0011	<0.00063	<0.0007	<0.00081	<0.00053
Carbon tetrachloride	NA	NA	NA	NA	<0.0013	<0.0012	<0.0012 J	<0.0022	<0.0021	<0.0018	<0.0021	<0.0011 J	<0.0013 J	<0.0019 J	<0.0019	0.0013	<0.0023	<0.0013 J	<0.0014 J	<0.0017	<0.0011
Chlorobenzene	NA	40	NA	NA	<0.0011	<0.001	<0.001 J	<0.0018	<0.0018	<0.0015	<0.0018	<0.00094	<0.0011 J	<0.0016 J	<0.0016	0.0011	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00093
Chloroethane	NA	NA	NA	NA	<0.0016	<0.0015	<0.0015	<0.0027	<0.0026	<0.0022	<0.0026	<0.0014	<0.0016	<0.0023	<0.0023	0.0017	<0.0028	<0.0016	<0.0018	<0.0021	<0.0014
Chloroform	NA	NA	NA	NA	<0.00076	<0.00072	<0.0007	<0.002	<0.0019	<0.0018	<0.0012	<0.00065	<0.00075	<0.0011	<0.0011	0.00079	<0.0013	<0.00075	<0.00084	<0.00097	<0.00064
Chloromethane	NA	NA	NA	NA	<0.0019 J	<0.0018	<0.0018 J	<0.0032 J	<0.003 J	<0.0026 J	<0.0031 J	<0.0016 J	<0.0019 J	<0.0027 J	<0.0027 J	<0.002 J	<0.0034 J	<0.0019 J	<0.0021 J	<0.0024 J	<0.0016 J
cis-1,2-Dichloroethene	NA	NA	NA	NA	<0.00096	<0.0009	<0.00088	<0.0016	<0.0015	<0.0013	<0.0015	<0.00081	<0.00094	<0.0014	<0.0014	0.00099	<0.0017	<0.00095	<0.0011	<0.0012	<0.0008
cis-1,3-Dichloropropene	NA	NA	NA	NA	<0.00062	<0.00059	<0.00058	<0.001	<0.00099	<0.00085	<0.001	<0.00053	<0.00061	<0.00089	<0.00089	0.00065	<0.0011	<0.00062	<0.00069	<0.00079	<0.00052
Dibromochloromethane	NA	NA	NA	NA	<0.0011	<0.001	<0.001 J	<0.0018	<0.0017	<0.0015	<0.0017	<0.00092	<0.0011 J	<0.0015 J	<0.0015	0.0011	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00091
Dibromomethane	NA	NA	NA	NA	<0.00087	<0.00081	<0.0008	<0.0014	<0.0014	<0.0012	<0.0014	<0.00074	<0.00085	<0.0012	<0.0012	0.0009	<0.0015	<0.00086	<0.00095	<0.0011	<0.00073
Dichlorodifluoromethane	NA	NA	NA	NA	<0.0018 J	<0.0017 J	<0.0016 J	<0.0029 J	<0.0028 J	<0.0024 J	<0.0029 J	<0.0015 J	<0.0017 J	<0.0025 J	<0.0025	0.0018	<0.0031 J	<0.0018 J	<0.002 J	<0.0023	<0.0015 J
Ethylbenzene	NA	NA	NA	NA	**0.0016 J**	<0.0011	<0.0011 J	<0.0019	<0.0019	<0.0016	**0.0027 J**	<0.001	<0.0012 J	<0.0017 J	<0.0017	**0.002 J**	<0.0021	<0.0012 J	<0.0013 J	<0.0015	<0.00099
Hexachlorobutadiene	NA	NA	NA	NA	<0.0013 J	<0.0012	<0.0012 J	<0.0022 J	<0.0021 J	<0.0018 J	<0.0021 J	<0.0011 J	<0.0013 J	<0.0019 J	<0.0019	<0.0013 J	<0.0023	<0.0013 J	<0.0014 J	<0.0017	<0.0011
Iodomethane	NA	NA	NA	NA	<0.0029	<0.0027	<0.0027 J	<0.0048	<0.0046	<0.0039	<0.0046	<0.0025 J	<0.0028 J	<0.0041 J	<0.0041	0.003	<0.0051	<0.0029 J	<0.0032 J	<0.0037	<0.0024
Isopropylbenzene	NA	NA	NA	NA	<0.0011 J	<0.001	<0.00098	<0.0018	<0.0017 J	<0.0014 J	<0.0017 J	<0.0009 J	<0.001	<0.0015	<0.0015	<0.0011 J	<0.0019	<0.001	<0.0012	<0.0014	<0.00089
Methyl tert-butyl ether	NA	NA	NA	NA	<0.0021	<0.002 J	<0.0019	<0.0035	<0.0033	<0.0029	<0.0034 J	<0.0018	<0.0021	<0.003	<0.003	0.0022	<0.0037 J	<0.0021	<0.0023	<0.0027	<0.0018 J
Methylene Chloride	NA	NA	NA	NA	<0.0025	<0.0024	<0.0023	<0.0042	<0.004	<0.0034	<0.0041	<0.0021	<0.0025	<0.0036	**0.029**	0.0026	<0.0044	<0.0025	<0.0028	<0.0032	<0.0021
Naphthalene	NA	NA	NA	NA	<0.0027 J	<0.0026	<0.0025 J	<0.0045	<0.0043 J	<0.0037 J	<0.0044 J	<0.0023	<0.0027 J	<0.0039 J	<0.0039	**0.0033 J**	<0.0048	<0.0027 J	<0.003 J	<0.0035	<0.0023
n-Butylbenzene	NA	NA	NA	NA	<0.00067 J	<0.00063	<0.00062 J	<0.0011	<0.0011 J	<0.00091 J	<0.0011 J	<0.00057 J	<0.00065 J	<0.00095 J	<0.00096	<0.00069 J	<0.0012	<0.00066 J	<0.00074 J	<0.00085	<0.00056
N-Propylbenzene	NA	NA	NA	NA	<0.0011 J	<0.001	<0.001 J	<0.0018	<0.0017 J	<0.0015 J	<0.0018 J	<0.00093 J	<0.0011 J	<0.0016 J	<0.0016	<0.0011 J	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00092
sec-Butylbenzene	NA	NA	NA	NA	<0.00081 J	<0.00076	<0.00075 J	<0.0013	<0.0013 J	<0.0011 J	<0.0013 J	<0.00069 J	<0.00079 J	<0.0011 J	<0.0012	<0.00084 J	<0.0014	<0.0008 J	<0.00089 J	<0.001	<0.00068
Styrene	300	NA	NA	NA	<0.00082	<0.00077	<0.00076 J	<0.0014	<0.0013	<0.0011	<0.0013	<0.0007	<0.0008 J	<0.0012 J	<0.0012	0.00085	<0.0014	<0.00081 J	<0.0009 J	<0.001	<0.00069
tert-Butylbenzene	NA	NA	NA	NA	<0.0011 J	<0.001	<0.001 J	<0.0018	<0.0017 J	<0.0015 J	<0.0018 J	<0.00093 J	<0.0011 J	<0.0016 J	<0.0016	<0.0011 J	<0.0019	<0.0011 J	<0.0012 J	<0.0014	<0.00092
Tetrachloroethene	NA	NA	NA	NA	<0.00082	<0.00077	<0.00076 J	<0.0014	<0.0013	<0.0011	<0.0013	<0.0007 J	<0.0008 J	<0.0012 J	<0.0012	0.00085	<0.0014	<0.00081 J	<0.0009 J	<0.001	<0.00069
Toluene	200	NA	NA	NA	**0.0026 J**	<0.0015	<0.0015	<0.0026	<0.0025	<0.0022	**0.0032 J**	<0.0014	<0.0016	**0.0023 J**	<0.0023	**0.0026 J**	<0.0028	<0.0016	<0.0018	**0.002 J**	<0.0013
trans-1,2-Dichloroethene	NA	NA	NA	NA	<0.0013	<0.0012	<0.0012	<0.0022	<0.0021	<0.0018	<0.0021	<0.0011	<0.0013	<0.0019	<0.0019	0.0014	<0.0023	<0.0013	<0.0014	<0.0017	<0.0011
trans-1,3-Dichloropropene	NA	NA	NA	NA	<0.00067	<0.00063	<0.00062	<0.0011	<0.0011	<0.00091	<0.0011	<0.00057	<0.00065	<0.00095	<0.00096	0.00069	<0.0012	<0.00066	<0.00074	<0.00085	<0.00056
Trichloroethene	NA	NA	NA	NA	<0.0016	<0.0015	<0.0015	<0.0027	<0.0026	<0.0022	<0.0026	<0.0014	<0.0016	<0.0023	<0.0023	0.0017	<0.0028	<0.0016	<0.0018	<0.0021	<0.0014
Trichlorofluoromethane	NA	NA	NA	NA	<0.00076	<0.00072	<0.0007	<0.0013	<0.0012	<0.001	<0.0012	<0.00065	<0.00075	<0.0011	<0.0011	0.00079	<0.0013	<0.00075	<0.00084	<0.00097	<0.00064
Vinyl chloride	NA	NA	NA	NA	<0.001	<0.00098	<0.00096	<0.0017	<0.0016	<0.0014	<0.0017	<0.00088	<0.001	<0.0015	<0.0015	0.0011	<0.0018	<0.001	<0.0011	<0.0013	<0.00087
Xylenes, Total	NA	NA	NA	NA	**0.0022 J**	<0.0012	<0.0012 J	<0.0022	<0.0021	<0.0018	<0.0021	<0.0011	<0.0013 J	<0.0019 J	<0.0019	0.0013	<0.0023	<0.0013 J	<0.0014 J	<0.0017	<0.0011

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Plant and soil invertebrate screening values from TCEQ (2006). No soil benchmarks are available for mammals or avian receptors.
4. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. NA = Not applicable, no value provided.
5. J = Estimated value. J+ = Estimated value with a potential high bias. J- = Estimated value with a potential low bias.

TABLE 4
SHALLOW SOIL SAMPLING RESULTS: VOLATILE ORGANIC COMPOUNDS
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Plant Soil	Invertebrate Soil	Mammalian Soil	Avian Soil	R&H Oil West Side			R&H Oil East Side						Tropicana				
Sample Location:	Screening Level	Screening Level	Screening Level	Screening Level	MW-12	MW-14	NMW-3	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	(mg/kg)[3]	(mg/kg)[3]	(mg/kg)[3]	(mg/kg)[3]	5/23/2011	5/23/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Shallow Soil																		
Sample Interval (ft bgs):					4-5	3-5	3-4	3-4	2-3	2-3	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	<0.0014	<0.0017	<0.0017 J	<0.0032	<0.095	<0.0019 J	<0.13	<0.0015 J	<0.0016 J	<0.0022	<0.0017 J	<0.0014 J	<0.0016 J	<0.0016
1,1,1-Trichloroethane	NA	NA	NA	NA	<0.00073	<0.00091	<0.0009	<0.0017	<0.05	<0.001	<0.071	<0.00082	<0.00084	<0.0011	<0.00089	<0.00074	<0.00085	<0.00083
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	<0.00086	<0.0011	<0.0011 J	<0.002 J	<0.059	0.0012 R	<0.083	<0.00096 J	<0.00099 J	<0.0013	<0.001 J	<0.00087 J	<0.001 J	<0.00098
1,1,2-Trichloroethane	NA	NA	NA	NA	<0.00072	<0.00089	<0.00089 J	<0.0017	<0.049	<0.001 J	<0.07	<0.00081 J	<0.00083 J	<0.0011	<0.00088 J	<0.00073 J	<0.00084 J	<0.00082
1,1-Dichloroethane	NA	NA	NA	NA	<0.00086	<0.0011	<0.0011	<0.002	<0.059	<0.0012	<0.083	<0.00096	<0.00099	<0.0013	<0.001	<0.00087	<0.001	<0.00098
1,1-Dichloroethene	NA	NA	NA	NA	<0.0012	<0.0015	<0.0015	<0.0028	<0.083	<0.0017	<0.12	<0.0013	<0.0014	<0.0019	<0.0015	<0.0012	<0.0014	<0.0014
1,1-Dichloropropene	NA	NA	NA	NA	<0.00064	<0.0008	<0.00079 J	<0.0015	<0.044	<0.0009	<0.062	<0.00072 J	<0.00074 J	<0.001	<0.00078 J	<0.00065 J	<0.00075 J	<0.00073
1,2,3-Trichloropropane	NA	NA	NA	NA	<0.0013	<0.0016	<0.0016	<0.003 J	<0.089	0.0018 R	<0.13	<0.0014	<0.0015	<0.002	<0.0016	<0.0013	<0.0015	<0.0015
1,2,4-Trichlorobenzene	NA	20	NA	NA	<0.0019	<0.0024	<0.0024 J	<0.0045 J	<0.13	0.0027 R	<0.19	<0.0022 J	<0.0022 J	<0.0031	<0.0024 J	<0.002 J	<0.0023 J	<0.0022
1,2,4-Trimethylbenzene	NA	NA	NA	NA	<0.00091	**0.0034 J**	<0.0011 J	<0.0029	<0.062	**0.057 J**	**1.5**	<0.001 J	<0.001 J	<0.0015	<0.0011 J	<0.00092 J	<0.0011 J	<0.001
1,2-Dibromo-3-Chloropropane	NA	NA	NA	NA	<0.0024	<0.003	<0.003 J	<0.0055 J	<0.17	0.0034 R	<0.23	<0.0027 J	<0.0028 J	<0.0038	<0.0029 J	<0.0024 J	<0.0028 J	<0.0027
1,2-Dibromoethane	NA	NA	NA	NA	<0.001	<0.0012	<0.0012	<0.0023	<0.069	<0.0014 J	<0.098	<0.0011	<0.0012	<0.0016	<0.0012	<0.001	<0.0012	<0.0011
1,2-Dichlorobenzene	NA	NA	NA	NA	<0.00079	<0.00098	<0.00097 J	<0.0018 J	<0.054	0.0011 R	<0.077	<0.00088 J	<0.00091 J	<0.0012	<0.00096 J	<0.0008 J	<0.00092 J	<0.0009
1,2-Dichloroethane	NA	NA	NA	NA	<0.00089	<0.0011	<0.0011	<0.002	<0.061	<0.0012	<0.086	<0.00099	<0.001	<0.0014	<0.0011	<0.0009	<0.001	<0.001
1,2-Dichloropropane	NA	700	NA	NA	<0.0007	<0.00087	<0.00086	<0.0016	<0.048	<0.00098	<0.068	<0.00078	<0.00081	<0.0011	<0.00086	<0.00071	<0.00082	<0.0008
1,3,5-Trimethylbenzene	NA	NA	NA	NA	<0.0016	<0.002	<0.0019 J	<0.0036 J	<0.11	0.0022 R	**0.65**	<0.0018 J	<0.0018 J	<0.0025	<0.0019 J	<0.0016 J	<0.0018 J	<0.0018
1,3-Dichlorobenzene	NA	NA	NA	NA	<0.0007	<0.00087	<0.00086 J	<0.0016 J	<0.048	0.00098 R	<0.068	<0.00078 J	<0.00081 J	<0.0011	<0.00086 J	<0.00071 J	<0.00082 J	<0.0008
1,3-Dichloropropane	NA	NA	NA	NA	<0.00062	<0.00077	<0.00077	<0.0014	<0.043	<0.00087 J	<0.06	<0.0007	<0.00072	<0.00098	<0.00076	<0.00063	<0.00073	<0.00071
1,4-Dichlorobenzene	NA	NA	NA	NA	<0.00065	<0.00081	<0.0008 J	<0.0015 J	<0.045	0.00091 R	<0.063	<0.00073 J	<0.00075 J	<0.001	<0.00079 J	<0.00066 J	<0.00076 J	<0.00074
2,2-Dichloropropane	NA	NA	NA	NA	<0.0018	<0.0022	<0.0022	<0.0041	<0.12	<0.0025 J	<0.17	<0.002	<0.0021	<0.0028	<0.0022	<0.0018	<0.0021	<0.002
2-Butanone (MEK)	NA	NA	NA	NA	<0.0019	<0.0023	<0.0023	<0.0043	<0.13	**0.32**	**4**	**0.051**	<0.0022	<0.0029	<0.0023	<0.0019	<0.0022	<0.0021
2-Chlorotoluene	NA	NA	NA	NA	<0.00067	<0.00083	<0.00083 J	<0.0015 J	<0.046	0.00094 R	<0.065	<0.00075 J	<0.00078 J	<0.0011	<0.00082 J	<0.00068 J	<0.00078 J	<0.00076
2-Hexanone	NA	NA	NA	NA	<0.001	<0.0012	<0.0012	<0.0023	<0.068	**0.016 J**	<0.097	<0.0011	<0.0012	<0.0016	<0.0012	<0.001	<0.0012	<0.0011
4-Chlorotoluene	NA	NA	NA	NA	<0.00082	<0.001	<0.001 J	<0.0019 J	<0.056	0.0011 R	<0.079	<0.00092 J	<0.00095 J	<0.0013	<0.001 J	<0.00083 J	<0.00096 J	<0.00093
4-Isopropyltoluene	NA	NA	NA	NA	<0.001	<0.0012	<0.0012 J	<0.0023 J	<0.069	0.0014 R	<0.26 J	**0.0049 J**	<0.0012 J	<0.0016	<0.0012 J	<0.001 J	<0.0012 J	<0.0011
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	<0.0015	<0.0018	<0.0018	<0.0033	<0.1	<0.002 J	<0.14	<0.0016	<0.0017	<0.0023	<0.0018	<0.0015	<0.0017	<0.0016
Acetone	NA	NA	NA	NA	<0.0016 J	**0.25 J-**	**0.05**	**0.091 J+**	**0.48 J**	**2.9 J**	**15**	<0.0018	**0.047**	**0.077 J+**	**0.053**	**0.053**	<0.0019	**0.027 J-**
Benzene	NA	NA	NA	NA	**0.0022 J**	**0.2**	<0.0022	<0.0014	**3.3 J**	**1.7**	<0.078 J	**0.012 J-**	<0.0029	**0.0051 J**	<0.0049	<0.0045	<0.0032	**0.0036 J**
Bromobenzene	NA	NA	NA	NA	<0.00098	<0.0012	<0.0012 J	<0.0022 J	<0.067	0.0014 R	<0.095	<0.0011 J	<0.0011 J	<0.0015	<0.0012 J	<0.00099 J	<0.0011 J	<0.0011
Bromodichloromethane	NA	NA	NA	NA	<0.00065	<0.00081	<0.0008	<0.0015	<0.045	<0.00091 J	<0.063	<0.00073	<0.00075	<0.001	<0.00079	<0.00066	<0.00076	<0.00074
Bromoform	NA	NA	NA	NA	<0.0014	<0.0017	<0.0017 J	<0.0031 J	<0.093	0.0019 R	<0.13	<0.0015 J	<0.0016 J	<0.0021	<0.0017 J	<0.0014 J	<0.0016 J	<0.0015
Bromomethane	NA	NA	NA	NA	<0.00082	<0.001	<0.001	<0.0019	<0.056 J	<0.0011	<0.079 J	<0.00092	<0.00095	<0.0013	<0.001	<0.00083	<0.00096	<0.00093
Carbon disulfide	NA	NA	NA	NA	<0.00054	<0.00067	<0.00067	<0.0012	<0.037 J	**0.0096 J**	<0.053 J	<0.00061	<0.00063	<0.00085	<0.00066	<0.00055	<0.00063	<0.00062
Carbon tetrachloride	NA	NA	NA	NA	<0.0011	<0.0014	<0.0014 J	<0.0026	<0.077	<0.0016	<0.11	<0.0012 J	<0.0013 J	<0.0017	<0.0014 J	<0.0011 J	<0.0013 J	<0.0013
Chlorobenzene	NA	40	NA	NA	<0.00095	<0.0012	<0.0012 J	<0.0022	<0.065	<0.0013 J	<0.092	<0.0011 J	<0.0011 J	<0.0015	<0.0012 J	<0.00096 J	<0.0011 J	<0.0011
Chloroethane	NA	NA	NA	NA	<0.0014	<0.0017	<0.0017	<0.0032	<0.095 J	<0.0019	<0.13 J	<0.0015	<0.0016	<0.0022	<0.0017	<0.0014	<0.0016	<0.0016
Chloroform	NA	NA	NA	NA	<0.00065	<0.00081	<0.0008	<0.0015	<0.045	<0.00091	<0.063	<0.00073	<0.00075	<0.001	<0.00079	<0.00066	<0.00076	<0.00074
Chloromethane	NA	NA	NA	NA	<0.0016	<0.002	<0.002 J	<0.0038 J	<0.11 J	<0.0023 J	<0.16 J	<0.0018 J	<0.0019 J	<0.0026 J	<0.002 J	<0.0017 J	<0.0019 J	<0.0019 J
cis-1,2-Dichloroethene	NA	NA	NA	NA	<0.00082	<0.001	<0.001	<0.0019	<0.056	<0.0011	<0.079	<0.00092	<0.00095	<0.0013	<0.001	<0.00083	<0.00096	<0.00093
cis-1,3-Dichloropropene	NA	NA	NA	NA	<0.00053	<0.00066	<0.00066	<0.0012	<0.037	<0.00075 J	<0.052	<0.0006	<0.00062	<0.00084	<0.00065	<0.00054	<0.00062	<0.00061
Dibromochloromethane	NA	NA	NA	NA	<0.00093	<0.0012	<0.0011 J	<0.0021	<0.064	<0.0013 J	<0.09	<0.001 J	<0.0011 J	<0.0015	<0.0011 J	<0.00094 J	<0.0011 J	<0.0011
Dibromomethane	NA	NA	NA	NA	<0.00074	<0.00092	<0.00091	<0.0017	<0.051	<0.001	<0.072	<0.00083	<0.00086	<0.0012	<0.0009	<0.00075	<0.00087	<0.00084
Dichlorodifluoromethane	NA	NA	NA	NA	<0.0015 J	<0.0019 J	<0.0019 J	<0.0035 J	<0.1 J	<0.0021	<0.15 J	<0.0017 J	<0.0018 J	<0.0024 J	<0.0019 J	<0.0015 J	<0.0018 J	<0.0017 J
Ethylbenzene	NA	NA	NA	NA	<0.001	**0.0088**	<0.0012 J	<0.0023	<0.069	**0.069 J**	<0.17 J	<0.0011 J	<0.0012 J	**0.0017 J**	<0.0012 J	<0.001 J	<0.0012 J	<0.0011
Hexachlorobutadiene	NA	NA	NA	NA	<0.0011	<0.0014	<0.0014 J	<0.0026 J	<0.077 J	0.0016 R	<0.11 J	<0.0012 J	<0.0013 J	<0.0017	<0.0014 J	<0.0011 J	<0.0013 J	<0.0013
Iodomethane	NA	NA	NA	NA	<0.0025	<0.0031	<0.003 J	<0.0057	<0.17 J	<0.0035	<0.24 J	<0.0028 J	<0.0029 J	<0.0039	<0.003 J	<0.0025 J	<0.0029 J	<0.0028
Isopropylbenzene	NA	NA	NA	NA	<0.00091	**0.14**	<0.0011	<0.0021 J	<0.062	**0.025 J**	<0.088	<0.001	<0.001	<0.0014	<0.0011	<0.00092	<0.0011	<0.001
Methyl tert-butyl ether	NA	NA	NA	NA	<0.0018 J	<0.0022 J	<0.0022	<0.0041	<0.12	<0.0025	<0.18	<0.002	<0.0021	<0.0028	<0.0022	<0.0018	<0.0021	<0.0021 J
Methylene Chloride	NA	NA	NA	NA	<0.0022	<0.0027	<0.0027	<0.005	<0.2	<0.003	<0.36	<0.0024	<0.0025	<0.0034	<0.0026	<0.0022	<0.0025	<0.0025
Naphthalene	NA	NA	NA	NA	<0.0023	**0.0037 J**	<0.0029 J	**0.0059 J**	**0.95 J**	0.0033 R	<0.77 J	<0.0026 J	<0.0027 J	<0.0037	<0.0029 J	<0.0024 J	<0.0027 J	<0.0027
n-Butylbenzene	NA	NA	NA	NA	<0.00057	**0.0051 J**	<0.00071 J	<0.0013 J	<0.039	0.0008 R	<0.056	<0.00064 J	<0.00066 J	<0.0009	<0.0007 J	<0.00058 J	<0.00067 J	<0.00065
N-Propylbenzene	NA	NA	NA	NA	<0.00094	**0.23**	<0.0012 J	<0.0022 J	<0.064	**0.035 J**	<0.091	**0.0026 J**	<0.0011 J	<0.0015	<0.0011 J	<0.00095 J	<0.0011 J	<0.0011
sec-Butylbenzene	NA	NA	NA	NA	<0.00069	**0.03**	<0.00085 J	<0.0016 J	<0.047	**0.014 J**	<0.067	**0.0063 J-**	<0.0008 J	<0.0011	<0.00084 J	<0.0007 J	<0.00081 J	<0.00078
Styrene	300	NA	NA	NA	<0.0007	<0.00087	<0.00086 J	<0.0016	<0.048	<0.00098 J	<0.068	<0.00078 J	<0.00081 J	<0.0011	<0.00086 J	<0.00071 J	<0.00082 J	<0.0008
tert-Butylbenzene	NA	NA	NA	NA	<0.00094	**0.0041 J**	<0.0012 J	<0.0022 J	<0.064	0.0013 R	<0.21 J	<0.001 J	<0.0011 J	<0.0015	<0.0011 J	<0.00095 J	<0.0011 J	<0.0011
Tetrachloroethene	NA	NA	NA	NA	<0.0007	<0.00087	<0.00086 J	<0.0016	<0.048	<0.00098 J	<0.068	<0.00078 J	<0.00081 J	<0.0011	<0.00086 J	<0.00071 J	<0.00082 J	<0.0008
Toluene	200	NA	NA	NA	**0.0021 J**	**0.0091**	<0.0017	<0.0031	**0.27 J**	**0.11 J**	**0.5**	**0.0024 J**	**0.0021 J**	**0.0052 J**	<0.0017	**0.0034 J**	**0.0021 J**	**0.0031 J**
trans-1,2-Dichloroethene	NA	NA	NA	NA	<0.0011	<0.0014	<0.0014	<0.0026	<0.077	<0.0016	<0.11	<0.0013	<0.0013	<0.0018	<0.0014	<0.0011	<0.0013	<0.0013
trans-1,3-Dichloropropene	NA	NA	NA	NA	<0.00057	<0.00071	<0.00071	<0.0013	<0.039	<0.0008 J	<0.056	<0.00064	<0.00066	<0.0009	<0.0007	<0.00058	<0.00067	<0.00065
Trichloroethene	NA	NA	NA	NA	<0.0014	<0.0017	<0.0017	<0.0032	<0.095	<0.0019	<0.13	<0.0015	<0.0016	<0.0022	<0.0017	<0.0014	<0.0016	<0.0016
Trichlorofluoromethane	NA	NA	NA	NA	<0.00065	<0.00081	<0.0008	<0.0015	<0.045 J	<0.00091	<0.063 J	<0.00073	<0.00075	<0.001	<0.00079	<0.00066	<0.00076	<0.00074
Vinyl chloride	NA	NA	NA	NA	<0.00089	<0.0011	<0.0011	<0.002	<0.061 J	<0.0012 J	<0.086 J	<0.00099	<0.001	<0.0014	<0.0011	<0.0009	<0.001	<0.001
Xylenes, Total	NA	NA	NA	NA	<0.0011	**0.02**	<0.0014 J	**0.005 J**	**0.23 J**	**0.11 J**	**2.4**	<0.0012 J	<0.0013 J	**0.0029 J**	<0.0014 J	**0.0016 J**	<0.0013 J	<0.0013

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in bold type.
3. Plant and soil invertebrate screening values from TCEQ (2006). No benchmarks are available for mammals or avian receptors.
4. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. NA = Not applicable, no value provided.
5. J = Estimated value. J+ = Estimated value with a potential high bias. J- = Estimated value with a potential low bias.

TABLE 5
SURFACE SOIL SAMPLING RESULTS: SEMIVOLATILE ORGANIC COMPOUNDS
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Sample Area:					R&H Oil West Side						R&H Oil East Side						Tropicana				
Sample Location:	Plant Soil Screening Level	Invertebrate Soil Screening Level	Mammalian Soil Screening Level	Avian Soil Screening Level	MW-12	MW-14	NMW-3	SB-1	SB-2	SB-3	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	(mg/kg)[3]	(mg/kg)[3]	(mg/kg)[3, 4]	(mg/kg)[3]	5/23/2011	5/23/2011	5/24/2011	10/24/2012	10/24/2012	10/24/2012	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Surface Soil																					
Sample Interval (ft bgs):					0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
2,4,5-Trichlorophenol	4	9	NA	NA	<1.1	<0.01	<0.011	<0.59 J	<0.67 J	<0.58 J	<1	<0.59	<1	<0.057	<1	<0.05	<0.1	<0.01	<0.23	<0.11	<0.055
2,4,6-Trichlorophenol	NA	10	NA	NA	<0.29	<0.0027	<0.0029	<0.16 J	<0.18 J	<0.15 J	<0.28	<0.16	<0.28	<0.015	<0.27	<0.013	<0.028	<0.0027	<0.062	<0.029	<0.015
2,4-Dichlorophenol	NA	NA	NA	NA	<0.41	<0.0039	<0.0041	<0.23 J	<0.26 J	<0.22 J	<0.4	<0.23	<0.4	<0.022	<0.39	<0.019	<0.04	<0.0039	<0.089	<0.041	<0.021
2,4-Dimethylphenol	NA	NA	NA	NA	<0.92 J	<0.0086	<0.0091	<0.51 J	<0.58 J	<0.49 J	<0.9 J	<0.51 J	<0.9 J	<0.048	<0.87 J	<0.043 J	<0.088	<0.0087	<0.2	<0.092	<0.047
2,4-Dinitrophenol	NA	NA	NA	NA	<0.5 J	<0.0047	<0.005	<0.28 J	<0.32 J	<0.27 J	<0.49 J	<0.28 J	<0.49 J	<0.027	<0.48 J	<0.024 J	<0.049	<0.0048	<0.11	<0.051	<0.026
2,4-Dinitrotoluene	NA	NA	NA	NA	<0.39 J	<0.0036	<0.0038	<0.21 J	<0.24 J	<0.21 J	<0.38 J	<0.21 J	<0.38 J	<0.02	<0.37 J	<0.018 J	<0.037	<0.0036	<0.083	<0.039	<0.02
2,6-Dinitrotoluene	NA	NA	NA	NA	<0.32 J	<0.003	<0.0031	<0.17 J	<0.2 J	<0.17 J	<0.31 J	<0.17 J	<0.31 J	<0.017	<0.3 J	<0.015 J	<0.03	<0.003	<0.068	<0.032	<0.016
2-Chloronaphthalene	NA	NA	NA	NA	<0.13	<0.0012	<0.0013	<0.072	<0.081	<0.07	<0.13	<0.071	<0.13	<0.0068	<0.12	<0.0061	<0.012	<0.0012	<0.028	<0.013	<0.0066
2-Chlorophenol	NA	NA	NA	NA	<0.21	<0.002	<0.0021	<0.12 J	<0.13 J	<0.11 J	<0.21	<0.12	<0.21	<0.011	<0.2	<0.0099	<0.02	<0.002	<0.045	<0.021	<0.011
2-Methylnaphthalene	NA	NA	NA	NA	<0.29 J	**0.0077 J**	<0.0029	<0.16 J	<0.18 J	<0.16 J	<0.29 J	<0.16 J	<0.29 J	**0.049 J**	<0.28 J	<0.014 J	<0.028	**0.016 J**	<0.063	<0.029	**0.081 J**
2-Nitroaniline	NA	NA	NA	NA	<0.52	<0.0049	<0.0052	<0.29 J	<0.33 J	<0.28 J	<0.51	<0.29	<0.51	<0.028	<0.5	<0.025	<0.05	<0.0049	<0.11	<0.052	<0.027
2-Nitrophenol	NA	NA	NA	NA	<0.42	<0.0039	<0.0041	<0.23 J	<0.26 J	<0.22 J	<0.41	<0.23	<0.41	<0.022	<0.4	<0.019	<0.04	<0.0039	<0.09	<0.042	<0.021
3 & 4 Methylphenol	NA	NA	NA	NA	<0.3	<0.0028	<0.003	<0.16	<0.19	<0.16	<0.29	<0.16	<0.29	<0.016	<0.28	<0.014	<0.029	<0.0028	<0.064	<0.03	<0.015
3,3'-Dichlorobenzidine	NA	NA	NA	NA	<1.1	<0.01	<0.011	<0.6 J	<0.68 J	<0.59 J	<1.1	<0.6	<1.1	<0.057	<1	<0.051	<0.1	<0.01	<0.23	<0.11	<0.056
3-Nitroaniline	NA	NA	NA	NA	<0.76 J	<0.0072	<0.0076	<0.42 J	<0.48 J	<0.41 J	<0.75 J	<0.42 J	<0.75 J	<0.04	<0.73 J	<0.036 J	<0.074	<0.0072	<0.16	<0.077	<0.039
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	<0.53 J	<0.005	<0.0053 J	<0.29 J	<0.33 J	<0.29 J	<0.52 J	<0.29 J	<0.52 J	<0.028	<0.51 J	<0.025 J	<0.051	<0.005 J	<0.11 J	<0.053 J	<0.027
4-Bromophenyl phenyl ether	NA	NA	NA	NA	<0.3	<0.0028	<0.003	<0.17	<0.19	<0.16	<0.3	<0.17	<0.3	<0.016	<0.29	<0.014	<0.029	<0.0029	<0.066	<0.03	<0.016
4-Chloro-3-methylphenol	NA	NA	NA	NA	<1.7	<0.016	<0.017	<0.92 J	<1 J	<0.9 J	<1.6	<0.92	<1.6	<0.088	<1.6	<0.078	<0.16	<0.016	<0.36	<0.17	<0.086
4-Chloroaniline	NA	NA	NA	NA	<0.62	<0.0058	<0.0062	<0.34 J	<0.39 J	<0.34 J	<0.61	<0.34	<0.61	<0.033	<0.59	<0.029	<0.06	<0.0059	<0.13	<0.062	<0.032
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	<0.19	<0.0018	<0.0019	<0.11 J	<0.12 J	<0.1 J	<0.19	<0.11	<0.19	<0.01	<0.18	<0.009	<0.019	<0.0018	<0.042	<0.019	<0.0099
4-Nitroaniline	NA	NA	NA	NA	<1.2 J	<0.011	<0.012 J	<0.66 J	<0.75 J	<0.64 J	<1.2 J	<0.66 J	<1.2 J	<0.063 J	<1.1 J	<0.056 J	<0.11	<0.011 J	<0.26 J	<0.12	<0.061
4-Nitrophenol	NA	NA	NA	NA	<0.54 J	<0.0051	<0.0054	<0.3 J	<0.34 J	<0.29 J	<0.53 J	<0.3 J	<0.53 J	<0.029	<0.52 J	<0.025 J	<0.052	<0.0051	<0.12	<0.054	<0.028
Acenaphthene	20	NA	NA	NA	<0.15	<0.0014	<0.0015	<0.085 J	<0.097 J	<0.083 J	<0.15	<0.085	<0.15	<0.0081	<0.15	<0.0072	**0.088 J**	**0.011 J**	**0.2 J**	<0.015	<0.0079
Acenaphthylene	NA	NA	NA	NA	<0.11	<0.001	<0.0011	<0.059 J	<0.067 J	<0.058 J	<0.1	<0.059	<0.1	<0.0056	<0.1	<0.005	**0.098 J**	<0.001	<0.023	<0.011	<0.0055
Aniline	NA	NA	NA	NA	<0.32 J	<0.003 J	<0.0032 J	<0.18 J	<0.2 J	<0.17 J	<0.31 J	<0.18 J	<0.31 J	<0.017 J	<0.3 J	<0.015 J	<0.031 J	<0.003 J	<0.069 J	<0.032 J	<0.016 J
Anthracene	NA	NA	NA	NA	<0.14	<0.0013	<0.0014	**0.24 J**	**0.25 J**	<0.074 J	<0.13	<0.076	<0.13	<0.0072	<0.13	<0.0064	<0.013	**0.025**	**0.83**	**0.17 J**	<0.007
Benzo[a]anthracene	NA	NA	NA	NA	<0.15	<0.0014	<0.0015	**0.22 J**	**0.13 J**	**0.087 J**	<0.14	<0.081	<0.14	<0.0078	<0.14	<0.0069	**0.49**	**0.032**	**4.1**	**0.14 J**	**0.25**
Benzo[a]pyrene	NA	NA	NA	NA	<0.17	<0.0016	<0.0017	**0.21 J**	<0.11	<0.093	<0.17	<0.095	<0.17	<0.0091	<0.16	<0.0081	**0.58**	**0.031**	**3.4**	**0.16 J**	**0.3**
Benzo[b]fluoranthene	NA	NA	NA	NA	<0.18	<0.0017	<0.0018	**0.47 J**	**0.16 J**	<0.099	<0.18	<0.1	<0.18	<0.0097	<0.17	<0.0086	**0.53**	**0.031**	**4.3**	**0.13 J**	**0.36**
Benzo[g,h,i]perylene	NA	NA	NA	NA	<0.54	<0.0051	<0.0054	<0.3 J	<0.34 J	<0.29 J	<0.53	<0.3	<0.53	<0.029	<0.52	<0.025	**0.45**	**0.025**	**1.5**	**0.16 J**	**0.18**
Benzo[k]fluoranthene	NA	NA	NA	NA	<0.16	<0.0015	<0.0016	<0.088 J	<0.1 J	<0.086 J	<0.16	<0.088	<0.16	<0.0084	<0.15	<0.0075	**0.55**	**0.026 J**	**2.8**	**0.15 J**	**0.27**
Benzyl alcohol	NA	NA	NA	NA	<0.62	<0.0058	<0.0062	<0.34 J	<0.39 J	<0.34 J	<0.61	<0.34	<0.61	<0.033	<0.59	<0.029	<0.06	<0.0059	<0.13	<0.062	<0.032
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	<0.15	<0.0014	<0.0015	<0.084	<0.095	<0.082	<0.15	<0.084	<0.15	<0.008	<0.14	<0.0071	<0.015	<0.0014	<0.033	<0.015	<0.0078
Bis(2-chloroethyl)ether	NA	NA	NA	NA	<0.18	<0.0017	<0.0018	<0.098 J	<0.11 J	<0.095 J	<0.17	<0.097	<0.17	<0.0093	<0.17	<0.0083	<0.017	<0.0017	<0.038	<0.018	<0.0091
Bis(2-chloroisopropyl) ether	NA	NA	NA	NA	<0.95	<0.0089	<0.0094	<0.52 J	<0.59 J	<0.51 J	<0.92	<0.52	<0.92	<0.05	<0.9	<0.044	<0.091	<0.0089	<0.2	<0.095	<0.049
Bis(2-ethylhexyl) phthalate	NA	NA	NA	NA	<0.57	<0.0054	<0.0057	<0.32	<0.36	<0.31	<0.56	<0.32	<0.56	<0.03	<0.55	<0.027	<0.055	<0.0054	<0.12	<0.058	<0.03
Butyl benzyl phthalate	NA	NA	NA	NA	<0.66	<0.0062	<0.0066	<0.37	<0.41	<0.36	<0.65	<0.37	<0.65	<0.035	<0.63	<0.031	<0.064	<0.0062	<0.14	<0.066	<0.034
Chrysene	NA	NA	NA	NA	<0.11	<0.001	<0.0011	**0.27 J**	**0.099 J**	<0.059	<0.11	<0.06	<0.11	<0.0058	<0.1	<0.0051	**0.52**	**0.031**	**4.4**	**0.13 J**	**0.27**
Dibenz(a,h)anthracene	NA	NA	NA	NA	<0.39	<0.0036	<0.0039	<0.21 J	<0.24 J	<0.21 J	<0.38	<0.21	<0.38	<0.021	<0.37	<0.018	<0.037	<0.0037	**0.6**	<0.039	<0.02
Dibenzofuran	NA	NA	NA	NA	<0.19	<0.0018	<0.0019	<0.11	<0.12	<0.1	<0.19	<0.11	<0.19	<0.01	<0.18	<0.0089	**0.061 J**	**0.0084 J**	**0.37 J**	<0.019	**0.09 J**
Diethyl phthalate	100	NA	NA	NA	<0.9	<0.0084	<0.009	<0.5 J	<0.57 J	<0.49 J	<0.88	<0.5	<0.88	<0.048	<0.86	<0.042	<0.087	<0.0085	<0.19	<0.09	<0.046
Dimethyl phthalate	NA	200	NA	NA	<0.52 J	<0.0049	<0.0052	<0.29 J	<0.33 J	<0.28 J	<0.51 J	<0.29 J	<0.51 J	<0.028	<0.5 J	<0.025 J	<0.05	<0.0049	<0.11	<0.052	<0.027
Di-n-butyl phthalate	200	NA	NA	NA	<0.28	<0.0026	<0.0028	**1.3 J**	<0.17 J	<0.15 J	<0.27	<0.15	<0.27	<0.015	<0.26	<0.013	<0.027	<0.0026	<0.06	<0.028	<0.014
Di-n-octyl phthalate	NA	NA	NA	NA	<0.2 J	<0.0019	<0.002	<0.11	<0.13	<0.11	<0.2 J	<0.11 J	<0.2 J	<0.011	<0.19 J	<0.0095 J	<0.02	<0.0019	<0.044	<0.02	<0.01
Fluoranthene	NA	NA	NA	NA	<0.33	<0.0031	<0.0033	**0.49 J**	**0.44 J**	**0.35 J**	<0.32	<0.18	<0.32	<0.018	<0.32	<0.016	**1**	**0.076**	**12**	**0.35**	**0.39**
Fluorene	NA	30	NA	NA	<0.25	<0.0024	<0.0025	<0.14	<0.16	<0.14	<0.25	<0.14	<0.25	<0.013	<0.24	<0.012	<0.024	**0.012 J**	<0.054	<0.025	<0.013
Hexachlorobenzene	NA	NA	NA	NA	<0.16	<0.0015	<0.0016	<0.09 J	<0.1 J	<0.088 J	<0.16	<0.09	<0.16	<0.0086	<0.15	<0.0076	<0.016	<0.0015	<0.035	<0.016	<0.0084
Hexachlorocyclopentadiene	NA	NA	NA	NA	<0.49 J	<0.0046	<0.0049 J	<0.27 J	<0.31 J	<0.27 J	<0.48 J	<0.27 J	<0.48 J	<0.026 J	<0.47 J	<0.023 J	<0.047	<0.0047 J	<0.11 J	<0.049 J	<0.025
Hexachloroethane	NA	NA	NA	NA	<0.25 J	<0.0023	<0.0025	<0.14 J	<0.15 J	<0.13 J	<0.24 J	<0.14 J	<0.24 J	<0.013	<0.23 J	<0.012 J	<0.024	<0.0023	<0.053	<0.025	<0.013
Indeno[1,2,3-cd]pyrene	NA	NA	NA	NA	<0.37	<0.0035	<0.0037	**0.23 J**	<0.23	<0.2	<0.37	<0.21	<0.37	<0.02	<0.36	<0.018	**0.44**	**0.023 J**	**1.5**	**0.15 J**	**0.16**
Isophorone	NA	NA	NA	NA	<0.11	<0.001	<0.0011	<0.059 J	<0.067 J	<0.058 J	<0.1	<0.059	<0.1	<0.0056	<0.1	<0.005	<0.01	<0.001	<0.023	<0.011	<0.0055
Nitrobenzene	NA	NA	NA	NA	<0.32 J	<0.003	<0.0031	<0.18	<0.2	<0.17	<0.31 J	<0.17 J	<0.31 J	<0.017	<0.3 J	<0.015 J	<0.03	<0.003	<0.068	<0.032	<0.016
N-Nitrosodi-n-propylamine	NA	NA	NA	NA	<0.24 J	<0.0022	<0.0024	<0.13	<0.15	<0.13	<0.23 J	<0.13 J	<0.23 J	<0.013	<0.23 J	<0.011 J	<0.023	<0.0022	<0.051	<0.024	<0.012
Pentachlorophenol	5	31	2.8	2.1	<0.43 J	<0.004	<0.0043	<0.24 J	<0.27 J	<0.23 J	<0.42 J	<0.24 J	<0.42 J	<0.023	<0.41 J	<0.02 J	<0.041	<0.004	<0.092	<0.043	<0.022
Phenanthrene	NA	NA	NA	NA	<0.53	<0.005	<0.0053	**0.9 J**	**0.99 J**	<0.29 J	<0.52	<0.29	<0.52	<0.028	<0.5	<0.025	**0.53**	**0.071**	**2.3**	**0.17 J**	**0.21**
Phenol	70	30	NA	NA	<0.45	<0.0042	<0.0045	<0.25 J	<0.28 J	<0.24 J	<0.44	<0.25	<0.44	<0.024	<0.43	<0.021	<0.044	<0.0043	<0.098	<0.045	<0.023
Pyrene	NA	NA	NA	NA	<0.2	<0.0018	<0.0019	<0.11	<0.12	<0.11	<0.19	<0.11	<0.19	<0.01	<0.19	**0.055 J**	**0.82**	**0.061**	**8.4**	**0.25**	**0.36**
Low molecular weight PAH[7, 8]	29	NA	100	NA	NC	**0.0077**	NC	**1.14**	**1.24**	NC	NC	NC	NC	**0.049**	NC	**0.0033**	**0.716**	**0.135**	**3.33**	**0.34**	**0.291**
High molecular weight PAH[7]	18	NA	1.1	NA	NC	NC	NC	**1.19**	**0.669**	**0.437**	NC	NC	NC	NC	NC	**0.055**	**3.41**	**0.231**	**32.9**	**1.03**	**1.57**
Total PAH[7, 8]	NA	NA	NA	NA	NC	**0.0077**	NC	**3.03**	**2.069**	**0.437**	NC	NC	NC	**0.049**	NC	**0.058**	**6.096**	**0.505**	**46.33**	**1.96**	**2.831**

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Plant and Invertebrate Soil Screening Levels taken from EPA SSL documents and TCEQ (2006). EPA Eco SSL documents used primarily, followed by TCEQ (2006). Mammalian and Avian Soil Screening Levels represent screening levels for chronic exposure to the most sensitive receptor in the class of receptor evaluated (EPA, 2003b).
4. Shading = Detected compound exceeds a screening level.

-- the mammalian screening level is exceeded in the sample.

5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. NA = Not applicable, no value provided. NC = Not calculated since no compounds were measured in this class of PAHs
6. J = Estimated value. J+ = Estimated value with a potential high bias. J- = Estimated value with a potential low bias.
7. LPAH, HPAH, and Total PAH were summed according to TCEQ, 2006 guidance.
8. Naphthalene was analyzed as part of the volatile organic suite of compounds (see Table 3) but, when it was measured in a given sample, the concentration was included in the PAH class analysis on this table.

TABLE 6
SHALLOW SOIL SAMPLING RESULTS: SEMIVOLATILE ORGANIC COMPOUNDS
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Sample Area:	Plant Soil	Invertebrate Soil	Mammalian Soil	Avian Soil	R&H Oil West Side			R&H Oil East Side						Tropicana				
Sample Location:	Screening Level	Screening Level	Screening Level	Screening Level	MW-12	MW-14	NMW-3	NMW-1	NMW-2	MW-15	MW-13	MW-16	MW-17	MW-18	NMW-4	NMW-5	MW-19	MW-20
Sample Date:	(mg/kg)[3, 4]	(mg/kg)[3, 4]	(mg/kg)[3, 4]	(mg/kg)[3, 4]	5/23/2011	5/23/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011	5/24/2011	5/24/2011	5/24/2011	5/23/2011
Shallow Soil																		
Sample Interval (ft bgs):					4-5	3-5	3-4	3-4	2-3	2-3	3-4	3-4	3-4	4-5	3-4	3-4	3-4	3-4
2,4,5-Trichlorophenol	4	9	NA	NA	<0.012	<0.013	<0.51	<1.3	<3.5	<0.55	<8.1	<0.65	<0.012	<0.12	<0.5	<0.45	<0.012	<0.057
2,4,6-Trichlorophenol	NA	10	NA	NA	<0.0031	<0.0036	<0.14	<0.34	<0.95	<0.15	<2.2	<0.17	<0.0033	<0.031	<0.13	<0.12	<0.0033	<0.015
2,4-Dichlorophenol	NA	NA	NA	NA	<0.0045	<0.0052	<0.2	<0.49	<1.4	<0.21	<3.1	<0.25	<0.0048	<0.045	<0.19	<0.18	<0.0047	<0.022
2,4-Dimethylphenol	NA	NA	NA	NA	<0.01	<0.012	<0.43 J	<1.1 J	<3. J	<0.47 J	<6.9 J	<0.56 J	<0.011	<0.1	<0.43 J	<0.39 J	<0.011	<0.049
2,4-Dinitrophenol	NA	NA	NA	NA	<0.0055	<0.0063	<0.24 J	<0.6 J	<1.7 J	<0.26 J	<3.8 J	<0.31 J	<0.0058	<0.055	<0.23 J	<0.21 J	<0.0058	<0.027
2,4-Dinitrotoluene	NA	NA	NA	NA	<0.0042	<0.0049	<0.18 J	<0.46 J	<1.3 J	<0.2 J	<2.9 J	<0.23 J	<0.0045	<0.042	<0.18 J	<0.16 J	<0.0044	<0.021
2,6-Dinitrotoluene	NA	NA	NA	NA	<0.0034	<0.004	<0.15 J	<0.38 J	<1. J	<0.16 J	<2.4 J	<0.19 J	<0.0037	<0.034	<0.15 J	<0.13 J	<0.0036	<0.017
2-Chloronaphthalene	NA	NA	NA	NA	<0.0014	<0.0016	<0.061	<0.15	<0.43	<0.066	<0.97	<0.079	<0.0015	<0.014	<0.06	<0.055	<0.0015	<0.0069
2-Chlorophenol	NA	NA	NA	NA	<0.0023	<0.0027	<0.1	<0.25	<0.7	<0.11	<1.6	<0.13	<0.0024	<0.023	<0.098	<0.089	<0.0024	<0.011
2-Methylnaphthalene	NA	NA	NA	NA	**0.0082 J**	<0.0037	<0.14 J	<0.35 J	<0.97 J	<0.15 J	<2.2 J	<0.18 J	<0.0034	<0.032	<0.14 J	**0.39 J**	<0.0034	<0.016
2-Nitroaniline	NA	NA	NA	NA	<0.0057	<0.0066	<0.25	<0.62	<1.7	<0.27	<3.9	<0.32	<0.0061	<0.057	<0.24	<0.22	<0.006	<0.028
2-Nitrophenol	NA	NA	NA	NA	<0.0045	<0.0052	<0.2	<0.5	<1.4	<0.21	<3.1	<0.25	<0.0048	<0.045	<0.19	<0.18	<0.0048	<0.022
3 & 4 Methylphenol	NA	NA	NA	NA	<0.0032	<0.0038	<0.14	<0.36	<0.99	<0.15	<2.2	<0.18	<0.0035	<0.032	<0.14	<0.13	<0.0034	<0.016
3,3'-Dichlorobenzidine	NA	NA	NA	NA	<0.012	<0.014	<0.51	<1.3	<3.6	<0.56	<8.2	<0.66	<0.013	<0.12	<0.5	<0.46	<0.012	<0.058
3-Nitroaniline	NA	NA	NA	NA	<0.0083	<0.0096	<0.36 J	<0.91 J	<2.5 J	<0.39 J	<5.8 J	<0.46 J	<0.0089	<0.083	<0.35 J	<0.32 J	<0.0088	<0.041
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	<0.0058	<0.0067	<0.25 J	<0.63 J	<1.8 J	<0.27 J	<4. J	<0.32 J	<0.0062 J	<0.058	<0.25 J	<0.23 J	<0.0061 J	<0.028
4-Bromophenyl phenyl ether	NA	NA	NA	NA	<0.0033	<0.0038	<0.14	<0.36	<1	<0.16	<2.3	<0.18	<0.0035	<0.033	<0.14	<0.13	<0.0035	<0.016
4-Chloro-3-methylphenol	NA	NA	NA	NA	<0.018	<0.021	<0.79	<2	<5.5	<0.85	<13	<1	<0.019	<0.18	<0.77	<0.7	<0.019	<0.089
4-Chloroaniline	NA	NA	NA	NA	<0.0068	<0.0078	<0.29	<0.74	<2.1	<0.32	<4.7	<0.38	<0.0072	<0.068	<0.29	<0.26	<0.0071	<0.033
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	<0.0021	<0.0024	<0.091	<0.23	<0.64	<0.099	<1.5	<0.12	<0.0022	<0.021	<0.089	<0.081	<0.0022	<0.01
4-Nitroaniline	NA	NA	NA	NA	<0.013	<0.015	<0.56 J	<1.4 J	<4. J	<0.61 J	<9. J	<0.72 J	<0.014	<0.13	<0.55 J	<0.5 J	<0.014	<0.064
4-Nitrophenol	NA	NA	NA	NA	<0.0059	<0.0068	<0.26 J	<0.65 J	<1.8 J	<0.28 J	<4.1 J	<0.33 J	<0.0063	<0.059	<0.25 J	<0.23 J	<0.0062	<0.029
Acenaphthene	20	NA	NA	NA	<0.0017	<0.0019	<0.073	<0.18	<0.51	<0.079	<1.2	<0.093	<0.0018	<0.017	<0.071	<0.065	<0.0018	<0.0082
Acenaphthylene	NA	NA	NA	NA	<0.0012	<0.0013	<0.051	<0.13	<0.35	<0.055	<0.81	<0.065	<0.0012	**0.19 J**	<0.05	<0.045	<0.0012	<0.0057
Aniline	NA	NA	NA	NA	<0.0035 J	<0.004 J	<0.15 J	<0.38 J	<1.1 J	<0.16 J	<2.4 J	<0.19 J	<0.0037 J	<0.035 J	<0.15 J	<0.13 J	<0.0037 J	<0.017 J
Anthracene	NA	NA	NA	NA	<0.0015	<0.0017	<0.065	<0.16	<0.45	<0.07	<1	<0.083	<0.0016	<0.015	<0.063	<0.058	<0.0016	<0.0073
Benzo[a]anthracene	NA	NA	NA	NA	<0.0016	<0.0019	<0.07	<0.18	<0.49	<0.076	<1.1	<0.09	<0.0017	<0.016	<0.068	<0.062	<0.0017	<0.0079
Benzo[a]pyrene	NA	NA	NA	NA	<0.0019	<0.0022	<0.081	<0.21	<0.57	<0.088	<1.3	<0.1	<0.002	<0.019	<0.08	<0.073	<0.002	<0.0092
Benzo[b]fluoranthene	NA	NA	NA	NA	<0.002	<0.0023	<0.087	<0.22	<0.61	<0.094	<1.4	<0.11	<0.0021	<0.02	<0.085	<0.078	<0.0021	<0.0098
Benzo[g,h,i]perylene	NA	NA	NA	NA	<0.0059	<0.0068	<0.26	<0.65	<1.8	<0.28	<4.1	<0.33	<0.0063	<0.059	<0.25	<0.23	<0.0062	<0.029
Benzo[k]fluoranthene	NA	NA	NA	NA	<0.0017	<0.002	<0.075	<0.19	<0.53	<0.082	<1.2	<0.097	<0.0018	<0.017	<0.074	<0.067	<0.0018	<0.0085
Benzyl alcohol	NA	NA	NA	NA	<0.0068	<0.0078	<0.29	<0.74	<2.1	<0.32	<4.7	<0.38	<0.0072	<0.068	<0.29	<0.26	<0.0072	<0.033
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	<0.0016	<0.0019	<0.072	<0.18	<0.5	<0.078	<1.1	<0.092	<0.0018	<0.017	<0.07	<0.064	<0.0017	<0.0081
Bis(2-chloroethyl)ether	NA	NA	NA	NA	<0.0019	<0.0022	<0.083	<0.21	<0.58	<0.09	<1.3	<0.11	<0.002	<0.019	<0.082	<0.075	<0.002	<0.0094
Bis(2-chloroisopropyl) ether	NA	NA	NA	NA	<0.01	<0.012	<0.45	<1.1	<3.1	<0.48	<7.1	<0.57	<0.011	<0.1	<0.44	<0.4	<0.011	<0.051
Bis(2-ethylhexyl) phthalate	NA	NA	NA	NA	<0.0062	<0.0072	<0.27	<0.68	<1.9	<0.29	<4.3	<0.35	<0.0067	<0.063	<0.27	<0.24	<0.0066	<0.031
Butyl benzyl phthalate	NA	NA	NA	NA	<0.0072	<0.0083	<0.31	<0.79	<2.2	<0.34	<5	<0.4	<0.0077	<0.072	<0.31	<0.28	<0.0076	<0.035
Chrysene	NA	NA	NA	NA	<0.0012	<0.0014	<0.052	<0.13	<0.36	<0.056	<0.82	<0.066	<0.0013	<0.012	<0.051	<0.046	<0.0013	<0.0058
Dibenz(a,h)anthracene	NA	NA	NA	NA	<0.0042	<0.0049	<0.18	<0.46	<1.3	<0.2	<2.9	<0.24	<0.0045	<0.042	<0.18	<0.16	<0.0045	<0.021
Dibenzofuran	NA	NA	NA	NA	<0.0021	<0.0024	<0.09	<0.23	<0.63	<0.097	<1.4	<0.12	<0.0022	<0.021	<0.088	<0.08	<0.0022	<0.01
Diethyl phthalate	100	NA	NA	NA	<0.0098	<0.011	<0.43	<1.1	<3	<0.46	<6.8	<0.55	**0.012 J**	<0.098	<0.42	<0.38	<0.01	<0.048
Dimethyl phthalate	NA	200	NA	NA	<0.0057	<0.0066	<0.25 J	<0.62 J	<1.7 J	<0.27 J	<3.9 J	<0.32 J	<0.0061	<0.057	<0.24 J	<0.22 J	<0.006	<0.028
Di-n-butyl phthalate	200	NA	NA	NA	<0.003	<0.0035	<0.13	<0.33	<0.92	<0.14	<2.1	<0.17	<0.0032	<0.03	<0.13	<0.12	<0.0032	<0.015
Di-n-octyl phthalate	NA	NA	NA	NA	<0.0022	<0.0026	<0.096 J	<0.24 J	<0.67 J	<0.1 J	<1.5 J	<0.12 J	<0.0024	<0.022	<0.094 J	<0.086 J	<0.0023	<0.011
Fluoranthene	NA	NA	NA	NA	<0.0036	<0.0042	<0.16	<0.4	<1.1	<0.17	<2.5	<0.2	<0.0039	<0.036	<0.15	<0.14	<0.0038	<0.018
Fluorene	NA	30	NA	NA	<0.0027	<0.0032	<0.12	<0.3	<0.84	<0.13	<1.9	<0.15	<0.0029	<0.027	<0.12	<0.11	<0.0029	<0.013
Hexachlorobenzene	NA	NA	NA	NA	<0.0018	<0.002	<0.077	<0.19	<0.54	<0.083	<1.2	<0.099	<0.0019	<0.018	<0.075	<0.069	<0.0019	<0.0087
Hexachlorocyclopentadiene	NA	NA	NA	NA	<0.0053	<0.0062	<0.23 J	<0.59 J	<1.6 J	<0.25 J	<3.7 J	<0.3 J	<0.0057 J	<0.054	<0.23 J	<0.21 J	<0.0057 J	<0.026
Hexachloroethane	NA	NA	NA	NA	<0.0027	<0.0031	<0.12 J	<0.29 J	<0.82 J	<0.13 J	<1.9 J	<0.15 J	<0.0029	<0.027	<0.11 J	<0.1 J	<0.0028	<0.013
Indeno[1,2,3-cd]pyrene	NA	NA	NA	NA	<0.0041	<0.0047	<0.18	<0.45	<1.2	<0.19	<2.8	<0.23	<0.0043	<0.041	<0.17	<0.16	<0.0043	<0.02
Isophorone	NA	NA	NA	NA	<0.0012	<0.0013	<0.051	<0.13	<0.35	<0.055	<0.81	<0.065	<0.0012	<0.012	<0.05	<0.045	<0.0012	<0.0057
Nitrobenzene	NA	NA	NA	NA	<0.0034	<0.004	<0.15 J	<0.38 J	<1. J	<0.16 J	<2.4 J	<0.19 J	<0.0037	<0.034	<0.15 J	<0.13 J	<0.0036	<0.017
N-Nitrosodi-n-propylamine	NA	NA	NA	NA	<0.0026	<0.003	<0.11 J	<0.28 J	<0.79 J	<0.12 J	<1.8 J	<0.14 J	<0.0027	<0.026	<0.11 J	<0.1 J	<0.0027	<0.013
Pentachlorophenol	5	31	NA	NA	<0.0046	<0.0054	<0.2 J	<0.51 J	<1.4 J	<0.22 J	<3.2 J	<0.26 J	<0.005	<0.047	<0.2 J	<0.18 J	<0.0049	<0.023
Phenanthrene	NA	NA	NA	NA	<0.0057	<0.0067	<0.25	<0.63	<1.8	<0.27	<4	<0.32	<0.0061	<0.058	<0.25	<0.22	<0.0061	<0.028
Phenol	70	30	NA	NA	<0.0049	<0.0057	<0.21	<0.54	<1.5	<0.23	<3.4	<0.28	<0.0053	<0.049	<0.21	<0.19	<0.0052	<0.024
Pyrene	NA	NA	NA	NA	<0.0021	<0.0025	<0.093	<0.23	<0.65	<0.1	<1.5	<0.12	<0.0023	<0.021	<0.091	<0.083	<0.0022	<0.01
Low molecular weight PAH[7, 8]	29	NA	100	NA	**0.0082**	**0.0037**	NC	**0.0059**	**0.95**	NC	NC	NC	NC	**0.19**	NC	**0.39**	NC	NC
High molecular weight PAH[7]	18	NA	1.1	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Total PAH[7, 8]	NA	NA	NA	NA	**0.0082**	**0.0037**	NC	**0.0059**	**0.95**	NC	NC	NC	NC	**0.19**	NC	**0.39**	NC	NC

NOTES:
1. All units are mg/kg.
2. Detected compounds are presented in **bold** type.
3. Plant and Invertebrate Soil Screening Levels taken from EPA SSL documents and TCEQ (2006). EPA Eco SSL documents used primarily, followed by TCEQ (2006).
   Mammalian and Avian Soil Screening Levels represent screening levels for chronic exposure to the most sensitive receptor in the class of receptor evaluated (EPA, 2003b).
4. There are no exceedances of any of the available soil screening levels.
5. < = Compound not detected at the indicated laboratory detection lmit. bgs = Below ground surface. NA = Not applicable, no value provided. NC = Not calculated since no compounds were measured in this class of PAHs
6. J = Estimated value. J+ = Estimated value with a potential high bias. J- = Estimated value with a potential low bias.
7. LPAH, HPAH, and Total PAH were summed according to TCEQ, 2006 guidance.
8. Naphthalene was analyzed as part of the volatile organic suite of compounds (see Table 4) but, when it was measured in a given sample, the concentration was included in the PAH class analysis on this table.

TABLE 7
DITCH SURFACE WATER SAMPLING RESULTS COMPARED TO ACUTE AQUATIC LIFE CRITERIA AND WILDLIFE SCREENING VALUES
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Location ID: / **Sample Date:**	Freshwater Acute Screening Level[1]	Wildlife Screening Value[2]	SW-1 10/11/2011	SW-2 10/11/2011	SW-3 10/11/2011	SW-4 10/11/2011	SW-5 10/11/2011
Constituent			mg/L	mg/L	mg/L	mg/L	mg/L
Total Metals							
Aluminum	0.991	6.95	**0.031 J**	**0.025 J**	**0.029 J**	**0.022 J**	**0.022 J**
Arsenic	0.34	0.45	**0.0065 J**	**0.0055 J**	**0.0046 J**	**0.0044 J**	**0.0047 J**
Barium	NA	35.8	**0.066**	**0.064**	**0.063**	**0.057**	**0.065**
Chromium*	1.09	7.26	<0.0016	<0.0016	<0.0016	<0.0016	<0.0016
Cobalt	45	NA	**0.00067 J**	**0.00069 J**	<0.00063	<0.00063	**0.00074 J**
Copper*	0.0275	101	**0.0086 J**	**0.008 J**	**0.0088 J**	**0.0063 J**	**0.008 J**
Lead*	0.137	8.21	<0.0029	<0.0029	<0.0029	<0.0029	<0.0029
Manganese	NA	586	**0.044**	**0.051**	**0.025**	**0.011**	**0.07**
Mercury	0.0024	3.27	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026
Nickel*	0.849	266	<0.0018	**0.0018 J**	**0.0026 J**	**0.0021 J**	<0.0018
Selenium	0.02	1.33	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
Thallium	NA	0.05	**0.0078**	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	NA	1.3	**0.0034 J**	**0.004 J**	**0.0056 J**	**0.0035 J**	**0.0043 J**
Zinc*	0.213	105	**0.066**	**0.072**	**0.081**	**0.064**	**0.061**
Volatile Organic Compounds (VOCs)							
1,1,1,2-Tetrachloroethane	NA	NA	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,1,1-Trichloroethane	14.7	3744	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
1,1,2,2-Tetrachloroethane	2.79	NA	<0.00022 J	<0.00022 J	<0.00022 J	<0.00022 J	<0.00022 J
1,1,2-Trichloroethane	5.4	NA	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028
1,1-Dichloroethane	15.37	NA	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
1,1-Dichloroethene	9.1	200	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
1,1-Dichloropropene	NA	NA	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021
1,2,3-Trichloropropane	NA	NA	<0.00029 J	<0.00029 J	<0.00029 J	<0.00029 J	<0.00029 J
1,2,4-Trichlorobenzene	0.309	NA	<0.00031	<0.00031	<0.00031	<0.00031	<0.00031
1,2,4-Trimethylbenzene	0.462	NA	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
1,2-Dibromo-3-Chloropropane	NA	NA	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J	<0.00081 J
1,2-Dibromoethane	NA	NA	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
1,2-Dichlorobenzene	0.66	NA	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,2-Dichloroethane	37.7	125	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
1,2-Dichloropropane	11.2	NA	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
1,3,5-Trimethylbenzene	0.4245	NA	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,3-Dichlorobenzene	0.153	NA	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
1,3-Dichloropropane	NA	NA	<0.00022	<0.00022	<0.00022	<0.00022	<0.00022
1,4-Dichlorobenzene	0.66	NA	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
2,2-Dichloropropane	NA	NA	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Butanone (MEK)	254.42	11790	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J	<0.00076 J
2-Chlorotoluene	NA	NA	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
2-Hexanone	36.79	NA	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035
4-Chlorotoluene	NA	NA	<0.00014	<0.00014	<0.00014	<0.00014	<0.00014
4-Isopropyltoluene	NA	NA	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
4-Methyl-2-pentanone (MIBK)	158.1	166	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
Acetone	607.4	66.6	**0.0084 J-**	**0.0087 J-**	**0.0067 J-**	**0.0071 J-**	**0.0052 J-**
Benzene	NA	95	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Bromobenzene	NA	NA	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromodichloromethane	12.962	NA	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
Bromoform	0.897	NA	<0.00019	<0.00019	<0.00019	<0.00019	<0.00019
Bromomethane	0.66	NA	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
Carbon disulfide	0.7	NA	<0.00024	<0.00024	<0.00024	<0.00024	<0.00024
Carbon tetrachloride	NA	107	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Chlorobenzene	NA	NA	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Chloroethane	NA	NA	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Chloroform	5.34	100	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Chloromethane	165	NA	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J	<0.00018 J
cis-1,2-Dichloroethene	NA	NA	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006
cis-1,3-Dichloropropene	NA	NA	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Dibromochloromethane	771	NA	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
Dibromomethane	NA	NA	<0.00052	<0.00052	<0.00052	<0.00052	<0.00052
Dichlorodifluoromethane	11.78	NA	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J	<0.00012 J
Ethylbenzene	6.54	NA	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Hexachlorobutadiene	NA	NA	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017
Iodomethane	NA	NA	<0.002	<0.002	<0.002	<0.002	<0.002
Isopropylbenzene	1.53	NA	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Methyl tert-butyl ether	66.043	NA	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Methylene Chloride	66	38.9	<0.00015 J	<0.00015 J	<0.00015 J	<0.00015 J	<0.00015 J
Naphthalene	1.48	NA	<0.00032	<0.00032	<0.00032	<0.00032	<0.00032
n-Butylbenzene	0.213	NA	<0.00016	<0.00016	<0.00016	<0.00016	<0.00016
N-Propylbenzene	0.385	NA	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
sec-Butylbenzene	0.246	NA	<0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Styrene	7.515	NA	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
tert-Butylbenzene	0.289	NA	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Tetrachloroethene	4.7	NA	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Toluene	8.7	93.7	<0.00015	<0.00015	<0.00015	<0.00015	<0.00015
trans-1,2-Dichloroethene	66	NA	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
trans-1,3-Dichloropropene	NA	NA	<0.00021	<0.00021	<0.00021	<0.00021	<0.00021
Trichloroethene	3.331	2.52	<0.00018	<0.00018	<0.00018	<0.00018	<0.00018
Trichlorofluoromethane	NA	NA	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Vinyl chloride	16.9	1.13	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Xylenes, Total	4.02	7.56	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026

TABLE 7
DITCH SURFACE WATER SAMPLING RESULTS COMPARED TO ACUTE AQUATIC LIFE CRITERIA AND WILDLIFE SCREENING VALUES
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Location ID: / **Sample Date:**	Freshwater Acute Screening Level[1]	Wildlife Screening Value[2]	SW-1 10/11/2011	SW-2 10/11/2011	SW-3 10/11/2011	SW-4 10/11/2011	SW-5 10/11/2011
Constituent			mg/L	mg/L	mg/L	mg/L	mg/L
Semivolatile Organic Compounds (SVOCs)							
2,4,5-Trichlorophenol	0.136	NA	<0.00025	<0.00025	<0.00025	<0.00042 J	<0.00025
2,4,6-Trichlorophenol	0.081	NA	<0.00018	<0.00018	<0.00018	<0.0003	<0.00018
2,4-Dichlorophenol	0.51	NA	<0.00015	<0.00015	<0.00015	<0.00025 J	<0.00015
2,4-Dimethylphenol	0.63	NA	<0.00031	<0.00031	<0.00031	<0.00052	<0.00031
2,4-Dinitrophenol	0.186	NA	<0.00038	<0.00038	<0.00038	<0.00065 J	<0.00038
2,4-Dinitrotoluene	7.29	NA	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013
2,6-Dinitrotoluene	NA	NA	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079
2-Chloronaphthalene	0.323	NA	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079
2-Chlorophenol	0.78	NA	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013
2-Methylnaphthalene	0.38	NA	<0.000069	<0.000069	<0.000069	<0.00012 J	<0.000069
2-Nitroaniline	NA	NA	<0.00019	<0.00019	<0.00019	<0.00032 J	<0.00019
2-Nitrophenol	5.753	NA	<0.00022	<0.00022	<0.00022	<0.00037 J	<0.00022
3 & 4 Methylphenol	1.63	NA	<0.0002	<0.0002	<0.0002	<0.00033 J	<0.0002
3,3'-Dichlorobenzidine	0.315	NA	<0.00018	<0.00018	<0.00018	<0.0003 J	<0.00018
3-Nitroaniline	NA	NA	<0.00016	<0.00016	<0.00016	<0.00027 J	<0.00016
4,6-Dinitro-2-methylphenol	0.069	NA	<0.00082 J	<0.00082 J	<0.00082 J	<0.0014 J	<0.00082 J
4-Bromophenyl phenyl ether	NA	NA	<0.000099	<0.000099	<0.000099	<0.00017	<0.000099
4-Chloro-3-methylphenol	NA	NA	<0.00017	<0.00017	<0.00017	<0.00028 J	<0.00017
4-Chloroaniline	NA	NA	<0.00021	<0.00021	<0.00021	<0.00035 J	<0.00021
4-Chlorophenyl phenyl ether	NA	NA	<0.000099	<0.000099	<0.000099	<0.00017	<0.000099
4-Nitroaniline	NA	NA	<0.00025	<0.00025	<0.00025	<0.00042 J	<0.00025
4-Nitrophenol	3.193	NA	<0.00055 J	<0.00055 J	<0.00055 J	<0.00093 J	<0.00055 J
Acenaphthene	NA	NA	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079
Acenaphthylene	NA	NA	<0.000059	<0.000059	<0.000059	<0.0001 J	<0.000059
Aniline	NA	NA	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079
Anthracene	0.0018	NA	<0.000049	<0.000049	<0.000049	<0.000083 J	<0.000049
Benzo[a]anthracene	0.2076	NA	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079
Benzo[a]pyrene	NA	3.6	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079
Benzo[b]fluoranthene	NA	NA	<0.000069	<0.000069	<0.000069	<0.00012 J	<0.000069
Benzo[g,h,i]perylene	NA	NA	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079
Benzo[k]fluoranthene	NA	NA	<0.000089	<0.000089	<0.000089	<0.00015 J	<0.000089
Benzyl alcohol	NA	NA	<0.00017	<0.00017	<0.00017	<0.00028 J	<0.00017
Bis(2-chloroethoxy)methane	NA	NA	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013
Bis(2-chloroethyl)ether	72	NA	<0.00015	<0.00015	<0.00015	<0.00025 J	<0.00015
Bis(2-chloroisopropyl) ether	37.847	NA	<0.00039	<0.00039	<0.00039	<0.00067 J	<0.00039
Bis(2-ethylhexyl) phthalate	NA	7.99	<0.00036	<0.00036	<0.00036	<0.00062 J	<0.0028
Butyl benzyl phthalate	0.56	NA	<0.00012	<0.00012	<0.00012	<0.00059	<0.00012
Chrysene	0.207	NA	<0.000079	<0.000079	<0.000079	<0.00013	<0.000079
Dibenz(a,h)anthracene	0.149	NA	<0.000079	<0.000079	<0.000079	<0.00013 J	<0.000079
Dibenzofuran	0.562	0.094	<0.000079	<0.000079	**0.00024 J**	<0.00013	<0.000079
Diethyl phthalate	6.259	NA	<0.0015	<0.0015	<0.0015	<0.0025	<0.0015
Dimethyl phthalate	NA	NA	<0.000069	<0.000069	<0.000069	<0.00012	<0.000069
Di-n-butyl phthalate	0.221	NA	<0.00011	<0.00011	<0.00011	<0.00018	<0.00011
Di-n-octyl phthalate	NA	NA	<0.00016	<0.00016	<0.00016	<0.00027 J	<0.00016
Fluoranthene	NA	NA	<0.000069	<0.000069	<0.000069	<0.00012	<0.000069
Fluorene	0.064	NA	<0.000069	<0.000069	<0.000069	<0.00012	<0.000069
Hexachlorobenzene	NA	NA	<0.00011	<0.00011	<0.00011	<0.00018	<0.00011
Hexachlorocyclopentadiene	NA	NA	<0.00013	<0.00013	<0.00013	<0.00022 J	<0.00013
Hexachloroethane	NA	NA	<0.000099	<0.000099	<0.000099	<0.00017 J	<0.000099
Indeno[1,2,3-cd]pyrene	NA	NA	<0.000069	<0.000069	<0.000069	<0.00012 J	<0.000069
Isophorone	36	NA	<0.00011	<0.00011	<0.00011	<0.00018 J	<0.00011
Nitrobenzene	NA	NA	<0.00011	<0.00011	<0.00011	<0.00018 J	<0.00011
N-Nitrosodi-n-propylamine	0.6	NA	<0.000099	<0.000099	<0.000099	<0.00017 J	<0.000099
Pentachlorophenol	0.0033	NA	<0.0006 J	<0.0006 J	<0.0006 J	<0.001	<0.0006 J
Phenanthrene	0.03	NA	<0.000059	<0.000059	<0.000059	<0.0001	<0.000059
Phenol	NA	NA	<0.000039 J	<0.000039 J	<0.000039 J	<0.000067 J	<0.000039 J
Pyrene	0.206	NA	<0.00011	<0.00011	<0.00011	<0.00018	<0.00011

NOTES:

1. Aquatic Life Surface Water Risk-Based Exposure Limits from TCEQ, updated January 19, 2011.
2. Screening Values are based on Sample, et al, 1996 Appendix D, Table 12.
3. Detected compounds are presented in **bold** type.
4. Shading = Detected compound exceeds the Freshwater Acute Screening Level.
5. NA = Not available.
6. < = Compound not detected at indicated detection limit. J = Estimated value. J- = Estimated value with potential low bias.

* Acute Screening Level adjusted for hardness of 202 mg/L which is from the nearest classified segment (1911) on the San Antonio River.

Table 8
SUMMARY OF DETECTED COMPOUNDS IN SURFACE SOIL (0 to 0.5 bgs)
R&H Oil/Tropicana Energy Site, San Antonio, Texas

	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Average Detection (mg/kg)	95% Upper Confidence Limit (mg/kg)	Statistic Used[2]	Frequency of Detection	Frequency of Screening Level Exceedance
Surface Soil							
TOTAL PETROLEUM HYDROCARBONS							
>C12-C28	130	5500	1406	2251	95% KM (t) UCL	10 of 17	NSL
>C28-C35	87	6500	1411	2258	95% KM (t) UCL	10 of 17	NSL
C6-C35 (Total)	210	12000	2804	4484	95% KM (t) UCL	10 of 17	NSL
METALS							
Aluminum	620	14000	5944	7657	95% Student's-t UCL	17 of 17	0 of 17
Arsenic	0.51	7.9	3.864	4.734	95% Student's-t UCL	17 of 17	0 of 17
Barium	8.5	230	81.15	107.6	95% Student's-t UCL	17 of 17	0 of 17
Chromium	1.8	20	9.941	12.34	95% Student's-t UCL	17 of 17	**17 of 17**
Cobalt	0.51	6.5	2.616	4.388	95% Student's-t UCL	17 of 17	0 of 17
Copper	1.5	49	15.39	23.4	95% Approx. Gamma UCL	17 of 17	**2 of 17**
Lead	2.9	430	77.35	140.1	95% Approx. Gamma UCL	17 of 17	**14 of 17**
Manganese	28	280	166.8	202.1	95% Student's-t UCL	17 of 17	**5 of 17**
Mercury	0.0035	0.37	0.103	0.184	95% Approx. Gamma UCL	17 of 17	**5 of 17**
Nickel	0.99	17	6.829	8.451	95% Student's-t UCL	17 of 17	0 of 17
Vanadium	3.1	25	13.88	16.66	95% Student's-t UCL	17 of 17	**17 of 17**
Zinc	3.9	360	92.62	156	95% Approx. Gamma UCL	17 of 17	**12 of 17**
VOLATILE ORGANIC COMPOUNDS							
1,2,4-Trimethylbenzene	0.0011	0.0011	0.0011	NC	NC	1 of 17	NSL
4-Isopropyltoluene	0.001	0.0079	0.00445	NC	NC	2 of 17	NSL
4-Methyl-2-pentanone (MIBK)	0.004	0.004	0.004	NC	NC	1 of 17	NSL
Acetone	0.017	0.19	0.0692	0.0911	95% KM (t) UCL	13 of 17	NSL
Benzene	6.20E-04	0.0026	0.00139	0.00168	95% KM (t) UCL	11 of 17	NSL
Ethylbenzene	0.0016	0.0027	0.0021	NC	NC	3 of 17	NSL
Methylene Chloride	0.0026	0.029	0.0158	NC	NC	2 of 17	NSL
Naphthalene	0.0033	0.0033	0.0033	NC	NC	1 of 17	NSL
Toluene	0.002	0.0032	0.0022	0.00239	95% KM (t) UCL	5 of 17	0 of 17
Xylenes, Total	0.0013	0.0022	0.00175	NC	NC	2 of 17	NSL
SEMI-VOLATILE ORGANIC COMPOUNDS							
2-Methylnaphthalene	0.0077	0.081	0.0227	0.0396	95% KM (t) UCL	4 of 17	NSL
Acenaphthene	0.011	0.2	0.0997	NC	NC	3 of 17	NSL
Acenaphthylene	0.098	0.098	0.098	NC	NC	1 of 17	NSL
Anthracene	0.025	0.83	0.107	0.199	95% KM (t) UCL	5 of 17	NSL
Benzo[a]anthracene	0.032	4.1	0.342	0.915	95% KM (BCA) UCL	8 of 17	NSL
Benzo[a]pyrene	0.031	3.4	0.334	0.749	95% KM (t) UCL	6 of 17	NSL
Benzo[b]fluoranthene	0.031	4.3	0.398	0.882	95% KM (t) UCL	7 of 17	NSL
Benzo[g,h,i]perylene	0.025	1.5	0.181	0.352	95% KM (t) UCL	5 of 17	NSL
Benzo[k]fluoranthene	0.026	2.8	0.244	0.553	95% KM (t) UCL	5 of 17	NSL
Chrysene	0.031	4.4	0.385	0.923	95% KM (t) UCL	7 of 17	NSL
Dibenz(a,h)anthracene	0.6	0.6	0.6	NC	NC	1 of 17	NSL
Dibenzofuran	0.0084	0.37	0.0498	0.102	95% KM (t) UCL	4 of 17	NSL
Di-n-butyl phthalate	1.3	1.3	1.3	NC	NC	1 of 17	NSL
Fluoranthene	0.076	12	0.928	2.504	95 % KM (BCA) UCL	8 of 17	NSL
Fluorene	0.012	0.012	0.012	NC	NC	1 of 17	0 of 17
Indeno[1,2,3-cd]pyrene	0.023	1.5	0.198	0.383	95% KM (t) UCL	6 of 17	NSL
Phenanthrene	0.071	2.3	0.358	0.616	95% KM (t) UCL	7 of 17	NSL
Pyrene	0.055	8.4	0.742	1.849	95% KM (t) UCL	6 of 17	NSL
Low molecular weight PAH[7, 8]	0.0077	3.33	NR[6]	NR	NR	10 of 17	0 of 17
High molecular weight PAH[7]	0.055	32.9	NR	NR	NR	9 of 17	**4 of 17**
Total PAH[7, 8]	0.0077	46.33	NR	NR	NR	10 of 17	NSL

NOTES:
1. All units are mg/kg.
2. See Appendix D for statistical calculations. If there were three of less measured detections, a 95% upper confidence limit could not be calculated. It should be noted that for most samples with a high number of non-detects, there is significant uncertainty related to calculating reliable and meaningful test statistics.
3. Mammalian and Avian Soil Screening Levels represent screening levels for chronic exposure to the most sensitive receptor in the class of receptor evaluated (EPA, 2003).
4. Shading = Detected compound exceeds either of the screening levels.
-- an ecological screening level is exceeded in the sample.
5. bgs = Below ground surface. NSL = No screening level. NC = Not calculated given the small number of detections.
6. NR = Not relevant. Summary statistics for data grouped by class is not meaningful since not all compounds within that class are consistently measured in the samples.
7. LPAH, HPAH, and Total PAH were summed according to TCEQ, 2006 guidance.
8. Naphthalene was analyzed as part of the volatile organic suite of compounds (see Table 3) but, when it was measured in a given sample, the concentration was included in the PAH class analysis on this table.

Table 9
SUMMARY OF DETECTED COMPOUNDS IN SHALLOW SOIL (approx. 2 to 5 ft. bgs)
R&H Oil/Tropicana Energy Site, San Antonio, Texas

	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Average Detection (mg/kg)	95% Upper Confidence Limit (mg/kg)	Statistic Used[2]	Frequency of Detection	Frequency of Screening Level Exceedance
Shallow Soil							
TOTAL PETROLEUM HYDROCARBONS							
>C12-C28	390	70000	9826	22700	95% KM (BCA) UCL	8 of 14	NSL
>C28-C35	170	22000	3767	7602	95% KM (t) UCL	7 of 14	NSL
C6-C35 (Total)	560	92000	13573	29226	95% KM (BCA) UCL	8 of 14	NSL
METALS							
Aluminum	2200	17000	13871	17000	Maximum	14 of 14	0 of 14
Arsenic	2.7	5.4	4.114	4.506	95% Student's-t UCL	14 of 14	0 of 14
Barium	68	170	106.5	118.1	95% Student's-t UCL	14 of 14	0 of 14
Chromium	2	14	11.36	12.8	95% Student's-t UCL	14 of 14	**14 of 14**
Cobalt	1.3	7.2	4.907	5.515	95% Student's-t UCL	14 of 14	0 of 14
Copper	8.5	18	10.4	11.58	95% Student's-t UCL	14 of 14	0 of 14
Lead	11	270	45.64	130.5	95% Chebyshev UCL	14 of 14	**13 of 14**
Manganese	27	390	242.6	285.4	95% Student's-t UCL	14 of 14	**8 of 14**
Mercury	0.0026	0.45	0.0553	0.2	95% Chebyshev UCL	14 of 14	2 of 14
Nickel	6.1	14	10.32	11.2	95% Student's-t UCL	14 of 14	0 of 14
Vanadium	4.2	36	22.09	25.58	95% Student's-t UCL	14 of 14	**14 of 14**
Zinc	8.3	110	36.74	64.42	95% Chebyshev UCL	14 0f 14	**2 of 14**
VOLATILE ORGANIC COMPOUNDS							
1,2,4-Trimethylbenzene	0.0034	1.5	0.52	NC	NC	3 of 14	NSL
1,3,5-Trimethylbenzene	0.65	0.65	0.65	NC	NC	1 of 14	NSL
2-Butanone (MEK)	0.051	4	1.457	NC	NC	3 of 14	NSL
2-Hexanone	0.016	0.016	0.016	NC	NC	1 of 14	NSL
4-Isopropyltoluene	0.0049	0.0049	0.0049	NC	NC	1 of 14	NSL
Acetone	0.027	15	1.365	12.11	99% KM (Chebyshev)	11 of 14	NSL
Benzene	0.0022	3.3	0.374	0.845	95% KM (t) UCL	7 of 14	NSL
Carbon disulfide	0.0096	0.0096	0.0096	NC	NC	1 of 14	NSL
Ethylbenzene	0.0017	0.069	0.0265	NC	NC	3 of 14	NSL
Isopropylbenzene	0.025	0.14	0.0825	NC	NC	2 of 14	NSL
Naphthalene	0.0033	0.95	0.241	NC	NC	3 of 14	NSL
n-Butylbenzene	0.0051	0.0051	0.0051	NC	NC	1 of 14	NSL
N-Propylbenzene	0.0026	0.23	0.0892	NC	NC	3 of 14	NSL
sec-Butylbenzene	0.0063	0.03	0.0168	NC	NC	3 of 14	NSL
tert-Butylbenzene	0.0041	0.0041	0.0041	NC	NC	1 of 14	NSL
Toluene	0.0021	0.5	0.0654	0.456	99% KM (Chebyshev)	11 of 14	0 of 14
Xylenes, Total	0.0016	2.4	0.199	0.512	95% KM (t) UCL	7 of 14	NSL
SEMI-VOLATILE ORGANIC COMPOUNDS							
2-Methylnaphthalene	0.0082	0.39	0.199	NC	NC	2 of 14	NSL
Acenaphthylene	0.19	0.19	0.19	NC	NC	1 of 14	NSL
Diethyl phthalate	0.012	0.012	0.012	NC	NC	1 of 14	0 of 14
Low molecular weight PAH[7, 8]	0.0037	0.95	NR[6]	NR	NR	6 of 14	0 of 14
High molecular weight PAH[7]	not detected	not detected	NR	NR	NR	0 of 14	0 of 14
Total PAH[7, 8]	0.0037	0.95	NR	NR	NR	6 of 14	NSL

NOTES:
1. All units are mg/kg.
2. See Appendix D for statistical calculations. If there were three or less measured detections, a 95% upper confidence limit could not be calculated. It should be noted that for most samples with a high number of non-detects, there is significant uncertainty related to calculating reliable and meaningful test statistics.
3. Mammalian and Avian Soil Screening Levels represent screening levels for chronic exposure to the most sensitive receptor in the class of receptor evaluated (EPA, 2003).
4. Shading = Detected compound exceeds either of the screening levels.
-- an ecological screening level is exceeded in the sample.
5. bgs = Below ground surface. NSL = No screening level. NC = Not calculated given the small number of detections.
6. NR = Not relevant. Summary statistics for data grouped by class is not meaningful since not all compounds within that class are consistently measured in the samples.
7. LPAH, HPAH, and Total PAH were summed according to TCEQ, 2006 guidance.
8. Naphthalene was analyzed as part of the volatile organic suite of compounds (see Table 4) but, when it was measured in a given sample, the concentration was included in the PAH class analysis on this table.

TABLE 10
SUMMARY OF DETECTED COMPOUNDS IN DITCH SURFACE WATER
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Location ID: / **Sample Date:**	Freshwater Acute Screening Level[1]	SW-1 10/11/2011	SW-2 10/11/2011	SW-3 10/11/2011	SW-4 10/11/2011	SW-5 10/11/2011
Constituent		mg/L	mg/L	mg/L	mg/L	mg/L
Total Metals by US EPA Method 6010B/7471A						
Aluminum	0.991	**0.031 J**	**0.025 J**	**0.029 J**	**0.022 J**	**0.022 J**
Arsenic	0.34	**0.0065 J**	**0.0055 J**	**0.0046 J**	**0.0044 J**	**0.0047 J**
Barium	NA	**0.066**	**0.064**	**0.063**	**0.057**	**0.065**
Cobalt	45	**0.00067 J**	**0.00069 J**	<0.00063	<0.00063	**0.00074 J**
Copper*	0.0275	**0.0086 J**	**0.008 J**	**0.0088 J**	**0.0063 J**	**0.008 J**
Manganese	NA	**0.044**	**0.051**	**0.025**	**0.011**	**0.07**
Nickel*	0.849	<0.0018	**0.0018 J**	**0.0026 J**	**0.0021 J**	<0.0018
Thallium	NA	**0.0078**	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	NA	**0.0034 J**	**0.004 J**	**0.0056 J**	**0.0035 J**	**0.0043 J**
Zinc*	0.213	**0.066**	**0.072**	**0.081**	**0.064**	**0.061**
Volatile Organic Compounds (VOCs) by US EPA Method 8260B						
Acetone	607.4	**0.0084 J-**	**0.0087 J-**	**0.0067 J-**	**0.0071 J-**	**0.0052 J-**
Semivolatile Organic Compounds (SVOCs) by US EPA Method 8270C						
Dibenzofuran	0.562	<0.000079	<0.000079	**0.00024 J**	<0.00013	<0.000079

NOTES:

1. Aquatic Life Surface Water Risk-Based Exposure Limits from TCEQ, updated January 19, 2011.
2. Detected compounds are presented in **bold** type.
3. Shading = Detected compound exceeds the Freshwater Acute Screening Level.
4. NA = Not available.
5. < = Compound not detected at indicated detection limit. J = Estimated value. J- = Estimated value with potential low bias.

* Acute Screening Level adjusted for hardness of 202 mg/L which is from the nearest classified segment (1911) on the San Antonio River.

TABLE 11
SUMMARY OF COMPOUNDS BY MEDIA WITH SCREENING LEVEL EXCEEDANCES
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Constituent	Screening Level Exceeded	Frequency of Exceedance	Associated Data Table
Surface Soil			
Chromium	Plant	17 of 17	Table 2
	Invertebrate	17 of 17	
Copper	Avian Chronic SSL	2 of 17	Table 2
Lead	Plant	2 of 17	Table 2
	Mammalian Chronic SSL	7 of 17	
	Avian Chronic SSL	14 of 17	
Manganese	Plant	5 of 17	Table 2
Mercury	Plant	1 of 17	Table 2
	Invertebrate	5 of 17	
Vanadium	Plant	17 of 17	Table 2
	Avian Chronic SSL	13 of 17	
Zinc	Plant	3 of 17	Table 2
	Invertebrate	4 of 17	
	Mammalian Chronic SSL	7 of 17	
	Avian Chronic SSL	12 of 17	
High Molecular-Weight PAHs	Mammalian Chronic SSL	4 of 17	Table 5
Shallow Soil*			
Chromium	Plant	14 of 14	Table 2
	Invertebrate	14 of 14	
Lead	Plant	2 of 14	Table 2
	Mammalian Chronic SSL	2 of 14	
	Avian Chronic SSL	13 of 14	
Manganese	Plant	8 of 14	Table 2
Mercury	Plant	1 of 14	Table 2
	Invertebrate	2 of 14	
Vanadium	Plant	14 of 14	Table 2
	Avian Chronic SSL	13 of 14	
Zinc	Mammalian Chronic SSL	1 of 14	Table 2
	Avian Chronic SSL	2 of 14	
Surface Water			
No Compounds Exceed	Freshwater Acute Screening Level		Table 7

Notes:
* It is unlikely that avian receptors at the Site would encounter shallow soil since it is from 2 to 5 ft. below ground surface.

TABLE 12
COMPARISON OF BACKGROUND CONCENTRATIONS TO SITE CONCENTRATIONS AND CHRONIC SCREENING LEVELS IN SOIL
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Constituent	Plant Soil Screening Level (mg/kg)[3]	Invertebrate Soil Screening Level (mg/kg)[3]	Mammalian Soil Screening Level (mg/kg)[1]	Avian Soil Screening Level (mg/kg)[1]	Texas-Specific Background Value (mg/kg)	Kelly AFB Background Study (SAALC, 1999) (mg/kg)	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Average Detection (mg/kg)	95% Upper Confidence Limit (mg/kg)
Surface Soil										
Chromium[4]	1	0.4	34	26	30	43	1.8	**20**	9.941	12.34
Copper	70	80	49	28	15	30	1.5	49	15.39	23.4
Lead	120	1,700	56	11	15	33	2.9	430	77.35	140.1
Manganese[4]	220	450	4,000	43,000	300	510	28	**280**	166.8	202.1
Mercury	0.3	0.1	NSL	NSL	0.04	NBL	0.0035	0.37	0.103	0.174
Vanadium[4]	2	NSL	280	7.8	50	57	3.1	**25**	13.88	16.66
Zinc	160	120	79	46	30	73	3.9	360	92.62	156
High Molecular-Weight PAHs	18	NSL	1.1	NSL	Not Available*	Not Available*	0.055	32.9	NR	NR
Shallow Soil										
Chromium[4]	1	0.4	34	26	30	43	2	**14**	11.36	12.27
Lead	20	1,700	56	11	15	33	11	270	45.64	130.5
Manganese[4]	220	450	4,000	43,000	300	510	27	**390**	242.6	285.4
Mercury	0.3	0.1	NSL	NSL	0.04	NBL	0.0026	0.45	0.0553	0.2
Vanadium[4]	2	NSL	280	7.8	50	57	4.2	**36**	22.09	25.58
Zinc	60	120	79	46	30	73	8.3	110	36.74	64.42

Notes:
1. Mammalian and Avian Soil Screening Levels represent screening levels for chronic exposure to the most sensitive receptor in the class of receptor evaluated (EPA, 2003b).
2. NSL = No Screening Level available. NBL = No Background Level available.
3. NR = Not relevant. Summary statistics for data grouped by class is not meaningful since not all compounds within that class are consistently measured in the samples.
4. Outlined cell indicates maximum Site concentration is below background.

* Not available. While PAHs have been shown to be ubiquitous in urban areas, there are no background levels established for specifically Texas or Kelly AFB.

TABLE 13

UPSTREAM DITCH SURFACE WATER SAMPLING RESULTS COMPARED TO DOWNSTREAM

R&H Oil/Tropicana Energy Site, San Antonio, Texas

Location ID: **Sample Date:**	Freshwater Acute Screening Level[1]	**DOWNSTREAM** SW-1 10/11/2011	**DOWNSTREAM** SW-2 10/11/2011	**DOWNSTREAM** SW-3 10/11/2011	**UPSTREAM** SW-4 10/11/2011	**UPSTREAM** SW-5 10/11/2011
Constituent		mg/L	mg/L	mg/L	mg/L	mg/L
Total Metals by US EPA Method 6010B/7471A						
Aluminum	0.991	**0.031 J**	**0.025 J**	**0.029 J**	**0.022 J**	**0.022 J**
Arsenic	0.34	**0.0065 J**	**0.0055 J**	**0.0046 J**	**0.0044 J**	**0.0047 J**
Barium	NA	**0.066**	**0.064**	**0.063**	**0.057**	**0.065**
Cobalt	45	**0.00067 J**	**0.00069 J**	<0.00063	<0.00063	**0.00074 J**
Copper*	0.0275	**0.0086 J**	**0.008 J**	**0.0088 J**	**0.0063 J**	**0.008 J**
Manganese	NA	**0.044**	**0.051**	**0.025**	**0.011**	**0.07**
Nickel*	0.849	<0.0018	**0.0018 J**	**0.0026 J**	**0.0021 J**	<0.0018
Thallium	NA	**0.0078**	<0.0078	<0.0078	<0.0078	<0.0078
Vanadium	NA	**0.0034 J**	**0.004 J**	**0.0056 J**	**0.0035 J**	**0.0043 J**
Zinc*	0.213	**0.066**	**0.072**	**0.081**	**0.064**	**0.061**
Volatile Organic Compounds (VOCs) by US EPA Method 8260B						
Acetone	607.4	**0.0084 J-**	**0.0087 J-**	**0.0067 J-**	**0.0071 J-**	**0.0052 J-**
Semivolatile Organic Compounds (SVOCs) by US EPA Method 8270C						
Dibenzofuran	0.562	<0.000079	<0.000079	**0.00024 J**	<0.00013	<0.000079

NOTES:

1. Aquatic Life Surface Water Risk-Based Exposure Limits from TCEQ, updated January 19, 2011.
2. Screening Values are based on Sample, et al, 1996 Appendix D, Table 12.
3. Detected compounds are presented in **bold** type.
4. Shading = Detected compound exceeds the Freshwater Acute Screening Level.
5. NA = Not available.
6. < = Compound not detected at indicated detection limit. J = Estimated value. J- = Estimated value with potential low bias.

* Acute Screening Level adjusted for hardness of 202 mg/L which is from the nearest classified segment (1911) on the San Antonio River.

TABLE 14
MAMMALIAN AND AVIAN TOXICITY REFERENCE VALUES (TRVs) FOR LIMITED EXPOSURES (ACUTE)
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Constituent	Mammalian NOAEL TRV for Limited Exposure (mg/kg-day)[1]	NOAEL Mammalian Soil Screening Level (mg/kg)[6]	Mammalian LOAEL TRV for Limited Exposure (mg/kg-day)[1]	LOAEL Mammalian Soil Screening Level (mg/kg)[6]	Avian NOAEL TRV for Limited Exposure (mg/kg-day)[1]	NOAEL Avian Soil Screening Level (mg/kg)[7]	Avian LOAEL TRV for Limited Exposure (mg/kg-day)[1]	LOAEL Avian Soil Screening Level (mg/kg)[7]
Copper[2]	NE	NE	NE	NE	21	145.2	52.3	362
Lead[3]	96.1	1147	275.3	3280	24	162	185.7	1253
Zinc[4]	72.9	76.4	310.5	325.4	81.2	56.5	247.6	172.3
High Molecular-Weight PAHs[5]	14.2	25.4	43.1	77.1	NS	NS	NS	NS

Notes:
1. Mammalian and Avian no observable adverse effect level (NOAEL) and lowest observable adverse effect level (LOAEL) are the geometric mean for all endpoints for studies with acute exposure (<15 days).
The calculations for these values are provided in Appendix E.
2. EPA, 2007a. Ecological Soil Screening Levels for Copper. Interim Final. OSWER Directive 9285.7-68. February.
3. EPA, 2005. Ecological Soil Screening Levels for Lead. Interim Final. OSWER Directive 9285.7-70. March.
4. EPA, 2007b. Ecological Soil Screening Levels for Zinc. Interim Final. OSWER Directive 9285.7-73. June.
5. EPA, 2007c. Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs). Interim Final. OSWER Directive 9285.7-78. June.
6. The most sensitive avian receptor (i.e., an insectivore, the woodcock) was used to estimate the avian soil screening level.
7. The most sensitive mammalian receptor (i.e., an insectivore, the shrew) was used to estimate the mammalian soil screening level.
NS = Not sufficient data to calculate an effects level.
NE = No exceedance of the chronic mammalian soil screening level.

Chronic TRVs -- For Reference Only

Constituent	Mammalian TRV for Chronic Exposure (mg/kg-day)	Avian TRV for Chronic Exposure (mg/kg-day)
Copper[2]	5.6	4.05
Lead[3]	4.7	1.63
Zinc[4]	75.4	66.1
High Molecular-Weight PAHs[5]	0.615	NS

TABLE 15
HAZARD QUOTIENTS FOR POTENTIAL ACUTE RISKS FROM SOIL
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Constituent	NOAEL Mammalian Soil Screening Level (mg/kg)	LOAEL Mammalian Soil Screening Level (mg/kg)	95% Upper Confidence Limit (mg/kg)	MAMMALIAN NOAEL-Based Hazard Quotients	MAMMALIAN LOAEL-Based Hazard Quotients
Surface Soil					
Copper	NE	NE	23.4		
Lead	1,147	3,280	140.1	0.12	0.04
Zinc	76.4	325.4	156	2.04	0.48
High Molecular-Weight PAHs	25.4	77.1	32.9 (max HPAH)	1.30	0.43
Shallow Soil					
Lead	1,147	3,280	130.5	0.11	0.04
Zinc	76.4	325.4	64.42	0.84	0.20

Constituent	NOAEL Avian Soil Screening Level (mg/kg)	LOAEL Avian Soil Screening Level (mg/kg)	95% Upper Confidence Limit (mg/kg)	AVIAN NOAEL-Based Hazard Quotients	AVIAN LOAEL-Based Hazard Quotients
Surface Soil					
Copper	145.2	362	23.4	0.16	0.06
Lead	162	1,253	140.1	0.86	0.11
Zinc	56.5	172.3	156	2.76	0.91
High Molecular-Weight PAHs	NS	NS	32.9 (max HPAH)		
Shallow Soil*					
Lead	162	1,253	130.5	0.81	0.10
Zinc	56.5	172.3	64.42	1.14	0.37

Notes:
NE = No exceedances of the chronic soil screening level.
NS = No screening level.
* It is unlikely that avian receptors at the Site would encounter shallow soil since it is from 2 to 5 ft. below ground surface.

TABLE 16
SLERA SUMMARY FOR SOIL
R&H Oil/Tropicana Energy Site, San Antonio, Texas

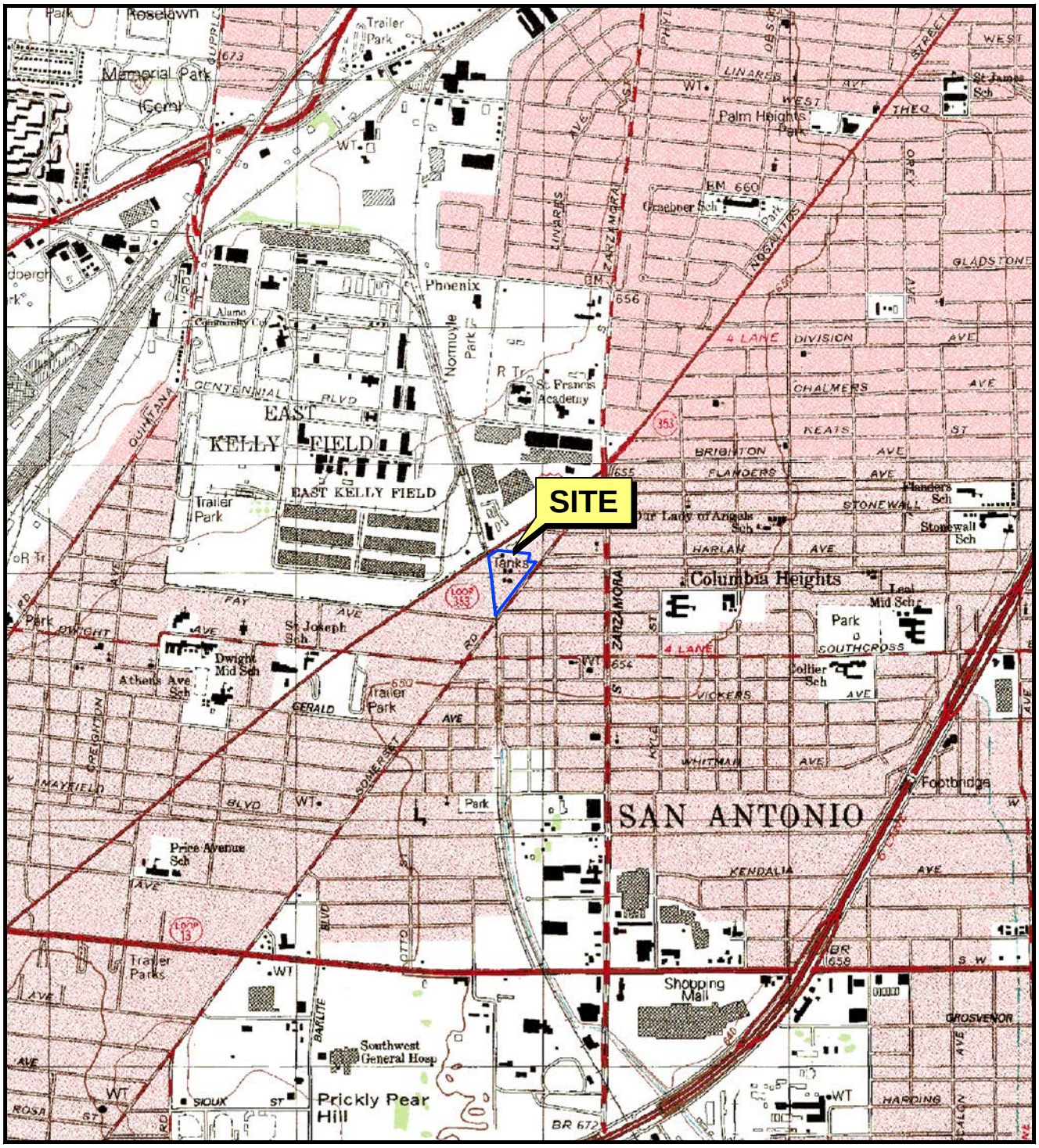
Constituent	Chronic Screening Level Exceeded	Frequency of Chronic Exceedance of Screening Level	Background Analysis	Acute Trophic Analysis	Risk Conclusion
Surface Soil					
Chromium	Plant Invertebrate	17 of 17 17 of 17	All detections < TX and Kelly background Values.	Not Applicable	Detected concentrations below background.
Copper	Avian Chronic SSL	2 of 17	Two detections > Kelly background value of 30 mg/kg.	Avian HQs < 1	Two concentrations (49 mg/kg, 35 mg/kg) > Kelly background and avian chronic screening value, but trophic analysis showed no risk.
Lead	Plant Mammalian Chronic SSL Avian Chronic SSL	2 of 17 7 of 17 14 of 17	12 of 17 samples > Kelly background of 33 mg/kg	Avian and mammal HQs < 1	Most surface soil concentrations greater than Kelly backgound, but all detections below chronic invertebrate screening and the acute trophic analysis showed no risk. Two detections greater than chronic plant screening value, but limited areas for plant growth in urban/industrial area. There are also uncertainties associated with plant screening value.
Manganese	Plant	5 of 17	All detections < TX and Kelly background Values.	Not Applicable	Detected concentrations below background.
Mercury	Plant Invertebrate	1 of 17 5 of 17	TX background is 0.04 mg/kg and Site maximum is 0.37 mg/kg. No background value from Kelly listed. Site average concentration is 0.1 mg/kg.	Not Applicable (no avian or mammal screening values available)	Only maximum value exceeds chronic plant screening value of 0.3 mg/kg. Given limited ecological habitat and lack of area background values, risk is assume to be negligible. There are also signficiant uncertainties associated with plant and invertebrate screening values.
Vanadium	Plant Avian Chronic SSL	17 of 17 13 of 17	All detections < TX and Kelly background values	Not Applicable	Detected concentrations below background.
Zinc	Plant Invertebrate Mammalian Chronic SSL Avian Chronic SSL	3 of 17 4 of 17 7 of 17 12 of 17	7 detections > Kelly background value	LOAEL-HQs < 1, NOAEL-HQs > 1	Given limited ecological habitat and uncertainties with plant and invertebrate screening levels, risk is assumed to be negligible.
HPAHs	Mammalian Chronic SSL	4 of 17	No background values available	Mammalian LOAEL-HQ < 1, NOAEL-HQ > 1	Given limited ecological habitat and lack of area background values, risk is assume to be negligible.

TABLE 16
SLERA SUMMARY FOR SOIL
R&H Oil/Tropicana Energy Site, San Antonio, Texas

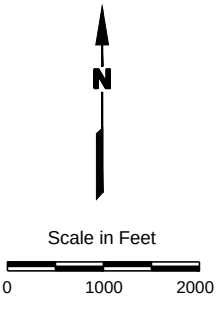
Constituent	Chronic Screening Level Exceeded	Frequency of Chronic Exceedance of Screening Level	Background Analysis	Acute Trophic Analysis	Risk Conclusion
Shallow Soil*					
Chromium	Plant Invertebrate	14 of 14 14 of 14	All detections < TX and Kelly background Values.	Not Applicable	Detected concentrations below background.
Lead	Plant Mammalian Chronic SSL Avian Chronic SSL	2 of 14 2 of 14 13 of 14	3 detections > Kelly background value	Avian and mammal HQs < 1	Three detections > Kelly backgound, but all detections below chronic invertebrate screening and the trophic analysis showed no risk. Two locations have detections > plant screening value, but data from 4-5 and 3-4 ft bgs. There are also uncertainties associated with plant screening value.
Manganese	Plant	8 of 14	All detections < Kelly background value	Not Applicable	Detected concentrations below background.
Mercury	Plant Invertebrate	1 of 14 2 of 14	2 samples > TX background	Not Applicable (no avian or mammal screening values available)	Only maximum value exceeds chronic plant screening value of 0.3 mg/kg. Given limited ecological habitat and lack of area background values, risk is assume to be negligible. There are also signficiant uncertainties associated with plant and invertebrate screening values.
Vanadium	Plant Avian Chronic SSL	14 of 14 13 of 14	All detections < TX and Kelly background values	Not Applicable	Detected concentrations below background.
Zinc	Mammalian Chronic SSL Avian Chronic SSL	1 of 14 2 of 14	Only maximum detection > Kelly background.	Both LOAEL-HQs < 1, Mammalian NOAEL-HQ < 1, Avian LOAEL > 1	Given limited ecological habitat risk is assumed to be negligible.

Notes:
* It is unlikely that avian receptors at the Site would encounter shallow soil since it is from 2 to 5 ft. below ground surface.
All other detected compounds were below screening values (when a screening value was available).
There were no exceedances of surface water screening criteria, therefore a table summarizing risks for surface water expsoures was not necessary .

FIGURES



QUADRANGLE LOCATIONS



Source:
http://www.tnris.state.tx.us Terrell Wells and San Antonio West, TX
7.5 min. U.S.G.S. quadrangles, 1992 and 1993.

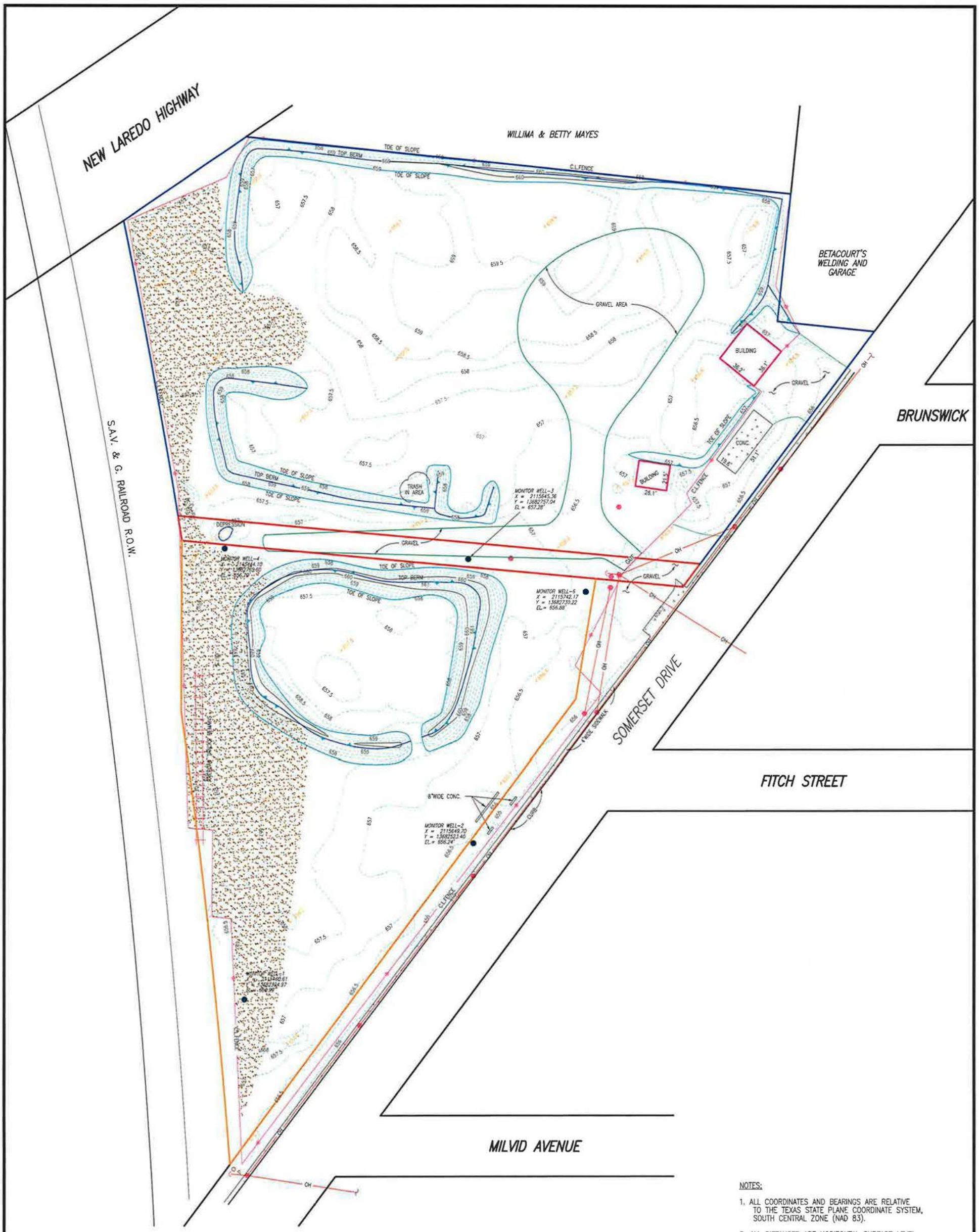
R&H OIL/TROPICANA ENERGY SITE

Figure 1

SITE LOCATION MAP

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: FEB., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



NOTES:

1. ALL COORDINATES AND BEARINGS ARE RELATIVE TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).
2. ALL DISTANCES ARE HORIZONTAL SURFACE LEVEL LENGTHS (SF= 0.99983626426).
3. ELEVATIONS ARE RELATIVE TO THE NAVD 88 (AS DETERMINED BY GEOID99) AND ARE BASED ON THE NGS CORS STATION EZSA.

EXPLANATION

- 657.5 Ground Surface Elevation Contour (Ft MSL)
- Power Pole
- OH Overhead Wire
- Guy Anchor
- Top Bank Berm
- Toe of Slope
- Chain-link Fence
- OS Utility Sign
- Projected Portion of Site with Direct Surface Water Runoff to Drainage Ditch West of Site

Source:
Topographic map develop by Doyle & Wachtstetter, Inc. based on survey performed September 20, 2007.

N

Scale in Feet

0 40 80

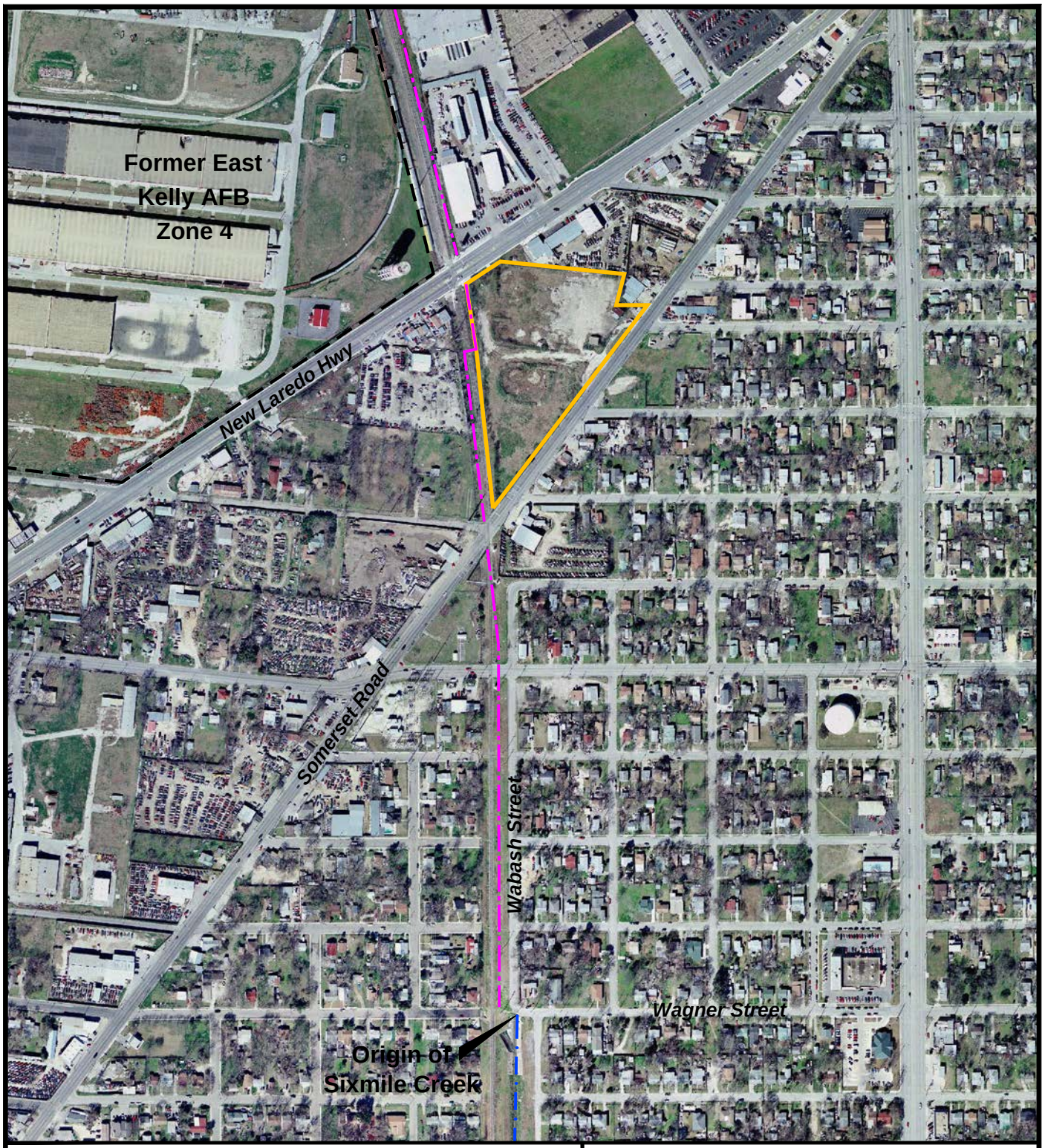
R&H OIL/TROPICANA ENERGY SITE

Figure 2

SITE TOPOGRAPHIC MAP

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: FEB., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Approx. Site Boundary
- Drainage Ditch
- Sixmile Creek

Note:
Location for origin of Sixmile Creek based on USGS San Antonio West quadragle.

Source:
http://imageserver.sanantonio.gov aerial photograph.

N

Approx. Scale in Feet

0 250 500

R&H OIL/TROPICANA ENERGY SITE

Figure 3

DRAINAGE DITCH LOCATION

PROJECT: 1589	BY: ZGK	REVISIONS
DATE: FEB., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Sample Location

N

Approx. Scale in Feet

0 60 120

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03.

R&H OIL/TROPICANA ENERGY SITE

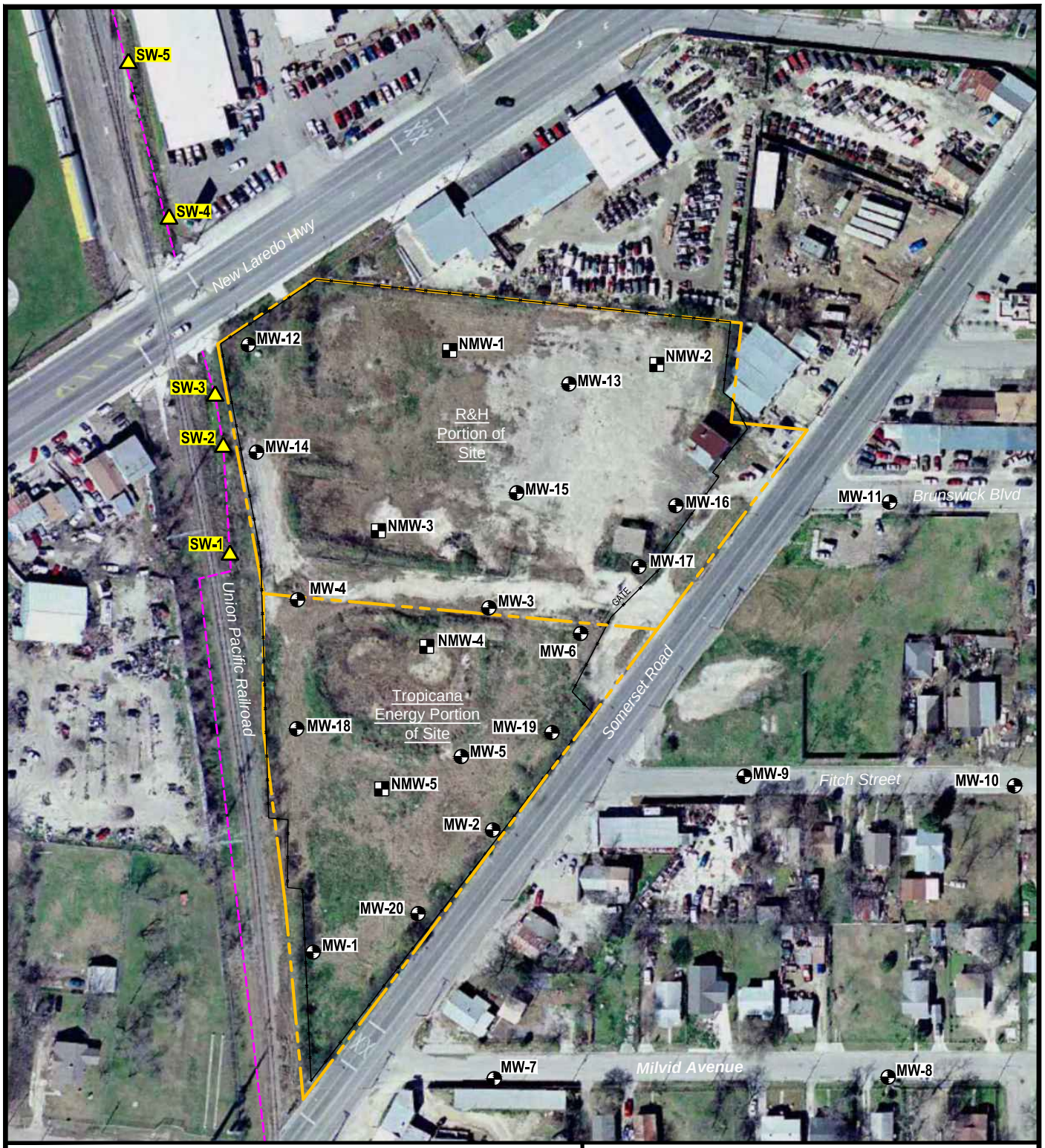
Figure 4

SOIL SAMPLE LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: FEB., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Drainage Ditch
- Groundwater Monitoring Well
- NAPL Monitoring Well
- Ditch Surface Water Sample Location

N

Approx. Scale in Feet

0 75 150

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03

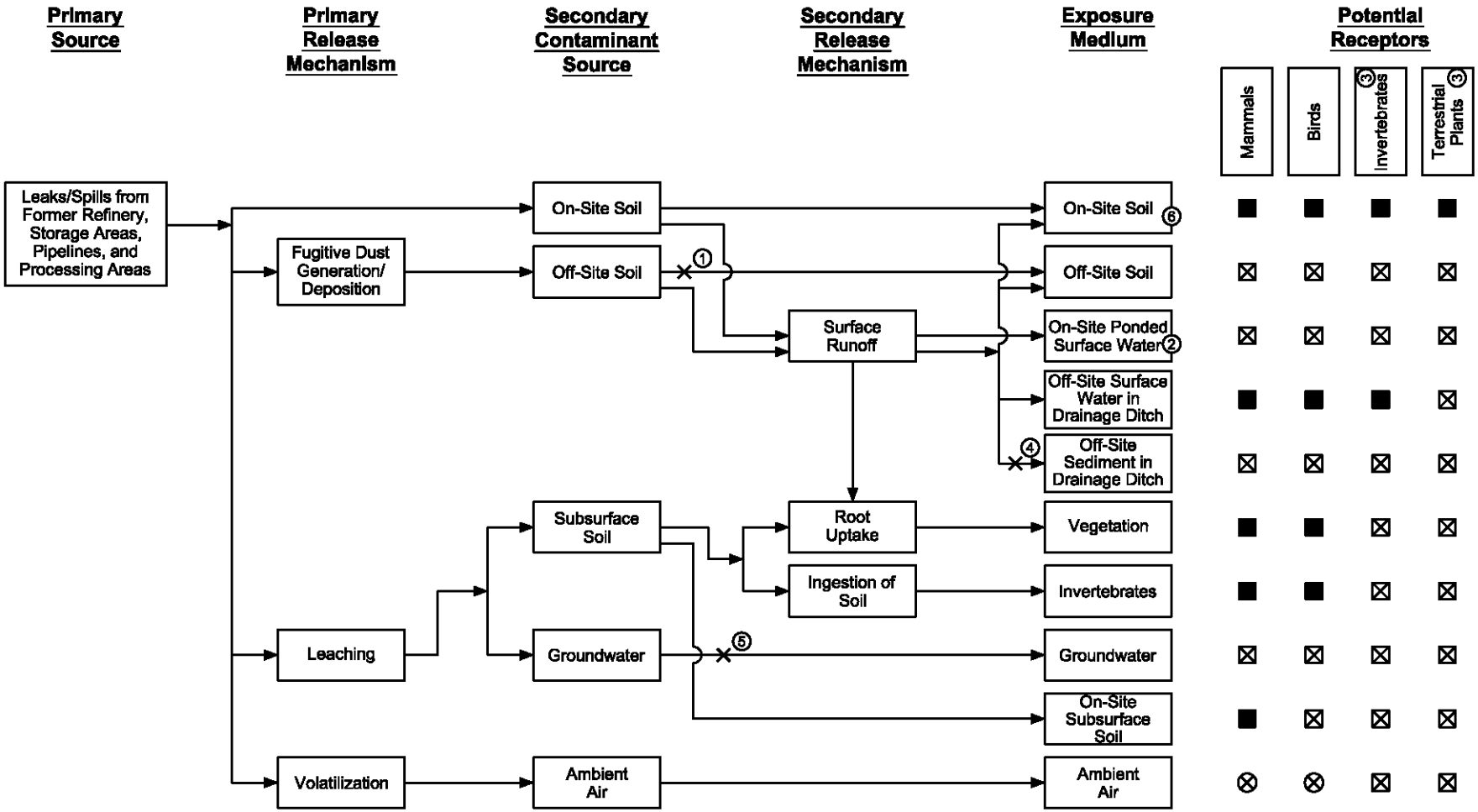
R&H OIL/TROPICANA ENERGY SITE

Figure 5

SURFACE WATER SAMPLE LOCATIONS

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: FEB., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



LEGEND

- ■ Pathway is complete
- ⊠ Pathway is incomplete
- ⊗ Pathway is potentially complete, not evaluated

NOTES:

① The off-site soil migration pathway is not significant transport pathway based on site-specific information. See text for additional discussion.
② On-site ponded water pathways are considered incomplete since it is only present after heavy rainfall.
③ Because of the lack of quality habitat at the Site, soil exposures are unlikely but are evaluated for plants and soil invertebrates at the Site for completeness and conservatism.
④ Because of the ephemeral nature of the ditch, "true" sediments are not present and therefore, sediment exposure scenarios and related screening levels are not applicable.
⑤ The depth to groundwater precludes exposure to most, if not all, receptors.
⑥ Surface soil exposure to reptiles is likely a complete pathway; however, Site conditions limit frequency of exposure. A qualitatively discussion is provided in the SLERA.

R&H OIL/TROPICANA ENERGY SITE

Figure 6

ECOLOGICAL CONCEPTUAL SITE MODEL

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: FEB., 2013	CHECKED: KHT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

APPENDICES

APPENDIX A

INFORMAL AND FORMAL COMMENTS ON DRAFT AND FINAL SLERA FROM EPA, TCEQ, AND EPA'S CONTRACTOR

MEMORANDIUM

SUBJECT: Comments on the R&H Oil/ Tropicana Energy Site (San Antonio, TX) Draft Screening Level Ecological Risk Assessment (SLERA)

FROM: Kenneth Shewmake, USEPA Ecological Risk Assessor

TO: Chris Villarreal, USEPA Remedial Project Manager

DATE: August 22, 2012

General Comments:

1. The tables do not show hazard quotients. This should be calculated and presented.

2. A comparison to background values or the TCEQ Texas specific background concentration values should be presented. Background values should not be incorporated with benchmark values and labeled extent evaluation values as was done in previous documents. The background values should be presented in a separate column or on a separate table.

3. The method detection limit and the laboratory reporting limit should be presented in the table section. This could be done as a separate column in Table 2, or as a separate table.

4. Tables 2,3,5, and 6 only show detected compounds. All the compounds that were included in the analysis should be shown in this report. The detection levels should be compared to screening benchmarks to ensure that compounds were not eliminated due to insufficient detection levels. This could be done on separate tables.

5. Avian and mammal EcoSSL screening values are available for many of the contaminants that exceed screening benchmarks. If EcoSSL values are available for birds and mammals then a comparison to sample results should be presented.

6. If data is available on soil characteristics such as soil pH, then this data should be included in this SLERA.

7. A discussion of possible ARARs and if any media concentrations exceed these values would be useful. This would facilitate the decision to halt the ecological risk assessment at the conclusion of the SLERA.

8. Summary and Conclusions, Section 5.0: This section needs to be expanded and improved. It should discuss each of the COPECs that exceed benchmark values and present information that supports a decision for each COPEC. This could include background, bioavailability, area use by receptors, and other factors that would normally be addressed in the BERA. The discussion should address current and future land use. As currently written, the summary and conclusions do not provide sufficient support for the alternative chosen on page 21.

Specific Comments:

9. Page iv, list of acronyms: The acronym for assessment endpoint (AE) is missing.

10. Page 3, first paragraph, third sentence: The EPA guidance for ecological risk assessment was released in 1997. The Eco-update from 2001 is not technically guidance. Cite the 1997 document that contains similar information.

11. Section 1.3, Land use and setting: Discuss instructional controls and provide additional support for the claim that the property will only be used for industrial/commercial purposes in the future.

12. Page 4, land use and setting, last paragraph: Describe the condition of the security fence. If fence is damaged or in need of repair this should be noted.

13. Section 2.0, Page 5, first paragraph: Cite Figure 6 in the discussion of the conceptual site model.

14. Page 7, third paragraph: Change sentence from "no terrestrial animals have been observed on site" to "no terrestrial mammals have been observed on the site".

15. Page 8, second paragraph and page 12, second paragraph: The text establishes the acronym chemical of interest (COI). It would be more appropriate to use the name and acronym provided in guidance which is contaminant of potential ecological concern (COPEC). This term is used in other parts of the text (page 20). It is confusing when new terms are used that are not consistent with guidance.

16. Section 3.2.2, comparison to acute benchmarks: A comparison to acute benchmarks was requested to ensure that birds and mammals transiting the site will not be harmed if values exceeding chronic benchmarks are not addressed due to the disturbed, industrial nature of the site. The discussion of acute risk to plants and invertebrates can be removed from this section.

17. Table 5- The second column is labeled extent evaluation value. Benchmark values should not be incorporated with background values and labeled extent evaluation values.

18. Table 5: Note 5 states the benchmark was changed from the EcoSSL value for mammals to the soil invertebrate benchmark. It would be better to use the original benchmark and then compare site conditions to the assumptions made in the EcoSSl. For example 3 mammals were used to establish the EcoSSL value. The shrew had a much lower result than the other mammals. Evaluate the possibility of insectivores feeding at the site and other assumptions used in calculating the EcoSSl.

19. Table 7: The TCEQ freshwater benchmark for Dibenzofuran is .094 mg/l. This value was missing from the table.

TCEQ Interoffice Memorandum

To: Marilyn Long, Project Manager; Superfund Section, Remediation Division

From: Larry Champagne, Ecological Risk Assessor; Technical Program Support Team, Remediation Division

Date: August 29, 2012

Subject: R&H Oil/ Tropicana Energy NPL Superfund Site
Draft Screening Level Ecological Risk Assessment (SLERA)
August 1, 2012

This site is comprised of two contiguous tracts: a northern tract (R&H Oil Company) and a southern tract (Tropicana Energy Company). Much of the land use surrounding this site is commercial/industrial and the land use zoning classification for the site is heavy industrial. Given the industrial nature of the surrounding area, the physical location of the site and zoning restrictions in the area, the property will be used for industrial/commercial purposes in the future. The site consists of gravel parking lots, paved roads, disturbed soil, and a mowed/maintained grass lot and is surrounded by a security fence. These circumstances suggest that there is likely no significant ecological habitat present. In fact, under the TCEQ Ecological Risk Assessment Program, the site itself would pass the soil exposure portion of the Tier 1 Exclusion Criteria Checklist. Nevertheless, as discussed in the comments below, there are some issues that this draft SLERA does not address.

1. The SLERA states that surface drainage and runoff from a portion of the site may flow into the drainage ditch immediately west of the site and that chemicals of potential ecological concern (COPECs) may have migrated into the ditch. It is also stated that due to the ephemeral nature of the ditch that "true" sediments are not present and will not be evaluated and that only surface water samples were collected to evaluate potential impacts to the ditch. However, if site COPECs have been released to the ditch and the ditch substrate is not going to be evaluated as sediment, then it should be evaluated as potentially impacted off-property soil.

2. If off-property soil (e.g., the drainage ditch) is impacted by site COPECs, additional evaluation as discussed in the Ecological Conceptual Site Model should be conducted, particularly if the COPECs are bioaccumulative.

3. Although the ditch is ephemeral, it is still waters in the state and therefore TCEQ's acute water quality criteria apply. TCEQ's promulgated Texas surface water quality standards (TSWQS; July 22, 2010) are considered to be applicable or relative and appropriate requirements (ARARs) under the EPA Superfund Program. So, in addition to evaluating the surface water in the ditch for ingestion by wildlife, it is important that for the protection of aquatic life that the acute

criteria listed in the TSWQS (30 TAC §307) be used as these are state law. These criteria can be found online at: http://www.tceq.texas.gov/assets/public/permitting/waterquality/standards/docs/TSWQS2010/TSWQS2010_rule.pdf .

4. Potential risk to reptiles and amphibians are not addressed anywhere in this SLERA. At a minimum, some qualitative statement regarding this risk should be made.

5. Table 2: TCEQ (2006) does not provide a soil screening level benchmark for aluminum, so the source of the 5.0 mg/kg value is unknown. Perhaps it was confused with the 5.0 mg/kg TCEQ provides for antimony, which immediately follows aluminum in Table 3-4 (TCEQ, 2006).

References:

TCEQ. 2006. Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas RG-263 (Revised). January.

EA Engineering, Science,
and Technology, Inc.

South Central Region
405 S. Highway 121, Suite C-100
Lewisville, TX 75067
Telephone: 972-315-3922
Fax: 972-315-5181
www.eaest.com

17 August 2012

Mr. Chris Villarreal
Task Order Monitor
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: **Comments on Screening Level Ecological Risk Assessment**
R&H Oil/Tropicana Energy Superfund Site
Remedial Investigation/Feasibility Study Oversight
U.S. Environmental Protection Agency Region 6
Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 0074-RSBD-06MB

Dear Mr. Villarreal:

EA Engineering, Science, and Technology, Inc. (EA) is pleased to submit one hard copy and one electronic copy on compact disk of Comments on the Draft Screening Level Ecological Risk Assessment (SLERA) prepared by Pastor, Behling, and Wheeler, LLC, for the R&H Oil Company Site Group. EA has reviewed the SLERA, which is dated 1 August 2012, and compiled our comments in the enclosed table.

EA will also transmit to EPA an electronic copy of this submittal via e-mail.

If you have any questions regarding this submittal, please call me at (972) 459-5017.

Sincerely,

Ted Telisak, P.E.
Project Manager

Enclosure

cc: Michael Pheeny, EPA Contracting Officer (letter only)
Rena McClurg, EPA Project Officer (letter only)
Marilyn Long, Texas Commission on Environmental Quality (1 hard copy and 1 CD)
Tim Startz, EA Program Manager (letter only via e-mail)
File

TRANSMITTAL OF DOCUMENTS FOR ACCEPTANCE BY EPA			DATE: 17 August 2012	TRANSMITTAL NO.: 0006
TO: **Mr. Chris Villarreal** **U.S. Environmental Protection Agency Region 6**		FROM: **Ted Telisak, P.E.** **EA Engineering, Science, and Technology, Inc.**		
TASK NO.	DELIVERABLE		NO. OF COPIES	
3	Comments on Draft Screening-Level Ecological Risk Assessment, 17August 2012 R&H Oil/Tropicana Energy Superfund Site		1 Hard Copy; 1 Electronic Copy on Compact Disk (CD); and 1 Electronic Copy via E-Mail	
ACCEPTANCE ACTION				
DOCUMENTS FOUND ACCEPTABLE (LIST BY SUBTASK NO.)		NAME/TITLE/SIGNATURE OF REVIEWER DATE		

R&H Oil / Tropicana Energy Superfund Site
Comments on Draft Screening-Level Ecological Risk Assessment

Item No.	Reference	Comment Dated 17 August 2012	PRP Response Dated _____
1.	Page 2, Section 1.0	This section states that substrate in the drainage ditch was not sampled because it does not constitute sediment. This material therefore constitutes soil. The Conceptual Site Model presented in Figure 6 states that site contributions to offsite soil will be evaluated if onsite soil migration pathways are significant. The Screening-Level Ecological Risk Assessment (SLERA) should state whether onsite soil concentrations are such that migration would significantly contribute to soil in the ditch or migration offsite. Additional description of the substrate lining the ditch may also be helpful in understanding fate and transport of any chemicals from the ditch offsite.	
2.	Page 4, Section 1.3	The SLERA states that the site currently provides little habitat, and that the habitat that exists is of relatively poor quality. Based on current zoning, expected land use is unlikely to change. The SLERA should also include text stating that any attempt to re-establish high quality habitat would first have to overcome limitations such as soil compaction and gravel beds; and that these factors are likely to play a larger role in determining the future ecology of the site rather than chemical concentrations.	
3.	Page 10, Section 2.5.1	The SLERA should be revised to provide more consistency in its handling of wildlife exposures at the site. Section 2.5.1 states that habitat at the site is too poor to support wildlife, but identifies wildlife consumption of surface water as a complete exposure pathway. While the site provides poor habitat, water is a resource that may draw wildlife. Since wildlife may utilize the site periodically, the SLERA should consider a more quantitative analysis of exposure pathways to soil as well as water. Quantitative assessment could be performed using EcoSSLs for wildlife and area use factors that appropriately account for limited site use.	

R&H Oil / Tropicana Energy Superfund Site
Comments on Draft Screening-Level Ecological Risk Assessment

Item No.	Reference	Comment Dated 17 August 2012	PRP Response Dated _____
4.	Page 13, Section 3.2	This section should provide a brief narrative discussing the sources of benchmarks and how benchmarks were derived. This is consistent with guidance, would make the meaning of comparisons to benchmarks clearer, and aid in later discussion of alternative low and moderate effects levels.	
5.	Page 14, Section 3.2.1 and 3.2.2	The use of the terms "chronic" and "acute" varies from standard practice. When used together, these terms typically refer to the duration of exposure and associated effects (i.e. long exposures and their effects are chronic, brief are acute). The alternate benchmarks utilized in Section 3.2.2 are benchmarks that correspond to different severity of effect (i.e. low effect, moderate effect, etc.) than those utilized in Section 3.2.1 (i.e. no effects). It is recommended that the terminology be revised to reflect differences in effects severity rather than exposure duration.	
6.	Page 14, Section 3.2.2	Several comparisons in this section rely on LC50 values. LC50 correspond to a concentration at which 50 percent of the exposed population experiences mortality and thus represent a severe endpoint. This level of effect is not typically utilized in SLERA. The SLERA should rely instead on low effects benchmarks. Where geometric means or other summary statistics are used, their calculation should be presented along with the original data in the appendix.	
7.	Page 15, Section 3.2.2	MATC is incorrectly spelled MACT in several instances.	

R&H Oil / Tropicana Energy Superfund Site
Comments on Draft Screening-Level Ecological Risk Assessment

Item No.	Reference	Comment Dated 17 August 2012	PRP Response Dated _____
8.	Page 15, Section 3.2	This section presents comparisons of all concentrations onsite to no effects benchmarks (referred to as chronic) and low or moderate effects benchmarks (referred to as acute) as the only lines of evidence evaluated in the SLERA. This section should also discuss the number of samples exceeding benchmarks and their locations. This information helps place exceedances in context and helps to better identify whether or not there are population-wide risks. If quantitative assessments of wildlife exposures to soil are performed, mean values should also be considered.	
9.	Page 20, Section 5.0	This section uses the term "benthic" where it is likely that "terrestrial" was intended.	
10.	Page 20, Section 5.0	This section will require revision to discuss wildlife modeling. This section should identify whether migration of soil into the ditch is likely to be a concern.	

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

JUN 20 2013

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Tim Nickels, Project Scientist
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664

RE: Screening Level Ecological Risk Assessment
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Dear Mr. Nickels:

This letter provides the comments (three sets) to be addressed for the submitted *Screening Level Ecological Risk Assessment*, dated March 26, 2013. A response grid for all the comments is enclosed as well. Please address each comment and utilize the response grid so that resolution of comments can be tracked.

I look forward to working with you on bringing the site Remedial Investigation/Feasibility Study to completion. If there are any questions, please feel free to contact me by telephone at 214.665.8409, or via email at tzhone.stephen@epa.gov.

Sincerely,

Stephen Tzhone
Remedial Project Manager

Enclosures (4)

cc: John Flores, TCEQ

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

April 19, 2013

MEMORANDUM

Subject: Comments on R&H Oil/ Tropicana Energy Site (San Antonio, TX) Draft Screening Level Ecological Risk Assessment (SLERA)

From: Kenneth Shewmake
Ecological Risk Assessor

To: Stephen Tzhone
Remedial Project Manager

General Comments:

1. The previous draft of this document showed a comparison to TCEQ soil screening benchmarks for terrestrial plants and for soil invertebrates. This comparison was removed from this document and it should have been retained. Comment number five on the previous draft stated the following.

   Avian and mammal EcoSSL screening values are available for many of the contaminants that exceed screening benchmarks. If EcoSSL values are available for birds and mammals then a comparison to sample results should be presented.

   This comment did not suggest eliminating the evaluation of terrestrial plants and for soil invertebrates. A table presenting this data should be included and the CSM (fig 6) should be updated. The results of this comparison should be in the incorporated into the summary and conclusion section.

2. Section 1.3, pages 4-5: Future land use was not discussed in sufficient detail. If future land use results in a restoration of any portion of the site to "natural" conditions then a more comprehensive ERA is needed to determine if proposed future land use will result in unacceptable risk to ecological receptors. It is assumed that the site will remain industrial, but stronger documentation is needed to confirm this. Please provide information on institutional controls, deed restrictions or information on future industrial facilities that will be located on site.

3. If a habitat evaluation was performed during the risk assessment then the report should be provided with this document or added as an appendix.

4. Section 5.1: Please indicate when soil screening levels (SSLs) are acute or chronic. The text describes NOAEL and LOAEL based SSLs and it needs to be clearer when acute values are used.

5. Section 5.0, Summary and Conclusions: The summary needs to list all contaminants that exceed screening values, provide a brief description of the risk from these contaminates, the magnitude of the risk, and discuss the reason that risk is considered acceptable.

6. Please discuss any ARARs or potential ARARs that were evaluated as part of this risk assessment.

EA Engineering, Science, and Technology, Inc.

South Central Region
405 S. Highway 121, Suite C-100
Lewisville, TX 75067
Telephone: 972-315-3922
Fax: 972-315-5181
www.eaest.com

18 June 2013

Mr. Stephen Tzhone
Task Order Monitor
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: **Comments on Screening Level Ecological Risk Assessment**
R&H Oil/Tropicana Energy Superfund Site
Remedial Investigation/Feasibility Study Oversight
U.S. Environmental Protection Agency Region 6
Remedial Action Contract 2
Contract: EP-W-06-004
Task Order: 0074-RSBD-06MB

Dear Mr. Tzhone:

EA Engineering, Science, and Technology, Inc. (EA) is pleased to submit one hard copy and one electronic copy on compact disk of Comments on the Screening Level Ecological Risk Assessment (SLERA). The SLERA was prepared by Pastor, Behling, and Wheeler, LLC, for the R&H Oil Company Site Group.

EA has reviewed the SLERA, which is dated 26 March 2013, and compiled our comments in the enclosed table. We note that, during discussions between EPA and the Potentially Responsible Parties, it was agreed that it was not necessary for the final version of the SLERA to address four of EA's comments on the Draft SLERA. Therefore we have not followed up during this review on EA's Comments 3, 5, 6, and 10 on the Draft SLERA, which were submitted to EPA on 17 August 2012.

EA will also transmit to EPA an electronic copy of this submittal via e-mail.

If you have any questions regarding this submittal, please call me at (972) 459-5017.

Sincerely,

Ted Telisak, P.E.
Project Manager

Enclosure

cc: Michael Pheeny, EPA Contracting Officer (letter only)
Rena McClurg, EPA Project Officer (letter only)
Marilyn Long, Texas Commission on Environmental Quality (1 hard copy and 1 CD)
Tim Startz, EA Program Manager (letter only via e-mail)
File

TRANSMITTAL OF DOCUMENTS FOR ACCEPTANCE BY EPA			DATE: 18 June 2013	TRANSMITTAL NO.: 0008
TO: **Mr. Stephen Tzhone** **U.S. Environmental Protection Agency Region 6**		FROM: **Ted Telisak, P.E.** **EA Engineering, Science, and Technology, Inc.**		
TASK NO.	DELIVERABLE		NO. OF COPIES	
7	Comments on Screening-Level Ecological Risk Assessment, 18 June 2013 R&H Oil/Tropicana Energy Superfund Site		1 Hard Copy; 1 Electronic Copy on Compact Disk (CD); and 1 Electronic Copy via E-Mail	
ACCEPTANCE ACTION				
DOCUMENTS FOUND ACCEPTABLE (LIST BY SUBTASK NO.)		NAME/TITLE/SIGNATURE OF REVIEWER DATE		

R&H Oil / Tropicana Energy Superfund Site
Comments on Screening-Level Ecological Risk Assessment dated March 26, 2013

Item No.	Reference	Comment dated 18 June 2013	PRP Response dated _____
1.	General	Overall, the finding of the document that there are no ecological risks requiring remediation is consistent with the data and analysis presented. However, it is recommended that additional clarification be provided as indicated in comments below, and that expanded text should be added regarding future land use as requested in recent EPA comments.	
2.	Section 1.0 Page 2, last paragraph	The document contains text indicating that sediment in the drainage ditch was not sampled. This text should be revised to indicate that material in the ditch was sampled but was more appropriately evaluated as soil, as is indicated elsewhere in the document. As is, the text seems to indicate that there is a data gap, but this data gap has been filled.	
3.	Section 3.2.	The discussion of development of acute Toxicity Reference Values (TRVs) should include an indication of the exposure duration considered acute. This would aid in transparency and reproducibility of TRVs.	
4.	Section 3.2.1. Tables 7, 10, 11	The text does not state that copper concentrations in surface water exceed the acute screening level. This should be added, along with consideration of hardness criteria where relevant for copper and other metals.	
5.	Section 3.2.1.	Previous comments indicated that Ecological Soil Screening Levels (EcoSSLs) should be considered in selecting screening criteria. EcoSSLs were used instead of Texas Commission on Environmental Quality (TCEQ) ecological comparison criteria for soil. EcoSSLs are not available for all detected chemicals. It was the intent of the original comment and is recommended in this comment that TCEQ criteria be used for comparisons where EcoSSLs are unavailable. If neither is available, additional values are available from studies available from the Oak Ridge National Laboratories Environmental Safety Division.	

R&H Oil / Tropicana Energy Superfund Site
Comments on Screening-Level Ecological Risk Assessment dated March 26, 2013

Item No.	Reference	Comment dated 18 June 2013	PRP Response dated _____
6.	Section 4.0 Figure 6.	Exposure pathways for reptiles and amphibians should be added to the uncertainty discussion. Reptiles and amphibians should also be added to Figure 6, either in the conceptual site model matrix or as a footnote.	
7.	Table 12.	Consistent formatting should be used in tables throughout the document. In Table 12, shading indicates concentrations below background values. On all other tables, shading indicates an exceedance.	
8.	Figure 6.	The figure should be changed to indicate that material in the ditch was considered as soil, as part of the conceptual site model.	

TCEQ Interoffice Memorandum

To: John Flores, Project Manager; Superfund Section, Remediation Division

From: LC Larry Champagne, Ecological Risk Assessor; Division Support Section, Remediation Division

Date: April 10, 2013

Subject: R&H Oil/ Tropicana Energy Superfund Site
Screening Level Ecological Risk Assessment (SLERA)
March 26, 2013

As requested, I have completed my review of this SLERA. I concur with the conclusions that: ecological risks at this site are negligible, there is no need for further ecological evaluation, and it is unnecessary to develop remedial action objectives to protect site ecological receptors. However, I do have the minor comments below regarding the surface water quality data tables. These comments do not affect the conclusions and are mostly provided for informational purposes, but may necessitate some slight revisions.

1. Tables 7, 10, and 13: As was done for zinc, a hardness adjustment should also be applied to the chromium, copper, lead, and nickel criteria (just copper and nickel for Tables 10 and 13). This is particularly true for copper as the currently listed freshwater acute criterion of 0.00739 mg/L appears to be slightly exceeded at sample locations SW-1, SW-2, SW-3, and SW-5. After the adjustment, the copper criterion will no longer be exceeded.
2. Table 11: Based on the comment above and contrary to what is stated in this table, concentrations of copper currently exceed its freshwater acute criterion. However, the hardness adjustment will make this comment moot.

R&H Oil / Tropicana Energy Superfund Site

Combined Comments from EPA, TCEQ, and EA Engineering
on
Final Screening-Level Ecological Risk Assessment, dated 26 March 2013

Item No.	Reference	Comments Dated April 10, April 19, and June 18, 2013	PRP Response Dated _____
1.	General	Overall, the finding of the document that there are no ecological risks requiring remediation is consistent with the data and analysis presented. However, it is recommended that additional clarification be provided as indicated in comments below, and that expanded text should be added regarding future land use as requested in recent EPA comments.	
2.	General	The previous draft of this document showed a comparison to TCEQ soil screening benchmarks for terrestrial plants and for soil invertebrates. This comparison was removed from this document and it should have been retained. Comment number five on the previous draft stated the following: *Avian and mammal EcoSSL screening values are available for many of the contaminants that exceed screening benchmarks. If EcoSSL values are available for birds and mammals then a comparison to sample results should be presented.* This comment did not suggest eliminating the evaluation of terrestrial plants and for soil invertebrates. A table presenting this data should be included and the CSM (fig 6) should be updated. The results of this comparison should be incorporated into the summary and conclusion section.	
3.	General	If a habitat evaluation was performed during the risk assessment then the report should be provided with this document or added as an appendix.	
4.	General	Please discuss any ARARs or potential ARARs that were evaluated as part of this risk assessment.	

R&H Oil / Tropicana Energy Superfund Site

Combined Comments from EPA, TCEQ, and EA Engineering
on
Final Screening-Level Ecological Risk Assessment, dated 26 March 2013

Item No.	Reference	Comments Dated April 10, April 19, and June 18, 2013	PRP Response Dated _____
5.	Section 1.0 Page 2, last paragraph	The document contains text indicating that sediment in the drainage ditch was not sampled. This text should be revised to indicate that material in the ditch was sampled but was more appropriately evaluated as soil, as is indicated elsewhere in the document. As is, the text seems to indicate that there is a data gap, but this data gap has been filled.	
6.	Section 1.3 Pages 4-5	Future land use was not discussed in sufficient detail. If future land use results in a restoration of any portion of the site to "natural" conditions then a more comprehensive ERA is needed to determine if proposed future will result in an unacceptable risk to ecological receptors. It is assumed that the site will remain industrial, but stronger documentation is needed to confirm this. Please provide information on institutional controls, deed restrictions or information on future industrial facilities that will be located on site.	
7.	Section 3.2.	The discussion of development of acute Toxicity Reference Values (TRVs) should include an indication of the exposure duration considered acute. This would aid in transparency and reproducibility of TRVs.	
8.	Section 3.2.1. Tables 7, 10, 11	The text does not state that copper concentrations in surface water exceed the acute screening level. This should be added, along with consideration of hardness criteria where relevant for copper and other metals.	

R&H Oil / Tropicana Energy Superfund Site

Combined Comments from EPA, TCEQ, and EA Engineering
on
Final Screening-Level Ecological Risk Assessment, dated 26 March 2013

Item No.	Reference	Comments Dated April 10, April 19, and June 18, 2013	PRP Response Dated _____
9.	Section 3.2.1.	Previous comments indicated that Ecological Soil Screening Levels (EcoSSLs) should be considered in selecting screening criteria. EcoSSLs were used instead of Texas Commission on Environmental Quality (TCEQ) ecological comparison criteria for soil. EcoSSLs are not available for all detected chemicals. It was the intent of the original comment and is recommended in this comment that TCEQ criteria be used for comparisons where EcoSSLs are unavailable. If neither is available, additional values are available from studies available from the Oak Ridge National Laboratories Environmental Safety Division.	
10.	Section 4.0 Figure 6.	Exposure pathways for reptiles and amphibians should be added to the uncertainty discussion. Reptiles and amphibians should also be added to Figure 6, either in the conceptual site model matrix or as a footnote.	
11.	Section 5.0	The summary needs to list all contaminants that exceed screening values, provide a brief description of the risk from these contaminates, the magnitude of the risk, and discuss the reason that risk is considered acceptable	
12.	Section 5.1	Please indicate when soil screening levels (SSLs) are acute or chronic. The text describes NOAEL and LOAEL based SSLs and it needs to be clearer when acute values are used.	
13.	Tables 7, 10, and 13:	As was done for zinc, a hardness adjustment should also be applied to the chromium, copper, lead, and nickel criteria (just copper and nickel for Tables 10 and 13). This is particularly true for copper as the currently listed freshwater acute criterion of 0.00739 mg/L appears to be	

Item No.	Reference	Comments Dated April 10, April 19, and June 18, 2013	PRP Response Dated _____
		slightly exceeded at sample locations SW-1, SW-2, SW-3, and SW-5. After the adjustment, the copper criterion will no longer be exceeded.	
14.	Table 11 Comment on Tables 7, 10, and 13	Based on the comment above and contrary to what is stated in this table, concentrations of copper currently exceeds its freshwater acute criterion. However, the hardness adjustment will make this comment moot.	
15.	Table 12.	Consistent formatting should be used in tables throughout the document. In Table 12, shading indicates concentrations below background values. On all other tables, shading indicates an exceedance.	
16.	Figure 6.	The figure should be changed to indicate that material in the ditch was considered as soil, as part of the conceptual site model.	

APPENDIX B

SITE PHOTOGRAPHS

EXPLANATION

- Approx. Site Boundary
- Drainage Ditch
- (1) Denotes Approximate Location of Corresponding Photograph

N

Approx. Scale in Feet

0 75 150

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03.

R&H OIL/TROPICANA ENERGY SITE

Figure B-1

SITE PHOTOGRAPH LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: FEB., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Photograph 1. North part of Site, standing near center looking East (April 20, 2006).

Photograph 2. North part of Site, standing near gate looking North/North-West to adjacent property (October 2, 2009).

Photograph 3. North part of Site, standing near center looking West (October 2, 2009).

Photograph 4. Southern portion of the Site, looking East prior to a mowing event (October 2, 2009).

Photograph 5. Southern portion of the Site, looking South along fenceline on western side of property prior to a mowing event (October 2, 2009).

Photograph 6. On south side of berm on southern portion of the Site, looking North property prior to a mowing event (October 2, 2009).

Photograph 7. Looking North along ditch that runs on both sides of railroad tracks, just West of the Site (April 20, 2006).

Photograph 8. Ditch running on the west-side of railroad tracks and east of junk yard, just before the culvert that connects the two sides of the ditch near Former Fitch Avenue (April 20, 2006).

Photograph 9a. Looking North along ditch, West of the Site (April 20, 2006).

Photograph 9b. Looking North along ditch, West of the Site (August 31, 2010).

Photograph 9c. Looking North along ditch, West of the Site (September 15, 2011).

Photograph 9d. Looking North along ditch, West of the Site (May 8, 2012).

Photograph 9e. Looking South along ditch, West of the Site (May 8, 2012).

Photograph 10a. Culvert in ditch, under railroad tracks that connects ditch near Site with ditch on other side of tracks (April 20, 2006).

Photograph 10b. Culvert in ditch, under railroad tracks that connects ditch near Site with ditch on other side of tracks (August 31, 2010).

Photograph 10c. Culvert in ditch, under railroad tracks that connects ditch near Site with ditch on other side of tracks (August 23, 2011).

Photograph 10d. Culvert in ditch, under railroad tracks that connects ditch near Site with ditch on other side of tracks (September 15, 2011).

Photograph 10e. Culvert in ditch, under railroad tracks that connects ditch near Site with ditch on other side of tracks, stake indicates location of surface water sample collection (October 11, 2011).

Photograph 11a. Ditch on western side of railroad tracks, looking South from culvert (April 20, 2006).

Photograph 11b. Ditch on western side of railroad tracks, looking South from culvert (August 31, 2010).

Photograph 12. On railroad tracks on western side (fenceline to right), looking North. Ditch has passed through culvert and is on the left side of the track. April 20, 2006.

Photograph 13a. Southern tip of the ditch, looking South (April 20, 2006).

Photograph 13b. Southern tip of the ditch, looking South (August 31, 2010).

Photograph 14. Similar view as Photograph 7 but further south on railroad tracks. Looking North along ditch that runs on both sides of railroad tracks, just West of the Site (August 31, 2010).

Photograph 15. Ditch running on the west-side of railroad tracks and east of junk yard, before the culvert that connects the two sides of the ditch near Former Fitch Avenue (August 31, 2010). Similar view to Photograph 8 but further north.

Photograph 16. Ditch North of the Site looking South, stake indicates location of surface water sample SW-4 (October 11, 2011).

APPENDIX C

US FISH AND WILDLIFE LETTER REGARDING PROTECTED AND ENDANGERED SPECIES AT KELLY AIR FORCE BASE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
512 490-0057
FAX 490-0974

DEC 14 2004

Andrew J. Chartrand
CH2M HILL
7600 West Tidwell Road
Suite 600
Houston, Texas 77040

Consultation # 2-15-05-I-0062

Dear Mr. Chartrand:

Thank you for your November 19, 2004, inquiry about possible environmental impacts from your planned project in San Antonio, Bexar County, Texas. We understand that you are conducting an ecological risk assessment for Kelly Air Force Base. A project description was not provided. Due to the volume of requests that we receive and our limited staff, we are only able to do a preliminary review of the project.

This review of your project indicates that it is in the following:

Karst invertebrates		Edwards Aquifer		Wetlands*	
☐	Zone 1	☒	Recharge zone	☐	None
☐	Zone 2	☐	Transition zone	☒	On or adjacent to site
☐	Zone 3	☒	Artesian zone		
☐	Zone 4	☐	Saline zone		
☒	Zone 5	☐	Contributing zone		
☐	No karst terrain				
☒	No Critical Habitat				

To assure that you are in compliance with federal law, you should evaluate the potential for your project to impact federally listed species and wetlands. We offer the following information to help you in that evaluation. A list of federally listed that occur in Bexar County is enclosed. The enclosed handouts and information are provided to assist project planners in determining if the project is likely to cause any impacts to resources the U.S. Fish and Wildlife Service (Service) is responsible for protecting. Projects that may affect federally listed species or their critical habitats under the Endangered Species Act of 1973, as amended, (Act) require formal consultation with the Service if the activity is authorized, funded, or carried out by a federal agency. It is the primary responsibility of the federal agency to determine whether its actions may affect a federally listed or proposed species.

TAKE PRIDE® IN AMERICA

Golden-cheeked warblers and black-capped vireos

Your proposed project has not been evaluated for potential impacts to the endangered golden-cheeked warbler (*Dendroica chrysoparia*) or black-capped vireo (*Vireo atricapilla*). For additional information on habitat requirements, please see the enclosed handouts "*Golden-cheeked Warbler*" and "*Black-capped Vireo*" produced by the Texas Parks and Wildlife Department (TPWD 1995)[1] or the Recovery Plan for each of these species[2] [3]. These handouts describe the distribution, habitat requirements, and management guidelines for these two species. However, habitat in Bexar County differs slightly from other areas, in some cases having more Ashe junipers (*Juniperus ashei*) and live oaks (*Quercus fusiformis*) with fewer deciduous trees. Please consult with us further, if habitat for the warbler or vireo is likely to be affected either directly or indirectly.

Karst invertebrates

There are five karst zones in the Bexar County area based on geology, distribution of known caves, distribution of cave fauna, and primary factors that determine the presence, size, shape and extent of caves with respect to cave development[4]. The five zones reflect the likelihood of finding a karst feature that will provide habitat for endangered karst invertebrates as follows:

Zone 1 - Areas known to contain one or more of the nine invertebrates;
Zone 2 - Areas having a high probability of suitable habitat for the invertebrates;
Zone 3 - Areas that probably do not contain the invertebrates;
Zone 4 - Areas that require further research but are generally equivalent to zone 3, although they may include sections that could be classified as zone 2 or zone 5; and
Zone 5 - Areas that do not contain the invertebrates.

Karst refers to limestone formations containing caves, sinks, and fissures. Certain karst formations may have a high probability of one or more of nine endangered karst invertebrates occurring in that area. The entire ranges of these species occur in north and/or northwestern Bexar County. The species and their habitat may be threatened by a number of factors including destruction and/or deterioration of habitat by commercial, residential, and road construction; filling of caves; increase in impervious cover; potential contamination from such things as septic effluent, sewer leaks, runoff, pesticides; predation by and competition with non-native fire ants (*Solenopsis invicta*); and vandalism (Federal Register Vol. 65, No. 248, December 26, 2000).

Edwards Aquifer dependent species

For additional information on Edwards Aquifer dependent species, please refer to the enclosed handout, "*Edwards Aquifer Species*" (TPWD 1995[5]) or the Recovery Plan for these species[6]. Note: This handout is only enclosed for projects occurring in the recharge zone for the Aquifer.

---

[1] Campbell, Linda. Texas Parks and Wildlife Department, Endangered Resources Branch. 1995. Endangered and Threatened Animals of Texas: Their Life History and Management. Texas Parks and Wildlife Press.

[2] USFWS. 1991. Black-capped vireo Recovery Plan. Albuquerque, New Mexico.

[3] USFWS. 1992. Golden-cheeked warbler Recovery Plan. Albuquerque, New Mexico.

[4] Veni, G., and Associates. 1994. Geologic controls on cave development and the distribution of endemic cave fauna in the San Antonio, Texas region. Section 6 report prepared for the Texas Parks and Wildlife Department and the U.S. Fish and Wildlife Service.

[5] Campbell, Linda. Texas Parks and Wildlife Department, Endangered Resources Branch. 1995. Endangered and Threatened Animals of Texas: Their Life History and Management. Texas Parks and Wildlife Press.

For information on water quality and quantity measures designed to minimize or avoid impacts to the Edwards Aquifer in Bexar County, please contact the Texas Commission on Environmental Quality's Edwards Aquifer Protection Program, 14250 Judson Road, San Antonio, Texas, 78233-4480, phone 210-490-3096, fax 210-545-4329, e-mail eapp@tceq.state.tx.us, website http://www.tnrcc.state.tx.us/eapp/index.html.

Wetlands

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at, or near, the surface and has hydrophytes, hydric or wetland soils, and are covered by shallow water at some time during the growing season of the year. Many wetlands are protected by law and require permits before they can be altered or destroyed. If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Section 404 permit from the U.S. Army Corps of Engineers. For permitting requirements under Section 404 of the Clean Water Act, please contact the Fort Worth District, Permit Section, CESWF-EV-O, P.O. Box 17300, Fort Worth, Texas, 76102-0300, or call 817-978-2681.

State-listed species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department, Endangered Resources Branch, Fountain Park Plaza Building, Suite 100, 3000 South IH-35, Austin, Texas 78704, or call 512-912-7011 for information concerning fish, wildlife, and plants of state concern.

If after reviewing the enclosed information, you need additional advice or information, please contact us. If you determine your project is likely to impacts resources that are of concern to the Service, or which have legal protection and will require Service permits or consultation, please contact Jana Milliken at 512-490-0057, extension 243.

Sincerely,

Robert T. Pine
Supervisor

* We reviewed National Wetland Inventory (NWI) maps to make this assessment. However, NWI maps may not identify all wetland areas, thus an "on-site" visit, by the applicant or consultant, is also recommended and should follow consultation with the maps.

Enclosures: Bexar County species list (updated August 23, 2004)
TPWD Golden-cheeked warbler handout
TPWD Black-capped vireo handout

[6] USFWS. 1996. San Marcos and Comal Springs and Associates Aquatic Ecosystems (revised) Recovery Plan. Albuquerque, New Mexico.

Federally Listed as Threatened and Endangered Species of Bexar County

DISCLAIMER

This list is based on information available as of on August 23, 2004. This list is subject to change as new biological information is gathered and should not be used as the sole source for identifying species that may be impacted by a project.

Edwards Aquifer species: (Edwards Aquifer County) refers to those six counties underlain by the Edwards Aquifer: Kinney, Uvalde, Medina, Bexar, Hays, and Comal counties (Texas).

Comal Springs riffle beetle	(E)	*Heterelmis comalensis*
Comal Springs dryopid beetle	(E)	*Stygoparnus comalensis*
Fountain darter	(E w/CH)	*Etheostoma fonticola*
Peck's cave amphipod	(E)	*Stygobromus (=Stygonectes) pecki*
San Marcos gambusia	(E w/CH)	*Gambusia georgei*
Texas wild-rice	(E w/CH)	*Zizania texana*
Texas blind salamander	(E)	*Typhlomolge rathbuni*
San Marcos salamander	(T □w/CH)	*Eurycea nana*

Migratory Species Common to many or all Counties: Species listed specifically in a county have confirmed sightings. If a species is not listed they may occur as migrants in those counties.

Least tern	(E ~)	*Sterna antillarum*
Whooping crane	(E w/CH)	*Grus americana*
Bald eagle	(T)	*Haliaeetus leucocephalus*
Piping plover	(T w/CH)	*Charadrius melodus*

Bexar County (Edwards Aquifer County)

Black-capped vireo	(E)	*Vireo atricapilla*
Golden-cheeked warbler	(E)	*Dendroica chrysoparia*
Madla cave meshweaver	(E w/CH)	*Cicurina madla*
Robber Baron Cave meshweaver	(E w/CH)	*Cicurina baronia*
Braken Bat Cave meshweaver	(E w/CH)	*Cicurina venii*
Government Canyon Bat Cave meshweaver	(E)	*Cicurina vespera*
Government Canyon Bat Cave spider	(E)	*Neoleptoneta microps*
Cokendolpher cave harvestman	(E w/CH)	*Texella cokendolpheri*
Ground beetle (no common name)	(E w/CH)	*Rhadine exilis*
Ground beetle (no common name)	(E w/CH)	*Rhadine infernalis*
Helotes mold beetle	(E w/CH)	*Batrisodes venyivi*

Note: The Edwards Aquifer species listed above may be affected by activities within Bexar County, although they do not occur in Bexar County.

INDEX

Statewide or areawide migrants are not included by county, except where they breed or occur in concentrations. The whooping crane is an exception; an attempt is made to include all confirmed sightings on this list.

E = Species in danger of extinction throughout all or a significant portion of its range.

APPENDIX D

PRO UCL STATISTICAL CALCULATIONS FOR SURFACE AND SHALLOW SOIL

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	Sheet1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

SHALLOW SOIL

>C12-C28

General Statistics			
Number of Valid Data	14	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	6
		Percent Non-Detects	42.86%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	390	Minimum Detected	5.966
Maximum Detected	70000	Maximum Detected	11.16
Mean of Detected	16904	Mean of Detected	8.439
SD of Detected	26691	SD of Detected	1.818
Minimum Non-Detect	6.9	Minimum Non-Detect	1.932
Maximum Non-Detect	8.1	Maximum Non-Detect	2.092

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	8
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	42.86%

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.663	Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	9661	Mean	5.378
SD	21423	SD	3.902
95% DL/2 (t) UCL	19800	95% H-Stat (DL/2) UCL	5.15E+09
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	6.396
		SD in Log Scale	2.788
		Mean in Original Scale	9676
		SD in Original Scale	21416
		95% t UCL	19812
		95% Percentile Bootstrap UCL	19502
		95% BCA Bootstrap UCL	24288
		95% H-UCL	3806874

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.39	Data Follow Appr. Gamma Distribution at 5% Significance Level
Theta Star	43301	
nu star	6.246	
A-D Test Statistic	0.667	Nonparametric Statistics

5% A-D Critical Value	0.764	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.764	Mean	9826
5% K-S Critical Value	0.309	SD	20567
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	5876
		95% KM (t) UCL	20233
Assuming Gamma Distribution		95% KM (z) UCL	19492
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	19847
Minimum	1.00E-06	95% KM (bootstrap t) UCL	111289
Maximum	70000	95% KM (BCA) UCL	22700
Mean	9659	95% KM (Percentile Bootstrap) UCL	20146
Median	515	95% KM (Chebyshev) UCL	35441
SD	21424	97.5% KM (Chebyshev) UCL	46524
k star	0.111	99% KM (Chebyshev) UCL	68295
Theta star	86776		
Nu star	3.117	Potential UCLs to Use	
AppChi2	0.408	95% KM (BCA) UCL	22700
95% Gamma Approximate UCL (Use when n >= 40)	73818		
95% Adjusted Gamma UCL (Use when n < 40)	98081		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

>C28-C35

General Statistics

Number of Valid Data	14	Number of Detected Data	7
Number of Distinct Detected Data	6	Number of Non-Detect Data	7
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	170	Minimum Detected	5.136
Maximum Detected	22000	Maximum Detected	9.999
Mean of Detected	7364	Mean of Detected	7.781
SD of Detected	10054	SD of Detected	1.793
Minimum Non-Detect	11	Minimum Non-Detect	2.398
Maximum Non-Detect	120	Maximum Non-Detect	4.787

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	7
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.685	Shapiro Wilk Test Statistic	0.937
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3689	Mean	4.938
SD	7823	SD	3.248
95% DL/2 (t) UCL	7392	95% H-Stat (DL/2) UCL	18936834

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	5.212
		SD in Log Scale	3.012
		Mean in Original Scale	3693
		SD in Original Scale	7821
		95% t UCL	7394
		95% Percentile Bootstrap UCL	7042
		95% BCA Bootstrap UCL	8345
		95% H-UCL	4886691

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.413	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	17829		
nu star	5.783		
A-D Test Statistic	0.48	Nonparametric Statistics	
5% A-D Critical Value	0.748	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.748	Mean	3767
5% K-S Critical Value	0.326	SD	7501
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	2165
		95% KM (t) UCL	7602
Assuming Gamma Distribution		95% KM (z) UCL	7329
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	7312
Minimum	1.00E-06	95% KM (bootstrap t) UCL	26605
Maximum	22000	95% KM (BCA) UCL	8120
Mean	3682	95% KM (Percentile Bootstrap) UCL	7464
Median	85	95% KM (Chebyshev) UCL	13205
SD	7826	97.5% KM (Chebyshev) UCL	17289
k star	0.106	99% KM (Chebyshev) UCL	25311
Theta star	34598		
Nu star	2.98	Potential UCLs to Use	
AppChi2	0.367	95% KM (t) UCL	7602
95% Gamma Approximate UCL (Use when n >= 40)	29938		
95% Adjusted Gamma UCL (Use when n < 40)	39922		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

C6-C35 (Total)

General Statistics			
Number of Valid Data	14	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	6
		Percent Non-Detects	42.86%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	560	Minimum Detected	6.328
Maximum Detected	92000	Maximum Detected	11.43
Mean of Detected	23333	Mean of Detected	8.802
SD of Detected	36159	SD of Detected	1.776
Minimum Non-Detect	11	Minimum Non-Detect	2.398
Maximum Non-Detect	13	Maximum Non-Detect	2.565
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	8
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	42.86%

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.664	Shapiro Wilk Test Statistic	0.931
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	13335	Mean	5.785
SD	29113	SD	3.844
95% DL/2 (t) UCL	27114	95% H-Stat (DL/2) UCL	4.67E+09
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	6.748
		SD in Log Scale	2.849
		Mean in Original Scale	13366
		SD in Original Scale	29097
		95% t UCL	27138
		95% Percentile Bootstrap UCL	26791
		95% BCA Bootstrap UCL	31675
		95% H-UCL	7900088
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.399	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	58475		
nu star	6.384		
A-D Test Statistic	0.641	Nonparametric Statistics	
5% A-D Critical Value	0.762	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.762	Mean	13573
5% K-S Critical Value	0.309	SD	27942
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	7983
		95% KM (t) UCL	27711
Assuming Gamma Distribution		95% KM (z) UCL	26704
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	27094
Minimum	1.00E-06	95% KM (bootstrap t) UCL	148550
Maximum	92000	95% KM (BCA) UCL	29226
Mean	13333	95% KM (Percentile Bootstrap) UCL	27464
Median	880	95% KM (Chebyshev) UCL	48372
SD	29114	97.5% KM (Chebyshev) UCL	63429
k star	0.111	99% KM (Chebyshev) UCL	93006
Theta star	120461		
Nu star	3.099	Potential UCLs to Use	
AppChi2	0.402	95% KM (BCA) UCL	29226
95% Gamma Approximate UCL (Use when n >= 40)	102691		
95% Adjusted Gamma UCL (Use when n < 40)	136516		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	2200	Minimum of Log Data	7.696
Maximum	17000	Maximum of Log Data	9.741
Mean	13871	Mean of log Data	9.457
Geometric Mean	12803	SD of log Data	0.522
Median	15000		
SD	3793		
Std. Error of Mean	1014		
Coefficient of Variation	0.273		
Skewness	-2.459		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.71	Shapiro Wilk Test Statistic	0.505
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	15667	95% H-UCL	19691
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	23595
95% Adjusted-CLT UCL (Chen-1995)	14827	97.5% Chebyshev (MVUE) UCL	27526
95% Modified-t UCL (Johnson-1978)	15556	99% Chebyshev (MVUE) UCL	35247
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.077	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2732		
MLE of Mean	13871		
MLE of Standard Deviation	6156		
nu star	142.2		
Approximate Chi Square Value (.05)	115.6	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	15539
Adjusted Chi Square Value	112.4	95% Jackknife UCL	15667
		95% Standard Bootstrap UCL	15497
Anderson-Darling Test Statistic	2.275	95% Bootstrap-t UCL	15221
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	15030
Kolmogorov-Smirnov Test Statistic	0.34	95% Percentile Bootstrap UCL	15286
Kolmogorov-Smirnov 5% Critical Value	0.229	95% BCA Bootstrap UCL	15000
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	18290
		97.5% Chebyshev(Mean, Sd) UCL	20202
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	23957
95% Approximate Gamma UCL (Use when n >= 40)	17057		
95% Adjusted Gamma UCL (Use when n < 40)	17539		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	18290
Recommended UCL exceeds the maximum observation			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Arsenic

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	14

Raw Statistics	Log-transformed Statistics

Minimum	2.7	Minimum of Log Data	0.993
Maximum	5.4	Maximum of Log Data	1.686
Mean	4.114	Mean of log Data	1.395
Geometric Mean	4.035	SD of log Data	0.207
Median	4.1		
SD	0.828		
Std. Error of Mean	0.221		
Coefficient of Variation	0.201		
Skewness	0.0736		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.97	Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.506	95% H-UCL	4.576
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.111
95% Adjusted-CLT UCL (Chen-1995)	4.483	97.5% Chebyshev (MVUE) UCL	5.542
95% Modified-t UCL (Johnson-1978)	4.507	99% Chebyshev (MVUE) UCL	6.388
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	20.41	Data appear Normal at 5% Significance Level	
Theta Star	0.202		
MLE of Mean	4.114		
MLE of Standard Deviation	0.911		
nu star	571.5		
Approximate Chi Square Value (.05)	517.1	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	4.478
Adjusted Chi Square Value	510.2	95% Jackknife UCL	4.506
		95% Standard Bootstrap UCL	4.464
Anderson-Darling Test Statistic	0.166	95% Bootstrap-t UCL	4.504
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	4.484
Kolmogorov-Smirnov Test Statistic	0.0989	95% Percentile Bootstrap UCL	4.45
Kolmogorov-Smirnov 5% Critical Value	0.228	95% BCA Bootstrap UCL	4.479
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5.079
		97.5% Chebyshev(Mean, Sd) UCL	5.497
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	6.317
95% Approximate Gamma UCL (Use when n >= 40)	4.548		
95% Adjusted Gamma UCL (Use when n < 40)	4.609		
Potential UCL to Use		Use 95% Student's-t UCL	4.506

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Barium

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	8
Raw Statistics		Log-transformed Statistics	
Minimum	68	Minimum of Log Data	4.22
Maximum	170	Maximum of Log Data	5.136
Mean	106.5	Mean of log Data	4.646
Geometric Mean	104.1	SD of log Data	0.217
Median	100		
SD	24.46		
Std. Error of Mean	6.537		

Coefficient of Variation	0.23		
Skewness	1.279		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.887	Shapiro Wilk Test Statistic	0.939
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	118.1	95% H-UCL	119
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	133.4
95% Adjusted-CLT UCL (Chen-1995)	119.6	97.5% Chebyshev (MVUE) UCL	145.1
95% Modified-t UCL (Johnson-1978)	118.4	99% Chebyshev (MVUE) UCL	168.1
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	17.67	Data appear Normal at 5% Significance Level	
Theta Star	6.027		
MLE of Mean	106.5		
MLE of Standard Deviation	25.34		
nu star	494.7		
Approximate Chi Square Value (.05)	444.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	117.3
Adjusted Chi Square Value	437.8	95% Jackknife UCL	118.1
		95% Standard Bootstrap UCL	116.8
Anderson-Darling Test Statistic	0.52	95% Bootstrap-t UCL	122.5
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	133.1
Kolmogorov-Smirnov Test Statistic	0.197	95% Percentile Bootstrap UCL	117.1
Kolmogorov-Smirnov 5% Critical Value	0.228	95% BCA Bootstrap UCL	119.9
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	135
		97.5% Chebyshev(Mean, Sd) UCL	147.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	171.5
95% Approximate Gamma UCL (Use when n >= 40)	118.6		
95% Adjusted Gamma UCL (Use when n < 40)	120.4		
Potential UCL to Use		Use 95% Student's-t UCL	118.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	6
Raw Statistics		Log-transformed Statistics	
Minimum	2	Minimum of Log Data	0.693
Maximum	14	Maximum of Log Data	2.639
Mean	11.36	Mean of log Data	2.356
Geometric Mean	10.55	SD of log Data	0.493
Median	11.5		
SD	3.054		
Std. Error of Mean	0.816		
Coefficient of Variation	0.269		
Skewness	-2.381		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.727	Shapiro Wilk Test Statistic	0.519
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874

Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	12.8	95% H-UCL	15.69
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	18.78
95% Adjusted-CLT UCL (Chen-1995)	12.14	97.5% Chebyshev (MVUE) UCL	21.79
95% Modified-t UCL (Johnson-1978)	12.72	99% Chebyshev (MVUE) UCL	27.72
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.51	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2.061		
MLE of Mean	11.36		
MLE of Standard Deviation	4.838		
nu star	154.3		
Approximate Chi Square Value (.05)	126.6	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	12.7
Adjusted Chi Square Value	123.2	95% Jackknife UCL	12.8
		95% Standard Bootstrap UCL	12.66
Anderson-Darling Test Statistic	2.146	95% Bootstrap-t UCL	12.44
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	12.38
Kolmogorov-Smirnov Test Statistic	0.349	95% Percentile Bootstrap UCL	12.5
Kolmogorov-Smirnov 5% Critical Value	0.229	95% BCA Bootstrap UCL	12.29
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	14.91
		97.5% Chebyshev(Mean, Sd) UCL	16.45
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	19.48
95% Approximate Gamma UCL (Use when n >= 40)	13.84		
95% Adjusted Gamma UCL (Use when n < 40)	14.22		
Potential UCL to Use		Use 95% Student's-t UCL	12.8
		or 95% Modified-t UCL	12.72

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Cobalt

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	11
Raw Statistics		Log-transformed Statistics	
Minimum	1.3	Minimum of Log Data	0.262
Maximum	7.2	Maximum of Log Data	1.974
Mean	4.907	Mean of log Data	1.538
Geometric Mean	4.653	SD of log Data	0.393
Median	5.1		
SD	1.283		
Std. Error of Mean	0.343		
Coefficient of Variation	0.262		
Skewness	-1.484		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.821	Shapiro Wilk Test Statistic	0.629
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	5.515	95% H-UCL	6.236
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7.326
95% Adjusted-CLT UCL (Chen-1995)	5.326	97.5% Chebyshev (MVUE) UCL	8.334
95% Modified-t UCL (Johnson-1978)	5.492	99% Chebyshev (MVUE) UCL	10.31
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	7.571	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.648		
MLE of Mean	4.907		
MLE of Standard Deviation	1.783		
nu star	212		
Approximate Chi Square Value (.05)	179.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	5.471
Adjusted Chi Square Value	175.3	95% Jackknife UCL	5.515
		95% Standard Bootstrap UCL	5.437
Anderson-Darling Test Statistic	1.715	95% Bootstrap-t UCL	5.375
Anderson-Darling 5% Critical Value	0.735	95% Hall's Bootstrap UCL	5.379
Kolmogorov-Smirnov Test Statistic	0.322	95% Percentile Bootstrap UCL	5.421
Kolmogorov-Smirnov 5% Critical Value	0.229	95% BCA Bootstrap UCL	5.35
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	6.402
		97.5% Chebyshev(Mean, Sd) UCL	7.049
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	8.32
95% Approximate Gamma UCL (Use when n >= 40)	5.802		
95% Adjusted Gamma UCL (Use when n < 40)	5.934		
Potential UCL to Use		Use 95% Student's-t UCL	5.515
		or 95% Modified-t UCL	5.492

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Copper

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	9
Raw Statistics		Log-transformed Statistics	
Minimum	8.5	Minimum of Log Data	2.14
Maximum	18	Maximum of Log Data	2.89
Mean	10.4	Mean of log Data	2.321
Geometric Mean	10.18	SD of log Data	0.203
Median	9.3		
SD	2.499		
Std. Error of Mean	0.668		
Coefficient of Variation	0.24		
Skewness	2.415		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.709	Shapiro Wilk Test Statistic	0.792
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	11.58	95% H-UCL	11.51
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	12.84
95% Adjusted-CLT UCL (Chen-1995)	11.96	97.5% Chebyshev (MVUE) UCL	13.9
95% Modified-t UCL (Johnson-1978)	11.65	99% Chebyshev (MVUE) UCL	15.99
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	18.66	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.557		
MLE of Mean	10.4		
MLE of Standard Deviation	2.407		
nu star	522.6		
Approximate Chi Square Value (.05)	470.6	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	11.5
Adjusted Chi Square Value	464	95% Jackknife UCL	11.58
		95% Standard Bootstrap UCL	11.46
Anderson-Darling Test Statistic	1.123	95% Bootstrap-t UCL	12.66
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	15.7
Kolmogorov-Smirnov Test Statistic	0.232	95% Percentile Bootstrap UCL	11.44
Kolmogorov-Smirnov 5% Critical Value	0.228	95% BCA Bootstrap UCL	12.04
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13.31
		97.5% Chebyshev(Mean, Sd) UCL	14.57
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	17.05
95% Approximate Gamma UCL (Use when n >= 40)	11.55		
95% Adjusted Gamma UCL (Use when n < 40)	11.71		
Potential UCL to Use		Use 95% Student's-t UCL	11.58
		or 95% Modified-t UCL	11.65

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	10
Raw Statistics		Log-transformed Statistics	
Minimum	11	Minimum of Log Data	2.398
Maximum	270	Maximum of Log Data	5.598
Mean	45.64	Mean of log Data	3.18
Geometric Mean	24.04	SD of log Data	0.997
Median	15		
SD	72.85		
Std. Error of Mean	19.47		
Coefficient of Variation	1.596		
Skewness	2.745		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.54	Shapiro Wilk Test Statistic	0.767
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	80.12	95% H-UCL	85.41
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	85.09
95% Adjusted-CLT UCL (Chen-1995)	92.93	97.5% Chebyshev (MVUE) UCL	105.6
95% Modified-t UCL (Johnson-1978)	82.5	99% Chebyshev (MVUE) UCL	146

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.763	Data do not follow a Discernable Distribution (0.05)	
Theta Star	59.8		
MLE of Mean	45.64		
MLE of Standard Deviation	52.25		
nu star	21.37		
Approximate Chi Square Value (.05)	11.87	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	77.67
Adjusted Chi Square Value	10.94	95% Jackknife UCL	80.12
		95% Standard Bootstrap UCL	76.38
Anderson-Darling Test Statistic	1.886	95% Bootstrap-t UCL	258.4
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL	225.4
Kolmogorov-Smirnov Test Statistic	0.269	95% Percentile Bootstrap UCL	78.93
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	95.86
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	130.5
		97.5% Chebyshev(Mean, Sd) UCL	167.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	239.4
95% Approximate Gamma UCL (Use when n >= 40)	82.19		
95% Adjusted Gamma UCL (Use when n < 40)	89.18		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	130.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	12
Raw Statistics		Log-transformed Statistics	
Minimum	27	Minimum of Log Data	3.296
Maximum	390	Maximum of Log Data	5.966
Mean	242.6	Mean of log Data	5.368
Geometric Mean	214.4	SD of log Data	0.645
Median	230		
SD	90.37		
Std. Error of Mean	24.15		
Coefficient of Variation	0.372		
Skewness	-0.608		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.939	Shapiro Wilk Test Statistic	0.666
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	285.4	95% H-UCL	396.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	462.7
95% Adjusted-CLT UCL (Chen-1995)	278.2	97.5% Chebyshev (MVUE) UCL	550.7
95% Modified-t UCL (Johnson-1978)	284.8	99% Chebyshev (MVUE) UCL	723.6
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	3.343	Data appear Normal at 5% Significance Level	
Theta Star	72.58		
MLE of Mean	242.6		
MLE of Standard Deviation	132.7		
nu star	93.61		

Approximate Chi Square Value (.05)	72.3	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	282.4
Adjusted Chi Square Value	69.82	95% Jackknife UCL	285.4
		95% Standard Bootstrap UCL	281.4
Anderson-Darling Test Statistic	1.042	95% Bootstrap-t UCL	281.7
Anderson-Darling 5% Critical Value	0.74	95% Hall's Bootstrap UCL	281.7
Kolmogorov-Smirnov Test Statistic	0.268	95% Percentile Bootstrap UCL	281.4
Kolmogorov-Smirnov 5% Critical Value	0.23	95% BCA Bootstrap UCL	279.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	347.9
		97.5% Chebyshev(Mean, Sd) UCL	393.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	483
95% Approximate Gamma UCL (Use when n >= 40)	314.2		
95% Adjusted Gamma UCL (Use when n < 40)	325.3		
Potential UCL to Use		Use 95% Student's-t UCL	285.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Mercury

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	13
Raw Statistics		Log-transformed Statistics	
Minimum	0.0026	Minimum of Log Data	-5.952
Maximum	0.45	Maximum of Log Data	-0.799
Mean	0.0553	Mean of log Data	-4.28
Geometric Mean	0.0138	SD of log Data	1.458
Median	0.00775		
SD	0.125		
Std. Error of Mean	0.0333		
Coefficient of Variation	2.252		
Skewness	2.943		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.475	Shapiro Wilk Test Statistic	0.827
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.114	95% H-UCL	0.172
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.102
95% Adjusted-CLT UCL (Chen-1995)	0.138	97.5% Chebyshev (MVUE) UCL	0.131
95% Modified-t UCL (Johnson-1978)	0.119	99% Chebyshev (MVUE) UCL	0.188
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.412	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.134		
MLE of Mean	0.0553		
MLE of Standard Deviation	0.0861		
nu star	11.54		
Approximate Chi Square Value (.05)	4.927	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	0.11

Adjusted Chi Square Value	4.367	95% Jackknife UCL	0.114
		95% Standard Bootstrap UCL	0.109
Anderson-Darling Test Statistic	2.067	95% Bootstrap-t UCL	0.82
Anderson-Darling 5% Critical Value	0.8	95% Hall's Bootstrap UCL	0.538
Kolmogorov-Smirnov Test Statistic	0.348	95% Percentile Bootstrap UCL	0.116
Kolmogorov-Smirnov 5% Critical Value	0.243	95% BCA Bootstrap UCL	0.149
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.2
		97.5% Chebyshev(Mean, Sd) UCL	0.263
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.386
95% Approximate Gamma UCL (Use when n >= 40)	0.13		
95% Adjusted Gamma UCL (Use when n < 40)	0.146		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	0.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Nickel

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	10
Raw Statistics		Log-transformed Statistics	
Minimum	6.1	Minimum of Log Data	1.808
Maximum	14	Maximum of Log Data	2.639
Mean	10.32	Mean of log Data	2.318
Geometric Mean	10.15	SD of log Data	0.194
Median	10.5		
SD	1.855		
Std. Error of Mean	0.496		
Coefficient of Variation	0.18		
Skewness	-0.305		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.949	Shapiro Wilk Test Statistic	0.902
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	11.2	95% H-UCL	11.41
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	12.68
95% Adjusted-CLT UCL (Chen-1995)	11.09	97.5% Chebyshev (MVUE) UCL	13.69
95% Modified-t UCL (Johnson-1978)	11.19	99% Chebyshev (MVUE) UCL	15.69
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	24.01	Data appear Normal at 5% Significance Level	
Theta Star	0.43		
MLE of Mean	10.32		
MLE of Standard Deviation	2.106		
nu star	672.4		
Approximate Chi Square Value (.05)	613.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	11.14
Adjusted Chi Square Value	605.7	95% Jackknife UCL	11.2
		95% Standard Bootstrap UCL	11.13
Anderson-Darling Test Statistic	0.468	95% Bootstrap-t UCL	11.18
Anderson-Darling 5% Critical Value	0.734	95% Hall's Bootstrap UCL	11.23
Kolmogorov-Smirnov Test Statistic	0.161	95% Percentile Bootstrap UCL	11.06
Kolmogorov-Smirnov 5% Critical Value	0.228	95% BCA Bootstrap UCL	11.04
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	12.48

		97.5% Chebyshev(Mean, Sd) UCL	13.42
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	15.25
95% Approximate Gamma UCL (Use when n >= 40)	11.32		
95% Adjusted Gamma UCL (Use when n < 40)	11.46		
Potential UCL to Use		Use 95% Student's-t UCL	11.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Vanadium

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	11
Raw Statistics		Log-transformed Statistics	
Minimum	4.2	Minimum of Log Data	1.435
Maximum	36	Maximum of Log Data	3.584
Mean	22.09	Mean of log Data	3.01
Geometric Mean	20.29	SD of log Data	0.503
Median	23		
SD	7.378		
Std. Error of Mean	1.972		
Coefficient of Variation	0.334		
Skewness	-0.591		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.936	Shapiro Wilk Test Statistic	0.719
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	25.58	95% H-UCL	30.48
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	36.53
95% Adjusted-CLT UCL (Chen-1995)	25	97.5% Chebyshev (MVUE) UCL	42.47
95% Modified-t UCL (Johnson-1978)	25.53	99% Chebyshev (MVUE) UCL	54.14
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.808	Data appear Normal at 5% Significance Level	
Theta Star	4.594		
MLE of Mean	22.09		
MLE of Standard Deviation	10.07		
nu star	134.6		
Approximate Chi Square Value (.05)	108.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	25.33
Adjusted Chi Square Value	105.7	95% Jackknife UCL	25.58
		95% Standard Bootstrap UCL	25.15
Anderson-Darling Test Statistic	0.982	95% Bootstrap-t UCL	25.23
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	25.54
Kolmogorov-Smirnov Test Statistic	0.22	95% Percentile Bootstrap UCL	25.07
Kolmogorov-Smirnov 5% Critical Value	0.229	95% BCA Bootstrap UCL	24.93
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	30.68
		97.5% Chebyshev(Mean, Sd) UCL	34.4
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	41.71

95% Approximate Gamma UCL (Use when n >= 40)	27.32
95% Adjusted Gamma UCL (Use when n < 40)	28.12

Potential UCL to Use		Use 95% Student's-t UCL	25.58

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Zinc

General Statistics			
Number of Valid Observations	14	Number of Distinct Observations	10
Raw Statistics		Log-transformed Statistics	
Minimum	8.3	Minimum of Log Data	2.116
Maximum	110	Maximum of Log Data	4.7
Mean	36.74	Mean of log Data	3.458
Geometric Mean	31.76	SD of log Data	0.554
Median	30		
SD	23.76		
Std. Error of Mean	6.35		
Coefficient of Variation	0.647		
Skewness	2.521		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.679	Shapiro Wilk Test Statistic	0.838
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	47.98	95% H-UCL	51.08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	60.98
95% Adjusted-CLT UCL (Chen-1995)	51.75	97.5% Chebyshev (MVUE) UCL	71.54
95% Modified-t UCL (Johnson-1978)	48.7	99% Chebyshev (MVUE) UCL	92.28
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.872	Data do not follow a Discernable Distribution (0.05)	
Theta Star	12.79		
MLE of Mean	36.74		
MLE of Standard Deviation	21.68		
nu star	80.41		
Approximate Chi Square Value (.05)	60.75	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	47.18
Adjusted Chi Square Value	58.48	95% Jackknife UCL	47.98
		95% Standard Bootstrap UCL	46.82
Anderson-Darling Test Statistic	1.294	95% Bootstrap-t UCL	66.13
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	108.4
Kolmogorov-Smirnov Test Statistic	0.251	95% Percentile Bootstrap UCL	48.52
Kolmogorov-Smirnov 5% Critical Value	0.23	95% BCA Bootstrap UCL	53.24
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	64.42
		97.5% Chebyshev(Mean, Sd) UCL	76.39
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	99.92
95% Approximate Gamma UCL (Use when n >= 40)	48.63		
95% Adjusted Gamma UCL (Use when n < 40)	50.51		

Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	64.42

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

1,2,4-Trimethylbenzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	11
		Percent Non-Detects	78.57%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0034	Minimum Detected	-5.684
Maximum Detected	1.5	Maximum Detected	0.405
Mean of Detected	0.52	Mean of Detected	-2.714
SD of Detected	0.849	SD of Detected	3.048
Minimum Non-Detect	9.10E-04	Minimum Non-Detect	-7.002
Maximum Non-Detect	0.062	Maximum Non-Detect	-2.781

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.777	Shapiro Wilk Test Statistic	0.998
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.114	Mean	-6.146
SD	0.399	SD	2.464
95% DL/2 (t) UCL	0.303	95% H-Stat (DL/2) UCL	2.085
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-10.93
		SD in Log Scale	5.023
		Mean in Original Scale	0.111
		SD in Original Scale	0.4
		95% t UCL	0.301
		95% Percentile Bootstrap UCL	0.326
		95% BCA Bootstrap UCL	0.437
		95% H-UCL	26426545
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		

A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.114
5% K-S Critical Value	N/A	SD	0.385
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.126
		95% KM (t) UCL	0.337
Assuming Gamma Distribution		95% KM (z) UCL	0.322
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.281
Minimum	N/A	95% KM (bootstrap t) UCL	2.363
Maximum	N/A	95% KM (BCA) UCL	1.5
Mean	N/A	95% KM (Percentile Bootstrap) UCL	1.5
Median	N/A	95% KM (Chebyshev) UCL	0.663
SD	N/A	97.5% KM (Chebyshev) UCL	0.901
k star	N/A	99% KM (Chebyshev) UCL	1.367
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.337
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	1.5
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

1,3,5-Trimethylbenzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
		Percent Non-Detects	85.71%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0022	Minimum Detected	-6.119
Maximum Detected	0.65	Maximum Detected	-0.431
Mean of Detected	0.326	Mean of Detected	-3.275
SD of Detected	0.458	SD of Detected	4.022
Minimum Non-Detect	0.0016	Minimum Non-Detect	-6.438
Maximum Non-Detect	0.11	Maximum Non-Detect	-2.207
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0513	Mean	-6.114
SD	0.173	SD	1.968
95% DL/2 (t) UCL	0.133	95% H-Stat (DL/2) UCL	0.19
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.0485
5% K-S Critical Value	N/A	SD	0.167
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0631
		95% KM (t) UCL	0.16
Assuming Gamma Distribution		95% KM (z) UCL	0.152
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.486
Minimum	N/A	95% KM (bootstrap t) UCL	0.0485
Maximum	N/A	95% KM (BCA) UCL	0.65
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.323
SD	N/A	97.5% KM (Chebyshev) UCL	0.442
k star	N/A	99% KM (Chebyshev) UCL	0.676
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	99% KM (Chebyshev) UCL	0.676
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Warning: Recommended UCL exceeds the maximum observation
Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

2-Butanone (MEK)

General Statistics			
Number of Valid Data	14	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	11
		Percent Non-Detects	78.57%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.051	Minimum Detected	-2.976
Maximum Detected	4	Maximum Detected	1.386
Mean of Detected	1.457	Mean of Detected	-0.91
SD of Detected	2.206	SD of Detected	2.19

Minimum Non-Detect	0.0019	Minimum Non-Detect	-6.266
Maximum Non-Detect	0.13	Maximum Non-Detect	-2.04
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	12
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	85.71%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.801	Shapiro Wilk Test Statistic	0.992
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.318	Mean	-5.203
SD	1.063	SD	2.705
95% DL/2 (t) UCL	0.821	95% H-Stat (DL/2) UCL	21.04
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-8.011
		SD in Log Scale	4.271
		Mean in Original Scale	0.312
		SD in Original Scale	1.065
		95% t UCL	0.816
		95% Percentile Bootstrap UCL	0.88
		95% BCA Bootstrap UCL	1.189
		95% H-UCL	219525
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.352
5% K-S Critical Value	N/A	SD	1.014
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.332
		95% KM (t) UCL	0.94
Assuming Gamma Distribution		95% KM (z) UCL	0.898
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.788
Minimum	N/A	95% KM (bootstrap t) UCL	4.732
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	4
Median	N/A	95% KM (Chebyshev) UCL	1.799
SD	N/A	97.5% KM (Chebyshev) UCL	2.425
k star	N/A	99% KM (Chebyshev) UCL	3.655
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.94
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	4
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

2-Hexanone

General Statistics			
Number of Valid Data	14	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	13
		Percent Non-Detects	92.86%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 2-Hexanone was not processed!

4-Isopropyltoluene

General Statistics			
Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
		Percent Non-Detects	85.71%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0014	Minimum Detected	-6.571
Maximum Detected	0.0049	Maximum Detected	-5.319
Mean of Detected	0.00315	Mean of Detected	-5.945
SD of Detected	0.00247	SD of Detected	0.886
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.26	Maximum Non-Detect	-1.347

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0127	Mean	-6.5
SD	0.0349	SD	1.737
95% DL/2 (t) UCL	0.0292	95% H-Stat (DL/2) UCL	0.0502

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.00169
5% K-S Critical Value	N/A	SD	9.67E-04
Data not Gamma Distributed at 5% Significance Level		SE of Mean	3.95E-04
		95% KM (t) UCL	0.00239
Assuming Gamma Distribution		95% KM (z) UCL	0.00234
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00404
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.0049
Median	N/A	95% KM (Chebyshev) UCL	0.00341
SD	N/A	97.5% KM (Chebyshev) UCL	0.00416
k star	N/A	99% KM (Chebyshev) UCL	0.00562
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.00239
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (% Bootstrap) UCL	0.0049
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

Acetone

General Statistics			
Number of Valid Data	14	Number of Detected Data	11
Number of Distinct Detected Data	10	Number of Non-Detect Data	3
		Percent Non-Detects	21.43%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.027	Minimum Detected	-3.612
Maximum Detected	15	Maximum Detected	2.708
Mean of Detected	1.73	Mean of Detected	-1.714
SD of Detected	4.481	SD of Detected	1.989
Minimum Non-Detect	0.0016	Minimum Non-Detect	-6.438
Maximum Non-Detect	0.0019	Maximum Non-Detect	-6.266
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	11
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	21.43%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.446	Shapiro Wilk Test Statistic	0.814
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.359	Mean	-2.854
SD	3.999	SD	2.86
95% DL/2 (t) UCL	3.252	95% H-Stat (DL/2) UCL	572.6
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.64	Mean in Log Scale	-2.674
SD	4.488	SD in Log Scale	2.586
95% MLE (t) UCL	2.764	Mean in Original Scale	1.36
95% MLE (Tiku) UCL	2.725	SD in Original Scale	3.999
		95% t UCL	3.252
		95% Percentile Bootstrap UCL	3.455
		95% BCA Bootstrap UCL	4.554
		95% H UCL	132.4
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.282	Data do not follow a Discernable Distribution (0.05)	
Theta Star	6.137		
nu star	6.201		
A-D Test Statistic	1.635	Nonparametric Statistics	
5% A-D Critical Value	0.819	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.819	Mean	1.365
5% K-S Critical Value	0.276	SD	3.851
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.08
		95% KM (t) UCL	3.277
Assuming Gamma Distribution		95% KM (z) UCL	3.141
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.253
Minimum	1.00E-06	95% KM (bootstrap t) UCL	42.95
Maximum	15	95% KM (BCA) UCL	3.493
Mean	1.359	95% KM (Percentile Bootstrap) UCL	3.35
Median	0.053	95% KM (Chebyshev) UCL	6.07
SD	3.999	97.5% KM (Chebyshev) UCL	8.107
k star	0.177	99% KM (Chebyshev) UCL	12.11
Theta star	7.689		
Nu star	4.949	Potential UCLs to Use	
AppChi2	1.129	99% KM (Chebyshev) UCL	12.11
95% Gamma Approximate UCL (Use when n >= 40)	5.959		
95% Adjusted Gamma UCL (Use when n < 40)	7.401		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

Benzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	7
		Percent Non-Detects	50.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0022	Minimum Detected	-6.119
Maximum Detected	3.3	Maximum Detected	1.194

Mean of Detected	0.746	Mean of Detected	-3.047
SD of Detected	1.286	SD of Detected	3.05
Minimum Non-Detect	0.0014	Minimum Non-Detect	-6.571
Maximum Non-Detect	0.078	Maximum Non-Detect	-2.551

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	11
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	78.57%

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.68	Shapiro Wilk Test Statistic	0.863
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.377	Mean	-4.553
SD	0.954	SD	2.744
95% DL/2 (t) UCL	0.828	95% H-Stat (DL/2) UCL	51
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-6.233
		SD in Log Scale	3.981
		Mean in Original Scale	0.373
		SD in Original Scale	0.956
		95% t UCL	0.825
		95% Percentile Bootstrap UCL	0.843
		95% BCA Bootstrap UCL	0.981
		95% H-UCL	92572

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.242	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	3.084		
nu star	3.387		
A-D Test Statistic	0.621	Nonparametric Statistics	
5% A-D Critical Value	0.8	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.8	Mean	0.374
5% K-S Critical Value	0.338	SD	0.92
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.266
		95% KM (t) UCL	0.845
Assuming Gamma Distribution		95% KM (z) UCL	0.811
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.826
Minimum	1.00E-06	95% KM (bootstrap t) UCL	6.632
Maximum	3.3	95% KM (BCA) UCL	0.86
Mean	0.373	95% KM (Percentile Bootstrap) UCL	0.845
Median	0.0011	95% KM (Chebyshev) UCL	1.532
SD	0.956	97.5% KM (Chebyshev) UCL	2.034
k star	0.132	99% KM (Chebyshev) UCL	3.018
Theta star	2.816		
Nu star	3.709	Potential UCLs to Use	
AppChi2	0.61	95% KM (t) UCL	0.845
95% Gamma Approximate UCL (Use when n >= 40)	2.267		
95% Adjusted Gamma UCL (Use when n < 40)	2.945		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Carbon disulfide

General Statistics			
Number of Valid Data	14	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	14
		Percent Non-Detects	100.00%

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Carbon disulfide was not processed!

Ethylbenzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	11
		Percent Non-Detects	78.57%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0017	Minimum Detected	-6.377
Maximum Detected	0.069	Maximum Detected	-2.674
Mean of Detected	0.0265	Mean of Detected	-4.595
SD of Detected	0.037	SD of Detected	1.856
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.17	Maximum Non-Detect	-1.772

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.828	Shapiro Wilk Test Statistic	0.996
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0146	Mean	-6.162
SD	0.0281	SD	1.965
95% DL/2 (t) UCL	0.0279	95% H-Stat (DL/2) UCL	0.178
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-9.248
		SD in Log Scale	2.936

		Mean in Original Scale	0.00572
		SD in Original Scale	0.0184
		95% t UCL	0.0144
		95% Percentile Bootstrap UCL	0.0151
		95% BCA Bootstrap UCL	0.0205
		95% H-UCL	1.562
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.00747
5% K-S Critical Value	N/A	SD	0.0179
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00607
		95% KM (t) UCL	0.0182
Assuming Gamma Distribution		95% KM (z) UCL	0.0175
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0159
Minimum	N/A	95% KM (bootstrap t) UCL	0.0452
Maximum	N/A	95% KM (BCA) UCL	0.069
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.069
Median	N/A	95% KM (Chebyshev) UCL	0.0339
SD	N/A	97.5% KM (Chebyshev) UCL	0.0454
k star	N/A	99% KM (Chebyshev) UCL	0.0679
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.0182
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	0.069
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Isopropylbenzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
		Percent Non-Detects	85.71%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.025	Minimum Detected	-3.689
Maximum Detected	0.14	Maximum Detected	-1.966
Mean of Detected	0.0825	Mean of Detected	-2.827
SD of Detected	0.0813	SD of Detected	1.218
Minimum Non-Detect	9.10E-04	Minimum Non-Detect	-7.002
Maximum Non-Detect	0.088	Maximum Non-Detect	-2.43
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0176	Mean	-6.22
SD	0.038	SD	2.115
95% DL/2 (t) UCL	0.0356	95% H-Stat (DL/2) UCL	0.331
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.0332
5% K-S Critical Value	N/A	SD	0.0296
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0112
		95% KM (t) UCL	0.053
Assuming Gamma Distribution		95% KM (z) UCL	0.0516
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.111
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	0.14
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.082
SD	N/A	97.5% KM (Chebyshev) UCL	0.103
k star	N/A	99% KM (Chebyshev) UCL	0.145
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (BCA) UCL	0.14
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Naphthalene

General Statistics

Number of Valid Data	14	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	10
		Percent Non-Detects	71.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0033	Minimum Detected	-5.714
Maximum Detected	0.95	Maximum Detected	-0.0513
Mean of Detected	0.241	Mean of Detected	-4.124
SD of Detected	0.473	SD of Detected	2.727
Minimum Non-Detect	0.0023	Minimum Non-Detect	-6.075
Maximum Non-Detect	0.77	Maximum Non-Detect	-0.261

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.632	Shapiro Wilk Test Statistic	0.706
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0972	Mean	-5.484
SD	0.266	SD	2.174
95% DL/2 (t) UCL	0.223	95% H-Stat (DL/2) UCL	0.912

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-9.537
		SD in Log Scale	3.988
		Mean in Original Scale	0.0688
		SD in Original Scale	0.254
		95% t UCL	0.189
		95% Percentile Bootstrap UCL	0.204
		95% BCA Bootstrap UCL	0.272
		95% H-UCL	3594

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.232	Data do not follow a Discernable Distribution (0.05)
Theta Star	1.038	
nu star	1.856	

		Nonparametric Statistics	
A-D Test Statistic	0.822		
5% A-D Critical Value	0.715	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.715	Mean	0.0712
5% K-S Critical Value	0.421	SD	0.244
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0752
		95% KM (t) UCL	0.204
Assuming Gamma Distribution		95% KM (z) UCL	0.195
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.191
Minimum	1.00E-06	95% KM (bootstrap t) UCL	27.03
Maximum	0.95	95% KM (BCA) UCL	0.95

Mean	0.0688	95% KM (Percentile Bootstrap) UCL	0.207
Median	1.00E-06	95% KM (Chebyshev) UCL	0.399
SD	0.254	97.5% KM (Chebyshev) UCL	0.541
k star	0.124	99% KM (Chebyshev) UCL	0.82
Theta star	0.554		
Nu star	3.475	Potential UCLs to Use	
AppChi2	0.526	99% KM (Chebyshev) UCL	0.82
95% Gamma Approximate UCL (Use when n >= 40)	0.454		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

n-Butylbenzene

General Statistics

Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
		Percent Non-Detects	85.71%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	8.00E-04	Minimum Detected	-7.131
Maximum Detected	0.0051	Maximum Detected	-5.279
Mean of Detected	0.00295	Mean of Detected	-6.205
SD of Detected	0.00304	SD of Detected	1.31
Minimum Non-Detect	5.70E-04	Minimum Non-Detect	-7.47
Maximum Non-Detect	0.056	Maximum Non-Detect	-2.882

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00408	Mean	-7.091
SD	0.00859	SD	1.599
95% DL/2 (t) UCL	0.00814	95% H-Stat (DL/2) UCL	0.0167

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A

SD in Log Scale	N/A
Mean in Original Scale	N/A
SD in Original Scale	N/A
95% t UCL	N/A
95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A
95% H-UCL	N/A

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	N/A
Maximum	N/A
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
AppChi2	N/A
95% Gamma Approximate UCL (Use when n >= 40)	N/A
95% Adjusted Gamma UCL (Use when n < 40)	N/A

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only	
Data do not follow a Discernable Distribution (0.05)	

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.00116
SD	0.00119
SE of Mean	4.85E-04
95% KM (t) UCL	0.00202
95% KM (z) UCL	0.00196
95% KM (jackknife) UCL	0.00405
95% KM (bootstrap t) UCL	0.00123
95% KM (BCA) UCL	N/A
95% KM (Percentile Bootstrap) UCL	0.0051
95% KM (Chebyshev) UCL	0.00327
97.5% KM (Chebyshev) UCL	0.00419
99% KM (Chebyshev) UCL	0.00599
Potential UCLs to Use	
95% KM (BCA) UCL	N/A

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

N-Propylbenzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	11
		Percent Non-Detects	78.57%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0026	Minimum Detected	-5.952
Maximum Detected	0.23	Maximum Detected	-1.47
Mean of Detected	0.0892	Mean of Detected	-3.591
SD of Detected	0.123	SD of Detected	2.251
Minimum Non-Detect	9.40E-04	Minimum Non-Detect	-6.97
Maximum Non-Detect	0.091	Maximum Non-Detect	-2.397

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.854	Shapiro Wilk Test Statistic	0.992
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.025	Mean	-6.005
SD	0.061	SD	2.17
95% DL/2 (t) UCL	0.0539	95% H-Stat (DL/2) UCL	0.532
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-9.114
		SD in Log Scale	3.367
		Mean in Original Scale	0.0192
		SD in Original Scale	0.0614
		95% t UCL	0.0482
		95% Percentile Bootstrap UCL	0.0499
		95% BCA Bootstrap UCL	0.0822
		95% H-UCL	35.58
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.0216
5% K-S Critical Value	N/A	SD	0.0585
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0192
		95% KM (t) UCL	0.0556
Assuming Gamma Distribution		95% KM (z) UCL	0.0531
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0516
Minimum	N/A	95% KM (bootstrap t) UCL	0.0957
Maximum	N/A	95% KM (BCA) UCL	0.23
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.105
SD	N/A	97.5% KM (Chebyshev) UCL	0.141
k star	N/A	99% KM (Chebyshev) UCL	0.213
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.0556
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	N/A
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

sec-Butylbenzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	11

		Percent Non-Detects	78.57%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0063	Minimum Detected	-5.067
Maximum Detected	0.03	Maximum Detected	-3.507
Mean of Detected	0.0168	Mean of Detected	-4.281
SD of Detected	0.0121	SD of Detected	0.78
Minimum Non-Detect	6.90E-04	Minimum Non-Detect	-7.279
Maximum Non-Detect	0.067	Maximum Non-Detect	-2.703
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.961	Shapiro Wilk Test Statistic	1
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00796	Mean	-6.399
SD	0.0122	SD	1.907
95% DL/2 (t) UCL	0.0137	95% H-Stat (DL/2) UCL	0.11
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-6.996
		SD in Log Scale	1.527
		Mean in Original Scale	0.00395
		SD in Original Scale	0.00841
		95% t UCL	0.00793
		95% Percentile Bootstrap UCL	0.00773
		95% BCA Bootstrap UCL	0.00971
		95% H-UCL	0.0143
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.00892
5% K-S Critical Value	N/A	SD	0.0067
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00237
		95% KM (t) UCL	0.0131
Assuming Gamma Distribution		95% KM (z) UCL	0.0128
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0144
Minimum	N/A	95% KM (bootstrap t) UCL	0.0129
Maximum	N/A	95% KM (BCA) UCL	0.03
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.03
Median	N/A	95% KM (Chebyshev) UCL	0.0192

SD	N/A	97.5% KM (Chebyshev) UCL	0.0237
k star	N/A	99% KM (Chebyshev) UCL	0.0325
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.0131
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	0.03
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

tert-Butylbenzene

General Statistics

Number of Valid Data	14	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	9
		Percent Non-Detects	64.29%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	9.40E-04	Minimum Detected	-6.97
Maximum Detected	0.064	Maximum Detected	-2.749
Mean of Detected	0.0139	Mean of Detected	-5.842
SD of Detected	0.028	SD of Detected	1.757
Minimum Non-Detect	9.50E-04	Minimum Non-Detect	-6.959
Maximum Non-Detect	0.21	Maximum Non-Detect	-1.561

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.567	Shapiro Wilk Test Statistic	0.706
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0129	Mean	-6.437
SD	0.0314	SD	1.746
95% DL/2 (t) UCL	0.0278	95% H-Stat (DL/2) UCL	0.0554

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-7.053
		SD in Log Scale	1.436
		Mean in Original Scale	0.0053
		SD in Original Scale	0.0169
		95% t UCL	0.0133
		95% Percentile Bootstrap UCL	0.0143
		95% BCA Bootstrap UCL	0.019
		95% H-UCL	0.0101

Gamma Distribution Test with Detected Values Only	Data Distribution Test with Detected Values Only

k star (bias corrected)	0.3	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0464		
nu star	3.001		
A-D Test Statistic	1.039	Nonparametric Statistics	
5% A-D Critical Value	0.723	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.723	Mean	0.00595
5% K-S Critical Value	0.375	SD	0.0168
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0052
		95% KM (t) UCL	0.0152
Assuming Gamma Distribution		95% KM (z) UCL	0.0145
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0144
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.531
Maximum	0.064	95% KM (BCA) UCL	0.0169
Mean	0.00497	95% KM (Percentile Bootstrap) UCL	0.0156
Median	1.00E-06	95% KM (Chebyshev) UCL	0.0286
SD	0.017	97.5% KM (Chebyshev) UCL	0.0384
k star	0.156	99% KM (Chebyshev) UCL	0.0577
Theta star	0.032		
Nu star	4.356	Potential UCLs to Use	
AppChi2	0.867	97.5% KM (Chebyshev) UCL	0.0384
95% Gamma Approximate UCL (Use when n >= 40)	0.025		
95% Adjusted Gamma UCL (Use when n < 40)	0.0317		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Toluene

General Statistics			
Number of Valid Data	14	Number of Detected Data	11
Number of Distinct Detected Data	9	Number of Non-Detect Data	3
		Percent Non-Detects	21.43%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0021	Minimum Detected	-6.166
Maximum Detected	0.5	Maximum Detected	-0.693
Mean of Detected	0.0827	Mean of Detected	-4.56
SD of Detected	0.161	SD of Detected	2.103
Minimum Non-Detect	0.0017	Minimum Non-Detect	-6.377
Maximum Non-Detect	0.0031	Maximum Non-Detect	-5.776
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	7
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.595	Shapiro Wilk Test Statistic	0.76
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0652	Mean	-5.055
SD	0.146	SD	2.094
95% DL/2 (t) UCL	0.134	95% H-Stat (DL/2) UCL	0.966
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	

MLE yields a negative mean		Mean in Log Scale	-5.394
		SD in Log Scale	2.525
		Mean in Original Scale	0.065
		SD in Original Scale	0.146
		95% t UCL	0.134
		95% Percentile Bootstrap UCL	0.129
		95% BCA Bootstrap UCL	0.162
		95% H-UCL	6.173

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.3	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.276		
nu star	6.592		
A-D Test Statistic	1.526	Nonparametric Statistics	
5% A-D Critical Value	0.815	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.815	Mean	0.0654
5% K-S Critical Value	0.275	SD	0.14
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0393
		95% KM (t) UCL	0.135
Assuming Gamma Distribution		95% KM (z) UCL	0.13
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.134
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.344
Maximum	0.5	95% KM (BCA) UCL	0.133
Mean	0.065	95% KM (Percentile Bootstrap) UCL	0.137
Median	0.00275	95% KM (Chebyshev) UCL	0.237
SD	0.146	97.5% KM (Chebyshev) UCL	0.311
k star	0.2	99% KM (Chebyshev) UCL	0.456
Theta star	0.325		
Nu star	5.603	Potential UCLs to Use	
AppChi2	1.441	99% KM (Chebyshev) UCL	0.456
95% Gamma Approximate UCL (Use when n >= 40)	0.253		
95% Adjusted Gamma UCL (Use when n < 40)	0.308		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Xylenes, Total

General Statistics			
Number of Valid Data	14	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	7
		Percent Non-Detects	50.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0016	Minimum Detected	-6.438
Maximum Detected	2.4	Maximum Detected	0.875
Mean of Detected	0.396	Mean of Detected	-3.47
SD of Detected	0.888	SD of Detected	2.66
Minimum Non-Detect	0.0011	Minimum Non-Detect	-6.812
Maximum Non-Detect	0.0014	Maximum Non-Detect	-6.571
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	7
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.527	Shapiro Wilk Test Statistic	0.94
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.198	Mean	-5.412
SD	0.637	SD	2.707
95% DL/2 (t) UCL	0.5	95% H-Stat (DL/2) UCL	17.33
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-7.412
		SD in Log Scale	4.597
		Mean in Original Scale	0.198
		SD in Original Scale	0.637
		95% t UCL	0.499
		95% Percentile Bootstrap UCL	0.525
		95% BCA Bootstrap UCL	0.718
		95% H-UCL	9641703
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.252	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.568		
nu star	3.533		
A-D Test Statistic	0.549	Nonparametric Statistics	
5% A-D Critical Value	0.793	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.793	Mean	0.199
5% K-S Critical Value	0.337	SD	0.614
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.177
		95% KM (t) UCL	0.512
Assuming Gamma Distribution		95% KM (z) UCL	0.49
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.5
Minimum	1.00E-06	95% KM (bootstrap t) UCL	4.309
Maximum	2.4	95% KM (BCA) UCL	0.54
Mean	0.198	95% KM (Percentile Bootstrap) UCL	0.524
Median	8.01E-04	95% KM (Chebyshev) UCL	0.971
SD	0.637	97.5% KM (Chebyshev) UCL	1.305
k star	0.137	99% KM (Chebyshev) UCL	1.961
Theta star	1.444		
Nu star	3.836	Potential UCLs to Use	
AppChi2	0.658	95% KM (t) UCL	0.512
95% Gamma Approximate UCL (Use when n >= 40)	1.153		
95% Adjusted Gamma UCL (Use when n < 40)	1.491		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

2-Methylnaphthalene

General Statistics			
Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
		Percent Non-Detects	85.71%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0082	Minimum Detected	-4.804
Maximum Detected	0.39	Maximum Detected	-0.942
Mean of Detected	0.199	Mean of Detected	-2.873
SD of Detected	0.27	SD of Detected	2.731
Minimum Non-Detect	0.0034	Minimum Non-Detect	-5.684
Maximum Non-Detect	2.2	Maximum Non-Detect	0.788

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.178	Mean	-3.317
SD	0.305	SD	2.174
95% DL/2 (t) UCL	0.322	95% H-Stat (DL/2) UCL	7.99

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)
Theta Star	N/A	
nu star	N/A	
A-D Test Statistic	N/A	Nonparametric Statistics
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method
K-S Test Statistic	N/A	Mean 0.04
5% K-S Critical Value	N/A	SD 0.106
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.0431
		95% KM (t) UCL 0.116
Assuming Gamma Distribution		95% KM (z) UCL 0.111
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL 0.296

Minimum	N/A	95% KM (bootstrap t) UCL	0.0468
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.228
SD	N/A	97.5% KM (Chebyshev) UCL	0.309
k star	N/A	99% KM (Chebyshev) UCL	0.469
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	99% KM (Chebyshev) UCL	0.469
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Warning: Recommended UCL exceeds the maximum observation
Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Acenaphthylene

General Statistics

Number of Valid Data	14	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	13
		Percent Non-Detects	92.86%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Acenaphthylene was not processed!

Diethyl phthalate

General Statistics

Number of Valid Data	14	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	13
		Percent Non-Detects	92.86%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Diethyl phthalate was not processed!

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	Sheet1.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

SURFACE SOIL

>C12-C28

General Statistics

Number of Valid Data	17	Number of Detected Data	10
Number of Distinct Detected Data	8	Number of Non-Detect Data	7
		Percent Non-Detects	41.18%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	130	Minimum Detected	4.868
Maximum Detected	5500	Maximum Detected	8.613
Mean of Detected	2299	Mean of Detected	7.033
SD of Detected	2149	SD of Detected	1.482
Minimum Non-Detect	6.1	Minimum Non-Detect	1.808
Maximum Non-Detect	7	Maximum Non-Detect	1.946

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	10
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	41.18%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.867	Shapiro Wilk Test Statistic	0.876
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1354	Mean	4.617
SD	1989	SD	3.177
95% DL/2 (t) UCL	2196	95% H-Stat (DL/2) UCL	3062275

Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	472.7	Mean in Log Scale	5.535
SD	2888	SD in Log Scale	2.165
95% MLE (t) UCL	1696	Mean in Original Scale	1365
95% MLE (Tiku) UCL	1861	SD in Original Scale	1980
		95% t UCL	2204
		95% Percentile Bootstrap UCL	2165
		95% BCA Bootstrap UCL	2319
		95% H UCL	33526

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.651	Data appear Normal at 5% Significance Level	
Theta Star	3534		
nu star	13.01		

A-D Test Statistic	0.429	Nonparametric Statistics	
5% A-D Critical Value	0.754	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.754	Mean	1406
5% K-S Critical Value	0.275	SD	1893
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	484
		95% KM (t) UCL	2251
Assuming Gamma Distribution		95% KM (z) UCL	2202
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2232
Minimum	1.00E-06	95% KM (bootstrap t) UCL	2575
Maximum	5500	95% KM (BCA) UCL	2250

Mean	1352	95% KM (Percentile Bootstrap) UCL	2249
Median	130	95% KM (Chebyshev) UCL	3516
SD	1990	97.5% KM (Chebyshev) UCL	4429
k star	0.116	99% KM (Chebyshev) UCL	6222
Theta star	11639		
Nu star	3.951	Potential UCLs to Use	
AppChi2	0.702	95% KM (t) UCL	2251
95% Gamma Approximate UCL (Use when n >= 40)	7608	95% KM (Percentile Bootstrap) UCL	2249
95% Adjusted Gamma UCL (Use when n < 40)	9272		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

C6-C35 (Total)

General Statistics			
Number of Valid Data	17	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	7
		Percent Non-Detects	41.18%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	210	Minimum Detected	5.347
Maximum Detected	12000	Maximum Detected	9.393
Mean of Detected	4620	Mean of Detected	7.805
SD of Detected	4225	SD of Detected	1.396
Minimum Non-Detect	9.6	Minimum Non-Detect	2.262
Maximum Non-Detect	11	Maximum Non-Detect	2.398
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	10
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	41.18%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.903	Shapiro Wilk Test Statistic	0.92
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2720	Mean	5.26
SD	3940	SD	3.305
95% DL/2 (t) UCL	4388	95% H-Stat (DL/2) UCL	13464826
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	976.1	Mean in Log Scale	6.379
SD	5733	SD in Log Scale	2.066
95% MLE (t) UCL	3404	Mean in Original Scale	2752
95% MLE (Tiku) UCL	3732	SD in Original Scale	3916
		95% t UCL	4411
		95% Percentile Bootstrap UCL	4323
		95% BCA Bootstrap UCL	4676
		95% H UCL	51188
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.711	Data appear Normal at 5% Significance Level	
Theta Star	6495		
nu star	14.23		
A-D Test Statistic	0.287	Nonparametric Statistics	
5% A-D Critical Value	0.751	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.751	Mean	2804

5% K-S Critical Value	0.274	SD	3763
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	962.1
		95% KM (t) UCL	4484
Assuming Gamma Distribution		95% KM (z) UCL	4387
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	4374
Minimum	1.00E-06	95% KM (bootstrap t) UCL	4994
Maximum	12000	95% KM (BCA) UCL	4662
Mean	2718	95% KM (Percentile Bootstrap) UCL	4496
Median	510	95% KM (Chebyshev) UCL	6998
SD	3942	97.5% KM (Chebyshev) UCL	8812
k star	0.114	99% KM (Chebyshev) UCL	12377
Theta star	23769		
Nu star	3.887	Potential UCLs to Use	
AppChi2	0.678	95% KM (t) UCL	4484
95% Gamma Approximate UCL (Use when n >= 40)	15589	95% KM (Percentile Bootstrap) UCL	4496
95% Adjusted Gamma UCL (Use when n < 40)	19037		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

Aluminum

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	15
Raw Statistics		Log-transformed Statistics	
Minimum	620	Minimum of Log Data	6.43
Maximum	14000	Maximum of Log Data	9.547
Mean	5944	Mean of log Data	8.311
Geometric Mean	4067	SD of log Data	1.053
Median	5300		
SD	4044		
Std. Error of Mean	980.9		
Coefficient of Variation	0.68		
Skewness	0.147		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.924	Shapiro Wilk Test Statistic	0.834
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	7657	95% H-UCL	14586
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15113
95% Adjusted-CLT UCL (Chen-1995)	7595	97.5% Chebyshev (MVUE) UCL	18730
95% Modified-t UCL (Johnson-1978)	7662	99% Chebyshev (MVUE) UCL	25834
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.243	Data appear Normal at 5% Significance Level	
Theta Star	4782		
MLE of Mean	5944		
MLE of Standard Deviation	5332		
nu star	42.26		
Approximate Chi Square Value (.05)	28.36	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	7558
Adjusted Chi Square Value	27.17	95% Jackknife UCL	7657
		95% Standard Bootstrap UCL	7499
Anderson-Darling Test Statistic	0.961	95% Bootstrap-t UCL	7704
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	7583
Kolmogorov-Smirnov Test Statistic	0.219	95% Percentile Bootstrap UCL	7468
Kolmogorov-Smirnov 5% Critical Value	0.213	95% BCA Bootstrap UCL	7574

Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10220
		97.5% Chebyshev(Mean, Sd) UCL	12070
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	15704
95% Approximate Gamma UCL (Use when n >= 40)	8858		
95% Adjusted Gamma UCL (Use when n < 40)	9247		
Potential UCL to Use		Use 95% Student's-t UCL	7657

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Arsenic

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Raw Statistics		Log-transformed Statistics	
Minimum	0.51	Minimum of Log Data	-0.673
Maximum	7.9	Maximum of Log Data	2.067
Mean	3.864	Mean of log Data	1.137
Geometric Mean	3.118	SD of log Data	0.78
Median	4.3		
SD	2.055		
Std. Error of Mean	0.499		
Coefficient of Variation	0.532		
Skewness	-0.1		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.958	Shapiro Wilk Test Statistic	0.853
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.734	95% H-UCL	6.671
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7.789
95% Adjusted-CLT UCL (Chen-1995)	4.671	97.5% Chebyshev (MVUE) UCL	9.371
95% Modified-t UCL (Johnson-1978)	4.732	99% Chebyshev (MVUE) UCL	12.48
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.086	Data appear Normal at 5% Significance Level	
Theta Star	1.852		
MLE of Mean	3.864		
MLE of Standard Deviation	2.675		
nu star	70.92		
Approximate Chi Square Value (.05)	52.53	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	4.684
Adjusted Chi Square Value	50.87	95% Jackknife UCL	4.734
		95% Standard Bootstrap UCL	4.687
Anderson-Darling Test Statistic	0.8	95% Bootstrap-t UCL	4.747
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	4.724
Kolmogorov-Smirnov Test Statistic	0.221	95% Percentile Bootstrap UCL	4.648
Kolmogorov-Smirnov 5% Critical Value	0.211	95% BCA Bootstrap UCL	4.665
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	6.037
		97.5% Chebyshev(Mean, Sd) UCL	6.977
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	8.824
95% Approximate Gamma UCL (Use when n >= 40)	5.216		
95% Adjusted Gamma UCL (Use when n < 40)	5.386		
Potential UCL to Use		Use 95% Student's-t UCL	4.734

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Barium

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Raw Statistics		Log-transformed Statistics	
Minimum	8.5	Minimum of Log Data	2.14
Maximum	230	Maximum of Log Data	5.438
Mean	81.15	Mean of log Data	4.023
Geometric Mean	55.89	SD of log Data	1.009
Median	77		
SD	62.41		
Std. Error of Mean	15.14		
Coefficient of Variation	0.769		
Skewness	1.058		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.893	Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	107.6	95% H-UCL	183
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	194.4
95% Adjusted-CLT UCL (Chen-1995)	110.2	97.5% Chebyshev (MVUE) UCL	239.9
95% Modified-t UCL (Johnson-1978)	108.2	99% Chebyshev (MVUE) UCL	329.4
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.263	Data appear Normal at 5% Significance Level	
Theta Star	64.26		
MLE of Mean	81.15		
MLE of Standard Deviation	72.21		
nu star	42.94		
Approximate Chi Square Value (.05)	28.91	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	106
Adjusted Chi Square Value	27.71	95% Jackknife UCL	107.6
		95% Standard Bootstrap UCL	104.9
Anderson-Darling Test Statistic	0.503	95% Bootstrap-t UCL	116.3
Anderson-Darling 5% Critical Value	0.756	95% Hall's Bootstrap UCL	126.9
Kolmogorov-Smirnov Test Statistic	0.171	95% Percentile Bootstrap UCL	106.1
Kolmogorov-Smirnov 5% Critical Value	0.213	95% BCA Bootstrap UCL	110.4
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	147.1
		97.5% Chebyshev(Mean, Sd) UCL	175.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	231.8
95% Approximate Gamma UCL (Use when n >= 40)	120.5		
95% Adjusted Gamma UCL (Use when n < 40)	125.7		
Potential UCL to Use		Use 95% Student's-t UCL	107.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Chromium

General Statistics

Number of Valid Observations	17	Number of Distinct Observations	15
Raw Statistics		Log-transformed Statistics	
Minimum	1.8	Minimum of Log Data	0.588
Maximum	20	Maximum of Log Data	2.996
Mean	9.941	Mean of log Data	2.055
Geometric Mean	7.808	SD of log Data	0.817
Median	11		
SD	5.653		
Std. Error of Mean	1.371		
Coefficient of Variation	0.569		
Skewness	-0.0847		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.945	Shapiro Wilk Test Statistic	0.838
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	12.34	95% H-UCL	17.72
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	20.52
95% Adjusted-CLT UCL (Chen-1995)	12.17	97.5% Chebyshev (MVUE) UCL	24.8
95% Modified-t UCL (Johnson-1978)	12.33	99% Chebyshev (MVUE) UCL	33.21
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.869	Data appear Normal at 5% Significance Level	
Theta Star	5.318		
MLE of Mean	9.941		
MLE of Standard Deviation	7.271		
nu star	63.56		
Approximate Chi Square Value (.05)	46.22	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	12.2
Adjusted Chi Square Value	44.67	95% Jackknife UCL	12.34
		95% Standard Bootstrap UCL	12.12
Anderson-Darling Test Statistic	0.841	95% Bootstrap-t UCL	12.28
Anderson-Darling 5% Critical Value	0.749	95% Hall's Bootstrap UCL	12.28
Kolmogorov-Smirnov Test Statistic	0.176	95% Percentile Bootstrap UCL	12.14
Kolmogorov-Smirnov 5% Critical Value	0.211	95% BCA Bootstrap UCL	12.12
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	15.92
		97.5% Chebyshev(Mean, Sd) UCL	18.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	23.58
95% Approximate Gamma UCL (Use when n >= 40)	13.67		
95% Adjusted Gamma UCL (Use when n < 40)	14.14		
Potential UCL to Use		Use 95% Student's-t UCL	12.34

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

Cobalt

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Raw Statistics		Log-transformed Statistics	
Minimum	0.51	Minimum of Log Data	-0.673
Maximum	6.5	Maximum of Log Data	1.872

Mean	3.616	Mean of log Data	1.091
Geometric Mean	2.978	SD of log Data	0.74
Median	4		
SD	1.823		
Std. Error of Mean	0.442		
Coefficient of Variation	0.504		
Skewness	-0.332		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.951	Shapiro Wilk Test Statistic	0.848
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.388	95% H-UCL	5.991
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7.039
95% Adjusted-CLT UCL (Chen-1995)	4.306	97.5% Chebyshev (MVUE) UCL	8.424
95% Modified-t UCL (Johnson-1978)	4.382	99% Chebyshev (MVUE) UCL	11.14
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.288	Data appear Normal at 5% Significance Level	
Theta Star	1.581		
MLE of Mean	3.616		
MLE of Standard Deviation	2.391		
nu star	77.78		
Approximate Chi Square Value (.05)	58.47	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	4.344
Adjusted Chi Square Value	56.71	95% Jackknife UCL	4.388
		95% Standard Bootstrap UCL	4.332
Anderson-Darling Test Statistic	0.814	95% Bootstrap-t UCL	4.387
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	4.277
Kolmogorov-Smirnov Test Statistic	0.242	95% Percentile Bootstrap UCL	4.329
Kolmogorov-Smirnov 5% Critical Value	0.211	95% BCA Bootstrap UCL	4.271
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5.543
		97.5% Chebyshev(Mean, Sd) UCL	6.377
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	8.015
95% Approximate Gamma UCL (Use when n >= 40)	4.811		
95% Adjusted Gamma UCL (Use when n < 40)	4.96		
Potential UCL to Use		Use 95% Student's-t UCL	4.388

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

Copper

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Raw Statistics		Log-transformed Statistics	
Minimum	1.5	Minimum of Log Data	0.405
Maximum	49	Maximum of Log Data	3.892
Mean	15.39	Mean of log Data	2.393
Geometric Mean	10.95	SD of log Data	0.944
Median	12		
SD	12.27		
Std. Error of Mean	2.975		

Coefficient of Variation	0.797		
Skewness	1.469		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.873	Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	20.59	95% H-UCL	31.49
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	34.54
95% Adjusted-CLT UCL (Chen-1995)	21.42	97.5% Chebyshev (MVUE) UCL	42.35
95% Modified-t UCL (Johnson-1978)	20.76	99% Chebyshev (MVUE) UCL	57.69
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.369	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	11.25		
MLE of Mean	15.39		
MLE of Standard Deviation	13.16		
nu star	46.54		
Approximate Chi Square Value (.05)	31.89	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	20.29
Adjusted Chi Square Value	30.62	95% Jackknife UCL	20.59
		95% Standard Bootstrap UCL	20.13
Anderson-Darling Test Statistic	0.263	95% Bootstrap-t UCL	22.96
Anderson-Darling 5% Critical Value	0.754	95% Hall's Bootstrap UCL	25.44
Kolmogorov-Smirnov Test Statistic	0.15	95% Percentile Bootstrap UCL	20.34
Kolmogorov-Smirnov 5% Critical Value	0.213	95% BCA Bootstrap UCL	21.52
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	28.36
		97.5% Chebyshev(Mean, Sd) UCL	33.97
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	44.99
95% Approximate Gamma UCL (Use when n >= 40)	22.47		
95% Adjusted Gamma UCL (Use when n < 40)	23.4		
Potential UCL to Use		Use 95% Approximate Gamma UCL	22.47

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	15
Raw Statistics		Log-transformed Statistics	
Minimum	2.9	Minimum of Log Data	1.065
Maximum	430	Maximum of Log Data	6.064
Mean	77.35	Mean of log Data	3.655
Geometric Mean	38.67	SD of log Data	1.409
Median	52		
SD	99.99		
Std. Error of Mean	24.25		
Coefficient of Variation	1.293		
Skewness	3.03		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.643	Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	

95% Student's-t UCL	119.7	95% H-UCL	337.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	256.8
95% Adjusted-CLT UCL (Chen-1995)	136.3	97.5% Chebyshev (MVUE) UCL	327.2
95% Modified-t UCL (Johnson-1978)	122.7	99% Chebyshev (MVUE) UCL	465.3

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.739	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	104.7		
MLE of Mean	77.35		
MLE of Standard Deviation	89.99		
nu star	25.12		
Approximate Chi Square Value (.05)	14.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	117.2
Adjusted Chi Square Value	13.87	95% Jackknife UCL	119.7
		95% Standard Bootstrap UCL	116.6
Anderson-Darling Test Statistic	0.494	95% Bootstrap-t UCL	171.1
Anderson-Darling 5% Critical Value	0.772	95% Hall's Bootstrap UCL	291.1
Kolmogorov-Smirnov Test Statistic	0.129	95% Percentile Bootstrap UCL	121.5
Kolmogorov-Smirnov 5% Critical Value	0.216	95% BCA Bootstrap UCL	136.5
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	183.1
		97.5% Chebyshev(Mean, Sd) UCL	228.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	318.7
95% Approximate Gamma UCL (Use when n >= 40)	132.1		
95% Adjusted Gamma UCL (Use when n < 40)	140.1		

Potential UCL to Use		Use 95% Approximate Gamma UCL	132.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	15
Raw Statistics		Log-transformed Statistics	
Minimum	28	Minimum of Log Data	3.332
Maximum	280	Maximum of Log Data	5.635
Mean	166.8	Mean of log Data	4.925
Geometric Mean	137.6	SD of log Data	0.736
Median	170		
SD	83.32		
Std. Error of Mean	20.21		
Coefficient of Variation	0.499		
Skewness	-0.405		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.931	Shapiro Wilk Test Statistic	0.828
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	202.1	95% H-UCL	275.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	323.6
95% Adjusted-CLT UCL (Chen-1995)	197.9	97.5% Chebyshev (MVUE) UCL	387.1
95% Modified-t UCL (Johnson-1978)	201.8	99% Chebyshev (MVUE) UCL	511.7

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.307	Data appear Normal at 5% Significance Level	
Theta Star	72.31		
MLE of Mean	166.8		
MLE of Standard Deviation	109.8		

nu star	78.44		
Approximate Chi Square Value (.05)	59.04	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	200.1
Adjusted Chi Square Value	57.27	95% Jackknife UCL	202.1
		95% Standard Bootstrap UCL	198.7
Anderson-Darling Test Statistic	0.85	95% Bootstrap-t UCL	200.3
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	196.9
Kolmogorov-Smirnov Test Statistic	0.2	95% Percentile Bootstrap UCL	199.3
Kolmogorov-Smirnov 5% Critical Value	0.211	95% BCA Bootstrap UCL	195.9
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	254.9
		97.5% Chebyshev(Mean, Sd) UCL	293
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	367.9
95% Approximate Gamma UCL (Use when n >= 40)	221.7		
95% Adjusted Gamma UCL (Use when n < 40)	228.5		
Potential UCL to Use		Use 95% Student's-t UCL	202.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

Mercury

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	17
Raw Statistics		Log-transformed Statistics	
Minimum	0.0035	Minimum of Log Data	-5.655
Maximum	0.37	Maximum of Log Data	-0.994
Mean	0.103	Mean of log Data	-2.948
Geometric Mean	0.0524	SD of log Data	1.41
Median	0.08		
SD	0.104		
Std. Error of Mean	0.0252		
Coefficient of Variation	1.013		
Skewness	1.351		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.856	Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.147	95% H-UCL	0.459
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.349
95% Adjusted-CLT UCL (Chen-1995)	0.153	97.5% Chebyshev (MVUE) UCL	0.445
95% Modified-t UCL (Johnson-1978)	0.148	99% Chebyshev (MVUE) UCL	0.632
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.76	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.135		
MLE of Mean	0.103		
MLE of Standard Deviation	0.118		
nu star	25.83		
Approximate Chi Square Value (.05)	15.25	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	0.144
Adjusted Chi Square Value	14.4	95% Jackknife UCL	0.147
		95% Standard Bootstrap UCL	0.143

Anderson-Darling Test Statistic	0.165	95% Bootstrap-t UCL	0.161
Anderson-Darling 5% Critical Value	0.771	95% Hall's Bootstrap UCL	0.164
Kolmogorov-Smirnov Test Statistic	0.0865	95% Percentile Bootstrap UCL	0.145
Kolmogorov-Smirnov 5% Critical Value	0.216	95% BCA Bootstrap UCL	0.153
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.212
		97.5% Chebyshev(Mean, Sd) UCL	0.26
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.353
95% Approximate Gamma UCL (Use when n >= 40)	0.174		
95% Adjusted Gamma UCL (Use when n < 40)	0.184		
Potential UCL to Use		Use 95% Approximate Gamma UCL	0.174

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Nickel

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	14
Raw Statistics		Log-transformed Statistics	
Minimum	0.99	Minimum of Log Data	-0.0101
Maximum	17	Maximum of Log Data	2.833
Mean	6.829	Mean of log Data	1.722
Geometric Mean	5.595	SD of log Data	0.734
Median	7.6		
SD	3.83		
Std. Error of Mean	0.929		
Coefficient of Variation	0.561		
Skewness	0.76		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.897	Shapiro Wilk Test Statistic	0.861
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	8.451	95% H-UCL	11.16
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	13.13
95% Adjusted-CLT UCL (Chen-1995)	8.54	97.5% Chebyshev (MVUE) UCL	15.7
95% Modified-t UCL (Johnson-1978)	8.479	99% Chebyshev (MVUE) UCL	20.75
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.233	Data appear Normal at 5% Significance Level	
Theta Star	3.058		
MLE of Mean	6.829		
MLE of Standard Deviation	4.57		
nu star	75.92		
Approximate Chi Square Value (.05)	56.85	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	8.357
Adjusted Chi Square Value	55.12	95% Jackknife UCL	8.451
		95% Standard Bootstrap UCL	8.307
Anderson-Darling Test Statistic	0.881	95% Bootstrap-t UCL	8.645
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	9.063
Kolmogorov-Smirnov Test Statistic	0.206	95% Percentile Bootstrap UCL	8.422
Kolmogorov-Smirnov 5% Critical Value	0.211	95% BCA Bootstrap UCL	8.564
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10.88
		97.5% Chebyshev(Mean, Sd) UCL	12.63
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	16.07
95% Approximate Gamma UCL (Use when n >= 40)	9.119		
95% Adjusted Gamma UCL (Use when n < 40)	9.405		

Potential UCL to Use		Use 95% Student's-t UCL	8.451

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Vanadium

General Statistics

Number of Valid Observations	17	Number of Distinct Observations	12
Raw Statistics		Log-transformed Statistics	
Minimum	3.1	Minimum of Log Data	1.131
Maximum	25	Maximum of Log Data	3.219
Mean	13.88	Mean of log Data	2.473
Geometric Mean	11.85	SD of log Data	0.648
Median	16		
SD	6.563		
Std. Error of Mean	1.592		
Coefficient of Variation	0.473		
Skewness	-0.339		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.937	Shapiro Wilk Test Statistic	0.846
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	16.66	95% H-UCL	20.87
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	24.81
95% Adjusted-CLT UCL (Chen-1995)	16.36	97.5% Chebyshev (MVUE) UCL	29.3
95% Modified-t UCL (Johnson-1978)	16.63	99% Chebyshev (MVUE) UCL	38.14
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	2.782	Data appear Normal at 5% Significance Level	
Theta Star	4.987		
MLE of Mean	13.88		
MLE of Standard Deviation	8.319		
nu star	94.6		
Approximate Chi Square Value (.05)	73.17	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	16.49
Adjusted Chi Square Value	71.19	95% Jackknife UCL	16.66
		95% Standard Bootstrap UCL	16.39
Anderson-Darling Test Statistic	0.863	95% Bootstrap-t UCL	16.48
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	16.31
Kolmogorov-Smirnov Test Statistic	0.202	95% Percentile Bootstrap UCL	16.26
Kolmogorov-Smirnov 5% Critical Value	0.21	95% BCA Bootstrap UCL	16.23
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	20.82
		97.5% Chebyshev(Mean, Sd) UCL	23.82
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	29.72
95% Approximate Gamma UCL (Use when n >= 40)	17.94		
95% Adjusted Gamma UCL (Use when n < 40)	18.44		

Potential UCL to Use		Use 95% Student's-t UCL	16.66

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

Zinc

General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Raw Statistics		Log-transformed Statistics	
Minimum	3.9	Minimum of Log Data	1.361
Maximum	360	Maximum of Log Data	5.886
Mean	92.62	Mean of log Data	3.998
Geometric Mean	54.48	SD of log Data	1.271
Median	65		
SD	88.41		
Std. Error of Mean	21.44		
Coefficient of Variation	0.955		
Skewness	1.907		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.813	Shapiro Wilk Test Statistic	0.875
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	130.1	95% H-UCL	326.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	286.5
95% Adjusted-CLT UCL (Chen-1995)	138.5	97.5% Chebyshev (MVUE) UCL	361.6
95% Modified-t UCL (Johnson-1978)	131.7	99% Chebyshev (MVUE) UCL	509
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.927	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	99.88		
MLE of Mean	92.62		
MLE of Standard Deviation	96.18		
nu star	31.53		
Approximate Chi Square Value (.05)	19.7	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	127.9
Adjusted Chi Square Value	18.72	95% Jackknife UCL	130.1
		95% Standard Bootstrap UCL	127.6
Anderson-Darling Test Statistic	0.464	95% Bootstrap-t UCL	152
Anderson-Darling 5% Critical Value	0.764	95% Hall's Bootstrap UCL	184
Kolmogorov-Smirnov Test Statistic	0.173	95% Percentile Bootstrap UCL	129.7
Kolmogorov-Smirnov 5% Critical Value	0.215	95% BCA Bootstrap UCL	135.7
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	186.1
		97.5% Chebyshev(Mean, Sd) UCL	226.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	306
95% Approximate Gamma UCL (Use when n >= 40)	148.2		
95% Adjusted Gamma UCL (Use when n < 40)	156		
Potential UCL to Use		Use 95% Approximate Gamma UCL	148.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

1,2,4-Trimethylbenzene

General Statistics			
Number of Valid Data	16	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	15
Number of Missing Values	1	Percent Non-Detects	93.75%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable 1,2,4-Trimethylbenzene was not processed!

4-Isopropyltoluene

General Statistics			
Number of Valid Data	16	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	14
Number of Missing Values	1	Percent Non-Detects	87.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.001	Minimum Detected	-6.908
Maximum Detected	0.0079	Maximum Detected	-4.841
Mean of Detected	0.00445	Mean of Detected	-5.874
SD of Detected	0.00488	SD of Detected	1.461
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.0019	Maximum Non-Detect	-6.266

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	93.75%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00117	Mean	-7.11
SD	0.0018	SD	0.645
95% DL/2 (t) UCL	0.00196	95% H-Stat (DL/2) UCL	0.00145
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	

K-S Test Statistic	N/A	Mean	0.00143
5% K-S Critical Value	N/A	SD	0.00167
Data not Gamma Distributed at 5% Significance Level		SE of Mean	5.91E-04
		95% KM (t) UCL	0.00247
Assuming Gamma Distribution		95% KM (z) UCL	0.0024
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00605
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.00401
SD	N/A	97.5% KM (Chebyshev) UCL	0.00512
k star	N/A	99% KM (Chebyshev) UCL	0.00731
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (BCA) UCL	N/A
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

Acetone

General Statistics

Number of Valid Data	17	Number of Detected Data	13
Number of Distinct Detected Data	12	Number of Non-Detect Data	4
		Percent Non-Detects	23.53%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.017	Minimum Detected	-4.075
Maximum Detected	0.19	Maximum Detected	-1.661
Mean of Detected	0.0853	Mean of Detected	-2.641
SD of Detected	0.0478	SD of Detected	0.678
Minimum Non-Detect	0.0018	Minimum Non-Detect	-6.32
Maximum Non-Detect	0.0027	Maximum Non-Detect	-5.915

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	23.53%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.96	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0655	Mean	-3.634
SD	0.0554	SD	1.937
95% DL/2 (t) UCL	0.0889	95% H-Stat (DL/2) UCL	1.366

Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.057	Mean in Log Scale	-2.995
SD	0.0667	SD in Log Scale	0.882
95% MLE (t) UCL	0.0852	Mean in Original Scale	0.069
95% MLE (Tiku) UCL	0.0867	SD in Original Scale	0.0513
		95% t UCL	0.0907
		95% Percentile Bootstrap UCL	0.0889
		95% BCA Bootstrap UCL	0.0913
		95% H UCL	0.128

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.316	Data appear Normal at 5% Significance Level	
Theta Star	0.0368		
nu star	60.21		
A-D Test Statistic	0.26	Nonparametric Statistics	
5% A-D Critical Value	0.739	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.739	Mean	0.0692
5% K-S Critical Value	0.238	SD	0.0495
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0125
		95% KM (t) UCL	0.0911
Assuming Gamma Distribution		95% KM (z) UCL	0.0898
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0898
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.0941
Maximum	0.19	95% KM (BCA) UCL	0.0955
Mean	0.0652	95% KM (Percentile Bootstrap) UCL	0.0919
Median	0.062	95% KM (Chebyshev) UCL	0.124
SD	0.0557	97.5% KM (Chebyshev) UCL	0.147
k star	0.266	99% KM (Chebyshev) UCL	0.194
Theta star	0.245		
Nu star	9.041	Potential UCLs to Use	
AppChi2	3.352	95% KM (t) UCL	0.0911
95% Gamma Approximate UCL (Use when n >= 40)	0.176	95% KM (Percentile Bootstrap) UCL	0.0919
95% Adjusted Gamma UCL (Use when n < 40)	0.197		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Benzene

General Statistics			
Number of Valid Data	17	Number of Detected Data	11
Number of Distinct Detected Data	9	Number of Non-Detect Data	6
		Percent Non-Detects	35.29%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	6.20E-04	Minimum Detected	-7.386
Maximum Detected	0.0026	Maximum Detected	-5.952
Mean of Detected	0.00163	Mean of Detected	-6.49
SD of Detected	5.71E-04	SD of Detected	0.424
Minimum Non-Detect	6.80E-04	Minimum Non-Detect	-7.293
Maximum Non-Detect	0.0025	Maximum Non-Detect	-5.991
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	16
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	94.12%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.963	Shapiro Wilk Test Statistic	0.886
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00134	Mean	-6.746
SD	6.38E-04	SD	0.555
95% DL/2 (t) UCL	0.00161	95% H-Stat (DL/2) UCL	0.00183
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-6.652
		SD in Log Scale	0.421

		Mean in Original Scale	0.0014
		SD in Original Scale	5.66E-04
		95% t UCL	0.00164
		95% Percentile Bootstrap UCL	0.00162
		95% BCA Bootstrap UCL	0.00164
		95% H-UCL	0.00173

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	5.301	Data appear Normal at 5% Significance Level	
Theta Star	3.08E-04		
nu star	116.6		
A-D Test Statistic	0.478	Nonparametric Statistics	
5% A-D Critical Value	0.731	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.731	Mean	0.00139
5% K-S Critical Value	0.256	SD	6.12E-04
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.68E-04
		95% KM (t) UCL	0.00168
Assuming Gamma Distribution		95% KM (z) UCL	0.00166
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00167
Minimum	3.85E-04	95% KM (bootstrap t) UCL	0.00168
Maximum	0.0026	95% KM (BCA) UCL	0.00176
Mean	0.00139	95% KM (Percentile Bootstrap) UCL	0.00172
Median	0.00144	95% KM (Chebyshev) UCL	0.00212
SD	6.11E-04	97.5% KM (Chebyshev) UCL	0.00243
k star	3.86	99% KM (Chebyshev) UCL	0.00306
Theta star	3.60E-04		
Nu star	131.3	Potential UCLs to Use	
AppChi2	105.8	95% KM (t) UCL	0.00168
95% Gamma Approximate UCL (Use when n >= 40)	0.00172	95% KM (Percentile Bootstrap) UCL	0.00172
95% Adjusted Gamma UCL (Use when n < 40)	0.00176		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Ethylbenzene

General Statistics			
Number of Valid Data	14	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	11
Number of Missing Values	3	Percent Non-Detects	78.57%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0016	Minimum Detected	-6.438
Maximum Detected	0.0027	Maximum Detected	-5.915
Mean of Detected	0.0021	Mean of Detected	-6.189
SD of Detected	5.57E-04	SD of Detected	0.263
Minimum Non-Detect	9.90E-04	Minimum Non-Detect	-6.918
Maximum Non-Detect	0.0021	Maximum Non-Detect	-6.166
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.976	Shapiro Wilk Test Statistic	0.993
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	9.82E-04	Mean	-7.083
SD	6.63E-04	SD	0.54
95% DL/2 (t) UCL	0.0013	95% H-Stat (DL/2) UCL	0.00132
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-6.868
		SD in Log Scale	0.405
		Mean in Original Scale	0.00114
		SD in Original Scale	5.78E-04
		95% t UCL	0.00141
		95% Percentile Bootstrap UCL	0.0014
		95% BCA Bootstrap UCL	0.00146
		95% H-UCL	0.00141
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.00171
5% K-S Critical Value	N/A	SD	2.95E-04
Data not Gamma Distributed at 5% Significance Level		SE of Mean	9.70E-05
		95% KM (t) UCL	0.00188
Assuming Gamma Distribution		95% KM (z) UCL	0.00187
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00198
Minimum	N/A	95% KM (bootstrap t) UCL	0.00183
Maximum	N/A	95% KM (BCA) UCL	0.0027
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.0027
Median	N/A	95% KM (Chebyshev) UCL	0.00213
SD	N/A	97.5% KM (Chebyshev) UCL	0.00232
k star	N/A	99% KM (Chebyshev) UCL	0.00267
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.00188
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	0.0027
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Methylene Chloride

General Statistics			
Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
Number of Missing Values	3	Percent Non-Detects	85.71%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0026	Minimum Detected	-5.952
Maximum Detected	0.029	Maximum Detected	-3.54
Mean of Detected	0.0158	Mean of Detected	-4.746

SD of Detected	0.0187	SD of Detected	1.705
Minimum Non-Detect	0.0021	Minimum Non-Detect	-6.166
Maximum Non-Detect	0.0044	Maximum Non-Detect	-5.426

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00349	Mean	-6.314
SD	0.00736	SD	0.848
95% DL/2 (t) UCL	0.00697	95% H-Stat (DL/2) UCL	0.00472
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.00449
5% K-S Critical Value	N/A	SD	0.0068
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00257
		95% KM (t) UCL	0.00904
Assuming Gamma Distribution		95% KM (z) UCL	0.00871
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0223
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	0.029
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.029
Median	N/A	95% KM (Chebyshev) UCL	0.0157
SD	N/A	97.5% KM (Chebyshev) UCL	0.0205
k star	N/A	99% KM (Chebyshev) UCL	0.0301
Theta star	N/A		

Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	97.5% KM (Chebyshev) UCL	0.0205
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Naphthalene

General Statistics

Number of Valid Data	16	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	15
Number of Missing Values	1	Percent Non-Detects	93.75%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Naphthalene was not processed!

Toluene

General Statistics

Number of Valid Data	14	Number of Detected Data	5
Number of Distinct Detected Data	4	Number of Non-Detect Data	9
Number of Missing Values	3	Percent Non-Detects	64.29%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.002	Minimum Detected	-6.215
Maximum Detected	0.0032	Maximum Detected	-5.745
Mean of Detected	0.00254	Mean of Detected	-5.988
SD of Detected	4.45E-04	SD of Detected	0.174
Minimum Non-Detect	0.0013	Minimum Non-Detect	-6.645
Maximum Non-Detect	0.0028	Maximum Non-Detect	-5.878

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.955	Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00147	Mean	-6.682
SD	8.84E-04	SD	0.579
95% DL/2 (t) UCL	0.00189	95% H-Stat (DL/2) UCL	0.00209

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-6.281
		SD in Log Scale	0.255
		Mean in Original Scale	0.00193
		SD in Original Scale	5.41E-04

95% t UCL	0.00219
95% Percentile Bootstrap UCL	0.00217
95% BCA Bootstrap UCL	0.0022
95% H-UCL	0.0022

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	16.7	Data appear Normal at 5% Significance Level	
Theta Star	1.52E-04		
nu star	167		
A-D Test Statistic	0.257	Nonparametric Statistics	
5% A-D Critical Value	0.678	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.678	Mean	0.0022
5% K-S Critical Value	0.357	SD	3.53E-04
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.07E-04
		95% KM (t) UCL	0.00239
Assuming Gamma Distribution		95% KM (z) UCL	0.00238
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00241
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.00238
Maximum	0.0032	95% KM (BCA) UCL	0.00269
Mean	0.00112	95% KM (Percentile Bootstrap) UCL	0.00264
Median	7.16E-04	95% KM (Chebyshev) UCL	0.00267
SD	0.00117	97.5% KM (Chebyshev) UCL	0.00287
k star	0.377	99% KM (Chebyshev) UCL	0.00327
Theta star	0.00297		
Nu star	10.55	Potential UCLs to Use	
AppChi2	4.288	95% KM (t) UCL	0.00239
95% Gamma Approximate UCL (Use when n >= 40)	0.00275	95% KM (Percentile Bootstrap) UCL	0.00264
95% Adjusted Gamma UCL (Use when n < 40)	0.00313		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Xylenes, Total

General Statistics			
Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
Number of Missing Values	3	Percent Non-Detects	85.71%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0013	Minimum Detected	-6.645
Maximum Detected	0.0022	Maximum Detected	-6.119
Mean of Detected	0.00175	Mean of Detected	-6.382
SD of Detected	6.36E-04	SD of Detected	0.372
Minimum Non-Detect	0.0011	Minimum Non-Detect	-6.812
Maximum Non-Detect	0.0023	Maximum Non-Detect	-6.075
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	9.11E-04	Mean	-7.084
SD	4.41E-04	SD	0.397
95% DL/2 (t) UCL	0.00112	95% H-Stat (DL/2) UCL	0.00113
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.00137
5% K-S Critical Value	N/A	SD	2.40E-04
Data not Gamma Distributed at 5% Significance Level		SE of Mean	9.41E-05
		95% KM (t) UCL	0.00154
Assuming Gamma Distribution		95% KM (z) UCL	0.00152
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00198
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.0022
Median	N/A	95% KM (Chebyshev) UCL	0.00178
SD	N/A	97.5% KM (Chebyshev) UCL	0.00196
k star	N/A	99% KM (Chebyshev) UCL	0.00231
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.00154
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (% Bootstrap) UCL	0.0022
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

2-Methylnaphthalene

General Statistics			
Number of Valid Data	17	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	13
		Percent Non-Detects	76.47%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0077	Minimum Detected	-4.867

Maximum Detected	0.081	Maximum Detected	-2.513
Mean of Detected	0.0384	Mean of Detected	-3.633
SD of Detected	0.0335	SD of Detected	1.066
Minimum Non-Detect	0.0029	Minimum Non-Detect	-5.843
Maximum Non-Detect	0.29	Maximum Non-Detect	-1.238

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	17
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.927	Shapiro Wilk Test Statistic	0.956
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0663	Mean	-3.278
SD	0.0536	SD	1.344
95% DL/2 (t) UCL	0.089	95% H-Stat (DL/2) UCL	0.274
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-4.567
		SD in Log Scale	0.931
		Mean in Original Scale	0.0166
		SD in Original Scale	0.0202
		95% t UCL	0.0251
		95% Percentile Bootstrap UCL	0.0248
		95% BCA Bootstrap UCL	0.0279
		95% H-UCL	0.0292
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.537	Data appear Normal at 5% Significance Level	
Theta Star	0.0715		
nu star	4.299		
A-D Test Statistic	0.269	Nonparametric Statistics	
5% A-D Critical Value	0.663	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.663	Mean	0.0227
5% K-S Critical Value	0.4	SD	0.0245
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.00969
		95% KM (t) UCL	0.0396
Assuming Gamma Distribution		95% KM (z) UCL	0.0386
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0378
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.0456
Maximum	0.081	95% KM (BCA) UCL	0.081
Mean	0.0154	95% KM (Percentile Bootstrap) UCL	0.0561
Median	0.00678	95% KM (Chebyshev) UCL	0.0649
SD	0.0233	97.5% KM (Chebyshev) UCL	0.0832
k star	0.21	99% KM (Chebyshev) UCL	0.119
Theta star	0.0733		
Nu star	7.15	Potential UCLs to Use	
AppChi2	2.253	95% KM (t) UCL	0.0396
95% Gamma Approximate UCL (Use when n >= 40)	0.0489	95% KM (Percentile Bootstrap) UCL	0.0561
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Acenaphthene

General Statistics			
Number of Valid Data	17	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	14
		Percent Non-Detects	82.35%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.011	Minimum Detected	-4.51
Maximum Detected	0.2	Maximum Detected	-1.609
Mean of Detected	0.0997	Mean of Detected	-2.85
SD of Detected	0.095	SD of Detected	1.495
Minimum Non-Detect	0.0014	Minimum Non-Detect	-6.571
Maximum Non-Detect	0.15	Maximum Non-Detect	-1.897

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	16
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	94.12%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.989	Shapiro Wilk Test Statistic	0.941
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0467	Mean	-3.968
SD	0.0506	SD	1.738
95% DL/2 (t) UCL	0.0682	95% H-Stat (DL/2) UCL	0.468
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-6.096
		SD in Log Scale	1.853
		Mean in Original Scale	0.0192
		SD in Original Scale	0.0511
		95% t UCL	0.0408
		95% Percentile Bootstrap UCL	0.0418
		95% BCA Bootstrap UCL	0.0533
		95% H-UCL	0.0844
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	0.0287
5% K-S Critical Value	N/A	SD	0.0479
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0149
		95% KM (t) UCL	0.0547

Assuming Gamma Distribution		95% KM (z) UCL	0.0532
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0788
Minimum	N/A	95% KM (bootstrap t) UCL	0.0433
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	0.0935
SD	N/A	97.5% KM (Chebyshev) UCL	0.122
k star	N/A	99% KM (Chebyshev) UCL	0.177
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.0547
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	N/A
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Acenaphthylene

General Statistics			
Number of Valid Data	17	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	16
		Percent Non-Detects	94.12%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Acenaphthylene was not processed!

Anthracene

General Statistics			
Number of Valid Data	17	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	12
		Percent Non-Detects	70.59%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.025	Minimum Detected	-3.689
Maximum Detected	0.83	Maximum Detected	-0.186
Mean of Detected	0.303	Mean of Detected	-1.692
SD of Detected	0.308	SD of Detected	1.267
Minimum Non-Detect	0.0013	Minimum Non-Detect	-6.645
Maximum Non-Detect	0.14	Maximum Non-Detect	-1.966
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	76.47%

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.81	Shapiro Wilk Test Statistic	0.912
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	

Mean	0.11	Mean	-3.68
SD	0.202	SD	2.095
95% DL/2 (t) UCL	0.196	95% H-Stat (DL/2) UCL	2.476

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.635
		SD in Log Scale	2.131
		Mean in Original Scale	0.0917
		SD in Original Scale	0.209
		95% t UCL	0.18
		95% Percentile Bootstrap UCL	0.18
		95% BCA Bootstrap UCL	0.238
		95% H-UCL	1.107

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.59	Data appear Normal at 5% Significance Level	
Theta Star	0.514		
nu star	5.9		
A-D Test Statistic	0.332	Nonparametric Statistics	
5% A-D Critical Value	0.69	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.69	Mean	0.107
5% K-S Critical Value	0.364	SD	0.196
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0531
		95% KM (t) UCL	0.199
Assuming Gamma Distribution		95% KM (z) UCL	0.194
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.21
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.233
Maximum	0.83	95% KM (BCA) UCL	0.344
Mean	0.0891	95% KM (Percentile Bootstrap) UCL	0.299
Median	1.00E-06	95% KM (Chebyshev) UCL	0.338
SD	0.21	97.5% KM (Chebyshev) UCL	0.438
k star	0.124	99% KM (Chebyshev) UCL	0.635
Theta star	0.717		
Nu star	4.225	Potential UCLs to Use	
AppChi2	0.813	95% KM (t) UCL	0.199
95% Gamma Approximate UCL (Use when n >= 40)	0.463	95% KM (Percentile Bootstrap) UCL	0.299
95% Adjusted Gamma UCL (Use when n < 40)	0.56		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Benzo[a]anthracene

General Statistics			
Number of Valid Data	17	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	9
		Percent Non-Detects	52.94%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.032	Minimum Detected	-3.442
Maximum Detected	4.1	Maximum Detected	1.411
Mean of Detected	0.681	Mean of Detected	-1.512
SD of Detected	1.388	SD of Detected	1.428
Minimum Non-Detect	0.0014	Minimum Non-Detect	-6.571
Maximum Non-Detect	0.15	Maximum Non-Detect	-1.897
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	76.47%

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.507	Shapiro Wilk Test Statistic	0.92
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.34	Mean	-3.032
SD	0.977	SD	2.263
95% DL/2 (t) UCL	0.754	95% H-Stat (DL/2) UCL	9.855
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.16
		SD in Log Scale	1.934
		Mean in Original Scale	0.328
		SD in Original Scale	0.981
		95% t UCL	0.743
		95% Percentile Bootstrap UCL	0.791
		95% BCA Bootstrap UCL	1.056
		95% H-UCL	2.163
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.43	Data appear Lognormal at 5% Significance Level	
Theta Star	1.585		
nu star	6.878		
A-D Test Statistic	0.939	Nonparametric Statistics	
5% A-D Critical Value	0.759	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.759	Mean	0.342
5% K-S Critical Value	0.308	SD	0.947
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.246
		95% KM (t) UCL	0.771
Assuming Gamma Distribution		95% KM (z) UCL	0.746
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.737
Minimum	1.00E-06	95% KM (bootstrap t) UCL	4.284
Maximum	4.1	95% KM (BCA) UCL	0.915
Mean	0.321	95% KM (Percentile Bootstrap) UCL	0.809
Median	1.00E-06	95% KM (Chebyshev) UCL	1.413
SD	0.983	97.5% KM (Chebyshev) UCL	1.876
k star	0.134	99% KM (Chebyshev) UCL	2.785
Theta star	2.383		
Nu star	4.573	Potential UCLs to Use	
AppChi2	0.96	95% KM (BCA) UCL	0.915
95% Gamma Approximate UCL (Use when n >= 40)	1.526		
95% Adjusted Gamma UCL (Use when n < 40)	1.827		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Benzo[a]pyrene

General Statistics			
Number of Valid Data	15	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	9
Number of Missing Values	2	Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.031	Minimum Detected	-3.474
Maximum Detected	3.4	Maximum Detected	1.224
Mean of Detected	0.78	Mean of Detected	-1.232
SD of Detected	1.297	SD of Detected	1.549
Minimum Non-Detect	0.0016	Minimum Non-Detect	-6.438
Maximum Non-Detect	0.17	Maximum Non-Detect	-1.772

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	11
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	73.33%

Warning: There are only 6 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.625	Shapiro Wilk Test Statistic	0.971
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.338	Mean	-3.031
SD	0.861	SD	2.352
95% DL/2 (t) UCL	0.73	95% H-Stat (DL/2) UCL	20.98
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.71
		SD in Log Scale	2.378
		Mean in Original Scale	0.316
		SD in Original Scale	0.868
		95% t UCL	0.711
		95% Percentile Bootstrap UCL	0.738
		95% BCA Bootstrap UCL	0.996
		95% H-UCL	12.12

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.423	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.843		
nu star	5.08		
A-D Test Statistic	0.458	Nonparametric Statistics	
5% A-D Critical Value	0.728	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.728	Mean	0.334
5% K-S Critical Value	0.346	SD	0.833
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.236
		95% KM (t) UCL	0.749
Assuming Gamma Distribution		95% KM (z) UCL	0.721
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.685
Minimum	1.00E-06	95% KM (bootstrap t) UCL	2.789
Maximum	3.4	95% KM (BCA) UCL	0.903
Mean	0.312	95% KM (Percentile Bootstrap) UCL	0.778
Median	1.00E-06	95% KM (Chebyshev) UCL	1.361
SD	0.87	97.5% KM (Chebyshev) UCL	1.805
k star	0.129	99% KM (Chebyshev) UCL	2.678
Theta star	2.417		
Nu star	3.874	Potential UCLs to Use	
AppChi2	0.672	95% KM (t) UCL	0.749
95% Gamma Approximate UCL (Use when n >= 40)	1.798		
95% Adjusted Gamma UCL (Use when n < 40)	2.277		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Benzo[b]fluoranthene

General Statistics			
Number of Valid Data	16	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	9
Number of Missing Values	1	Percent Non-Detects	56.25%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.031	Minimum Detected	-3.474
Maximum Detected	4.3	Maximum Detected	1.459
Mean of Detected	0.854	Mean of Detected	-1.186
SD of Detected	1.53	SD of Detected	1.522
Minimum Non-Detect	0.0017	Minimum Non-Detect	-6.377
Maximum Non-Detect	0.18	Maximum Non-Detect	-1.715

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	12
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	75.00%

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.568	Shapiro Wilk Test Statistic	0.96
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.4	Mean	-2.865
SD	1.053	SD	2.339
95% DL/2 (t) UCL	0.861	95% H-Stat (DL/2) UCL	19.37

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.15
		SD in Log Scale	2.127
		Mean in Original Scale	0.382
		SD in Original Scale	1.059
		95% t UCL	0.846
		95% Percentile Bootstrap UCL	0.887
		95% BCA Bootstrap UCL	1.192
		95% H-UCL	5.462

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.439	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.948	
nu star	6.139	

A-D Test Statistic	0.58	Nonparametric Statistics	
5% A-D Critical Value	0.745	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.745	Mean	0.398
5% K-S Critical Value	0.325	SD	1.02
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.276
		95% KM (t) UCL	0.882

Assuming Gamma Distribution		95% KM (z) UCL	0.852
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.828
Minimum	1.00E-06	95% KM (bootstrap t) UCL	2.752
Maximum	4.3	95% KM (BCA) UCL	1.173
Mean	0.374	95% KM (Percentile Bootstrap) UCL	0.928
Median	1.00E-06	95% KM (Chebyshev) UCL	1.6
SD	1.062	97.5% KM (Chebyshev) UCL	2.12
k star	0.131	99% KM (Chebyshev) UCL	3.141
Theta star	2.856		
Nu star	4.189	Potential UCLs to Use	
AppChi2	0.798	95% KM (t) UCL	0.882
95% Gamma Approximate UCL (Use when n >= 40)	1.963		
95% Adjusted Gamma UCL (Use when n < 40)	2.415		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Benzo[g,h,i]perylene

General Statistics

Number of Valid Data	17	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	12
		Percent Non-Detects	70.59%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.025	Minimum Detected	-3.689
Maximum Detected	1.5	Maximum Detected	0.405
Mean of Detected	0.463	Mean of Detected	-1.526
SD of Detected	0.6	SD of Detected	1.506
Minimum Non-Detect	0.0051	Minimum Non-Detect	-5.279
Maximum Non-Detect	0.54	Maximum Non-Detect	-0.616

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	16
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	94.12%

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.766	Shapiro Wilk Test Statistic	0.973
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.237	Mean	-2.408
SD	0.348	SD	1.785
95% DL/2 (t) UCL	0.384	95% H-Stat (DL/2) UCL	2.632

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.346
		SD in Log Scale	1.563
		Mean in Original Scale	0.152
		SD in Original Scale	0.365
		95% t UCL	0.306
		95% Percentile Bootstrap UCL	0.305
		95% BCA Bootstrap UCL	0.422

		95% H-UCL	0.486

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.448	Data appear Normal at 5% Significance Level	
Theta Star	1.033		
nu star	4.481		
A-D Test Statistic	0.264	Nonparametric Statistics	
5% A-D Critical Value	0.697	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.697	Mean	0.181
5% K-S Critical Value	0.366	SD	0.351
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.098
		95% KM (t) UCL	0.352
Assuming Gamma Distribution		95% KM (z) UCL	0.342
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.326
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.541
Maximum	1.5	95% KM (BCA) UCL	0.512
Mean	0.136	95% KM (Percentile Bootstrap) UCL	0.431
Median	1.00E-06	95% KM (Chebyshev) UCL	0.608
SD	0.37	97.5% KM (Chebyshev) UCL	0.793
k star	0.124	99% KM (Chebyshev) UCL	1.156
Theta star	1.1		
Nu star	4.209	Potential UCLs to Use	
AppChi2	0.806	95% KM (t) UCL	0.352
95% Gamma Approximate UCL (Use when n >= 40)	0.711	95% KM (Percentile Bootstrap) UCL	0.431
95% Adjusted Gamma UCL (Use when n < 40)	0.86		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Benzo[k]fluoranthene

General Statistics			
Number of Valid Data	17	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	12
		Percent Non-Detects	70.59%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.026	Minimum Detected	-3.65
Maximum Detected	2.8	Maximum Detected	1.03
Mean of Detected	0.759	Mean of Detected	-1.285
SD of Detected	1.157	SD of Detected	1.717
Minimum Non-Detect	0.0015	Minimum Non-Detect	-6.502
Maximum Non-Detect	0.16	Maximum Non-Detect	-1.833
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	3
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	82.35%

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.703	Shapiro Wilk Test Statistic	0.993
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.253	Mean	-3.198
SD	0.67	SD	2.153
95% DL/2 (t) UCL	0.537	95% H-Stat (DL/2) UCL	5.136
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.876
		SD in Log Scale	2.686
		Mean in Original Scale	0.226
		SD in Original Scale	0.679
		95% t UCL	0.513
		95% Percentile Bootstrap UCL	0.537
		95% BCA Bootstrap UCL	0.705
		95% H-UCL	12.76
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.378	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.011		
nu star	3.776		
A-D Test Statistic	0.278	Nonparametric Statistics	
5% A-D Critical Value	0.705	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.705	Mean	0.244
5% K-S Critical Value	0.369	SD	0.653
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.177
		95% KM (t) UCL	0.553
Assuming Gamma Distribution		95% KM (z) UCL	0.535
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.491
Minimum	1.00E-06	95% KM (bootstrap t) UCL	1.606
Maximum	2.8	95% KM (BCA) UCL	0.815
Mean	0.223	95% KM (Percentile Bootstrap) UCL	0.682
Median	1.00E-06	95% KM (Chebyshev) UCL	1.015
SD	0.68	97.5% KM (Chebyshev) UCL	1.349
k star	0.117	99% KM (Chebyshev) UCL	2.005
Theta star	1.905		
Nu star	3.986	Potential UCLs to Use	
AppChi2	0.716	95% KM (t) UCL	0.553
95% Gamma Approximate UCL (Use when n >= 40)	1.243		
95% Adjusted Gamma UCL (Use when n < 40)	1.513		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Chrysene

General Statistics			
Number of Valid Data	15	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	9
Number of Missing Values	2	Percent Non-Detects	60.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.031	Minimum Detected	-3.474
Maximum Detected	4.4	Maximum Detected	1.482
Mean of Detected	0.908	Mean of Detected	-1.385
SD of Detected	1.719	SD of Detected	1.698
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.11	Maximum Non-Detect	-2.207
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	11
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	73.33%

Warning: There are only 6 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.585	Shapiro Wilk Test Statistic	0.958
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.38	Mean	-3.362
SD	1.12	SD	2.489
95% DL/2 (t) UCL	0.89	95% H-Stat (DL/2) UCL	30.56
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-4.015
		SD in Log Scale	2.545
		Mean in Original Scale	0.366
		SD in Original Scale	1.125
		95% t UCL	0.878
		95% Percentile Bootstrap UCL	0.922
		95% BCA Bootstrap UCL	1.238
		95% H-UCL	21.45
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.358	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2.537		
nu star	4.297		
A-D Test Statistic	0.569	Nonparametric Statistics	
5% A-D Critical Value	0.737	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.737	Mean	0.385
5% K-S Critical Value	0.349	SD	1.081
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.306
		95% KM (t) UCL	0.923
Assuming Gamma Distribution		95% KM (z) UCL	0.887
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.866
Minimum	1.00E-06	95% KM (bootstrap t) UCL	5.466
Maximum	4.4	95% KM (BCA) UCL	1.219
Mean	0.363	95% KM (Percentile Bootstrap) UCL	0.981
Median	1.00E-06	95% KM (Chebyshev) UCL	1.717
SD	1.126	97.5% KM (Chebyshev) UCL	2.294
k star	0.127	99% KM (Chebyshev) UCL	3.427
Theta star	2.859		
Nu star	3.812	Potential UCLs to Use	
AppChi2	0.649	95% KM (t) UCL	0.923
95% Gamma Approximate UCL (Use when n >= 40)	2.134		
95% Adjusted Gamma UCL (Use when n < 40)	2.709		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Dibenz(a,h)anthracene

General Statistics			
Number of Valid Data	17	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	16

Percent Non-Detects	94.12%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Dibenz(a,h)anthracene was not processed!

Dibenzofuran

General Statistics			
Number of Valid Data	14	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	10
Number of Missing Values	3	Percent Non-Detects	71.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0084	Minimum Detected	-4.78
Maximum Detected	0.37	Maximum Detected	-0.994
Mean of Detected	0.132	Mean of Detected	-2.745
SD of Detected	0.162	SD of Detected	1.562
Minimum Non-Detect	0.0018	Minimum Non-Detect	-6.32
Maximum Non-Detect	0.19	Maximum Non-Detect	-1.661

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.86%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.815	Shapiro Wilk Test Statistic	0.971
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.07	Mean	-3.764
SD	0.0955	SD	1.895
95% DL/2 (t) UCL	0.115	95% H-Stat (DL/2) UCL	1.457
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-4.809
		SD in Log Scale	1.719
		Mean in Original Scale	0.0417
		SD in Original Scale	0.0981
		95% t UCL	0.0881
		95% Percentile Bootstrap UCL	0.0899
		95% BCA Bootstrap UCL	0.12
		95% H-UCL	0.254
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.371	Data appear Normal at 5% Significance Level	
Theta Star	0.356		
nu star	2.972		
A-D Test Statistic	0.248	Nonparametric Statistics	
5% A-D Critical Value	0.669	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.669	Mean	0.0498
5% K-S Critical Value	0.404	SD	0.0934
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0297

		95% KM (t) UCL	0.102
Assuming Gamma Distribution		95% KM (z) UCL	0.0986
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0973
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.125
Maximum	0.37	95% KM (BCA) UCL	0.37
Mean	0.0401	95% KM (Percentile Bootstrap) UCL	0.13
Median	1.00E-06	95% KM (Chebyshev) UCL	0.179
SD	0.099	97.5% KM (Chebyshev) UCL	0.235
k star	0.141	99% KM (Chebyshev) UCL	0.345
Theta star	0.285		
Nu star	3.943	Potential UCLs to Use	
AppChi2	0.699	95% KM (t) UCL	0.102
95% Gamma Approximate UCL (Use when n >= 40)	0.226	95% KM (Percentile Bootstrap) UCL	0.13
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Di-n-butyl phthalate

General Statistics			
Number of Valid Data	17	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	16
		Percent Non-Detects	94.12%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Di-n-butyl phthalate was not processed!

Fluoranthene

General Statistics			
Number of Valid Data	17	Number of Detected Data	8
Number of Distinct Detected Data	7	Number of Non-Detect Data	9
		Percent Non-Detects	52.94%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.076	Minimum Detected	-2.577
Maximum Detected	12	Maximum Detected	2.485
Mean of Detected	1.887	Mean of Detected	-0.583
SD of Detected	4.094	SD of Detected	1.433
Minimum Non-Detect	0.0031	Minimum Non-Detect	-5.776
Maximum Non-Detect	0.33	Maximum Non-Detect	-1.109

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	10
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	7
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	58.82%

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.473	Shapiro Wilk Test Statistic	0.834
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	

DL/2 Substitution Method	
Mean	0.932
SD	2.863
95% DL/2 (t) UCL	2.145

Maximum Likelihood Estimate(MLE) Method	N/A
MLE yields a negative mean	

DL/2 Substitution Method	
Mean	-2.164
SD	2.305
95% H-Stat (DL/2) UCL	28.45

Log ROS Method	
Mean in Log Scale	-2.536
SD in Log Scale	2.167
Mean in Original Scale	0.897
SD in Original Scale	2.874
95% t UCL	2.114
95% Percentile Bootstrap UCL	2.256
95% BCA Bootstrap UCL	3.121
95% H-UCL	10.54

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.407
Theta Star	4.633
nu star	6.517
A-D Test Statistic	1.324
5% A-D Critical Value	0.761
K-S Test Statistic	0.761
5% K-S Critical Value	0.309
Data not Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics using Extrapolated Data	
Minimum	1.00E-06
Maximum	12
Mean	0.888
Median	1.00E-06
SD	2.877
k star	0.128
Theta star	6.943
Nu star	4.349
AppChi2	0.864
95% Gamma Approximate UCL (Use when n >= 40)	4.469
95% Adjusted Gamma UCL (Use when n < 40)	5.381

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only
Data appear Lognormal at 5% Significance Level

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	0.928
SD	2.778
SE of Mean	0.72
95% KM (t) UCL	2.186
95% KM (z) UCL	2.113
95% KM (jackknife) UCL	2.041
95% KM (bootstrap t) UCL	17.27
95% KM (BCA) UCL	2.504
95% KM (Percentile Bootstrap) UCL	2.305
95% KM (Chebyshev) UCL	4.068
97.5% KM (Chebyshev) UCL	5.427
99% KM (Chebyshev) UCL	8.096
Potential UCLs to Use	
95% KM (BCA) UCL	2.504

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Fluorene

General Statistics			
Number of Valid Data	14	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	13
Number of Missing Values	3	Percent Non-Detects	92.86%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Fluorene was not processed!

Indeno[1,2,3-cd]pyrene

General Statistics			
Number of Valid Data	15	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	9
Number of Missing Values	2	Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.023	Minimum Detected	-3.772
Maximum Detected	1.5	Maximum Detected	0.405
Mean of Detected	0.417	Mean of Detected	-1.565
SD of Detected	0.548	SD of Detected	1.378
Minimum Non-Detect	0.0035	Minimum Non-Detect	-5.655
Maximum Non-Detect	0.37	Maximum Non-Detect	-0.994

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	86.67%

Warning: There are only 6 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.717	Shapiro Wilk Test Statistic	0.96
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.224	Mean	-2.692
SD	0.372	SD	1.989
95% DL/2 (t) UCL	0.393	95% H-Stat (DL/2) UCL	5.472
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.061
		SD in Log Scale	1.636
		Mean in Original Scale	0.182
		SD in Original Scale	0.384
		95% t UCL	0.356
		95% Percentile Bootstrap UCL	0.367
		95% BCA Bootstrap UCL	0.481
		95% H-UCL	0.967

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.537	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.776		
nu star	6.45		
A-D Test Statistic	0.327	Nonparametric Statistics	
5% A-D Critical Value	0.719	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.719	Mean	0.198
5% K-S Critical Value	0.342	SD	0.366
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.105
		95% KM (t) UCL	0.383
Assuming Gamma Distribution		95% KM (z) UCL	0.371
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.356
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.63
Maximum	1.5	95% KM (BCA) UCL	0.456
Mean	0.177	95% KM (Percentile Bootstrap) UCL	0.42
Median	1.00E-06	95% KM (Chebyshev) UCL	0.655
SD	0.387	97.5% KM (Chebyshev) UCL	0.852
k star	0.143	99% KM (Chebyshev) UCL	1.241
Theta star	1.232		
Nu star	4.3	Potential UCLs to Use	
AppChi2	0.844	95% KM (t) UCL	0.383
95% Gamma Approximate UCL (Use when n >= 40)	0.9		
95% Adjusted Gamma UCL (Use when n < 40)	1.122		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Phenanthrene

General Statistics			
Number of Valid Data	17	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	10
		Percent Non-Detects	58.82%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.071	Minimum Detected	-2.645
Maximum Detected	2.3	Maximum Detected	0.833
Mean of Detected	0.739	Mean of Detected	-0.842
SD of Detected	0.777	SD of Detected	1.205
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.53	Maximum Non-Detect	-0.635

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	76.47%

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.831	Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.384	Mean	-2.102
SD	0.572	SD	1.966
95% DL/2 (t) UCL	0.626	95% H-Stat (DL/2) UCL	7.063

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.41
		SD in Log Scale	1.621
		Mean in Original Scale	0.326
		SD in Original Scale	0.594
		95% t UCL	0.578
		95% Percentile Bootstrap UCL	0.572
		95% BCA Bootstrap UCL	0.651
		95% H-UCL	1.493

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.703	Data appear Normal at 5% Significance Level	
Theta Star	1.051		
nu star	9.836		

A-D Test Statistic	0.23	Nonparametric Statistics	
5% A-D Critical Value	0.727	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.727	Mean	0.358
5% K-S Critical Value	0.319	SD	0.562
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.148
		95% KM (t) UCL	0.616

Assuming Gamma Distribution		95% KM (z) UCL	0.601
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.581
Minimum	1.00E-06	95% KM (bootstrap t) UCL	0.824
Maximum	2.3	95% KM (BCA) UCL	0.762
Mean	0.304	95% KM (Percentile Bootstrap) UCL	0.688
Median	1.00E-06	95% KM (Chebyshev) UCL	1.001
SD	0.606	97.5% KM (Chebyshev) UCL	1.28
k star	0.13	99% KM (Chebyshev) UCL	1.827
Theta star	2.341		
Nu star	4.417	Potential UCLs to Use	
AppChi2	0.893	95% KM (t) UCL	0.616
95% Gamma Approximate UCL (Use when n >= 40)	1.504	95% KM (Percentile Bootstrap) UCL	0.688
95% Adjusted Gamma UCL (Use when n < 40)	1.808		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Pyrene

General Statistics

Number of Valid Data	14	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	8
Number of Missing Values	3	Percent Non-Detects	57.14%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.055	Minimum Detected	-2.9
Maximum Detected	8.4	Maximum Detected	2.128
Mean of Detected	1.658	Mean of Detected	-1.029
SD of Detected	3.315	SD of Detected	1.866
Minimum Non-Detect	0.0018	Minimum Non-Detect	-6.32
Maximum Non-Detect	0.2	Maximum Non-Detect	-1.609

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	10
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	71.43%

Warning: There are only 6 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.569	Shapiro Wilk Test Statistic	0.917
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.742	Mean	-2.694
SD	2.215	SD	2.453
95% DL/2 (t) UCL	1.791	95% H-Stat (DL/2) UCL	61.82

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.483
		SD in Log Scale	2.617
		Mean in Original Scale	0.715
		SD in Original Scale	2.223
		95% t UCL	1.768
		95% Percentile Bootstrap UCL	1.867
		95% BCA Bootstrap UCL	2.511

		95% H-UCL	70.38

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.323	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	5.125		
nu star	3.881		
A-D Test Statistic	0.618	Nonparametric Statistics	
5% A-D Critical Value	0.747	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.747	Mean	0.742
5% K-S Critical Value	0.352	SD	2.134
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.625
		95% KM (t) UCL	1.849
Assuming Gamma Distribution		95% KM (z) UCL	1.77
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.788
Minimum	1.00E-06	95% KM (bootstrap t) UCL	14.89
Maximum	8.4	95% KM (BCA) UCL	2.013
Mean	0.71	95% KM (Percentile Bootstrap) UCL	1.913
Median	1.00E-06	95% KM (Chebyshev) UCL	3.465
SD	2.225	97.5% KM (Chebyshev) UCL	4.644
k star	0.127	99% KM (Chebyshev) UCL	6.958
Theta star	5.581		
Nu star	3.564	Potential UCLs to Use	
AppChi2	0.558	95% KM (t) UCL	1.849
95% Gamma Approximate UCL (Use when n >= 40)	4.541		
95% Adjusted Gamma UCL (Use when n < 40)	5.935		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

>C28-C35

General Statistics			
Number of Valid Data	17	Number of Detected Data	10
Number of Distinct Detected Data	10	Number of Non-Detect Data	7
		Percent Non-Detects	41.18%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	87	Minimum Detected	4.466
Maximum Detected	6500	Maximum Detected	8.78
Mean of Detected	2338	Mean of Detected	7.157
SD of Detected	2119	SD of Detected	1.379
Minimum Non-Detect	9.6	Minimum Non-Detect	2.262
Maximum Non-Detect	11	Maximum Non-Detect	2.398

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	10
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	41.18%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.914	Shapiro Wilk Test Statistic	0.926
5% Shapiro Wilk Critical Value	0.842	5% Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1377	Mean	4.879
SD	1981	SD	2.991
95% DL/2 (t) UCL	2216	95% H-Stat (DL/2) UCL	1257567
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	502.4	Mean in Log Scale	5.767
SD	2883	SD in Log Scale	2.021
95% MLE (t) UCL	1723	Mean in Original Scale	1395
95% MLE (Tiku) UCL	1888	SD in Original Scale	1968
		95% t UCL	2228
		95% Percentile Bootstrap UCL	2171
		95% BCA Bootstrap UCL	2298
		95% H UCL	23073
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.743	Data appear Normal at 5% Significance Level	
Theta Star	3146		
nu star	14.86		
A-D Test Statistic	0.227	Nonparametric Statistics	
5% A-D Critical Value	0.749	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.749	Mean	1411
5% K-S Critical Value	0.274	SD	1898
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	485.3
		95% KM (t) UCL	2258
Assuming Gamma Distribution		95% KM (z) UCL	2209
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2186
Minimum	1.00E-06	95% KM (bootstrap t) UCL	2508
Maximum	6500	95% KM (BCA) UCL	2467
Mean	1375	95% KM (Percentile Bootstrap) UCL	2284
Median	340	95% KM (Chebyshev) UCL	3526
SD	1983	97.5% KM (Chebyshev) UCL	4442
k star	0.117	99% KM (Chebyshev) UCL	6240
Theta star	11790		
Nu star	3.966	Potential UCLs to Use	
AppChi2	0.708	95% KM (t) UCL	2258
95% Gamma Approximate UCL (Use when n >= 40)	7700	95% KM (Percentile Bootstrap) UCL	2284
95% Adjusted Gamma UCL (Use when n < 40)	9381		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

APPENDIX E

US EPA ECOLOGICAL SOIL SCREENING LEVEL DOCUMENTATION

APPENDIX E
ACUTE NOAEL DOSE CALCULATIONS FOR HIGH MOLECULAR-WEIGHT PAHS

MAMMALIAN TOXICITY

COMPOUND	TEST ORGANISM	NOAEL	ENDPOINT
Benzo(a)pyrene	Mouse	10	Reproduction
Benzo(a)pyrene	Rat	5	Growth
Benzo(a)pyrene	Mouse	10	Growth
Benzo(a)pyrene	Rat	21.1	Growth
7,12-Dimethylbenz(a)anthracene	Mouse	28.5	Growth
Benzo(a)pyrene	Mouse	27.3	Survival
	Geometric Mean:	**14.20289**	

COMPOUND	TEST ORGANISM	LOAEL	ENDPOINT
Benzo(a)pyrene	Mouse	40	Reproduction
Benzo(a)pyrene	Rat	50	Growth
Benzo(a)pyrene	Rat	63.4	Growth
Benzo(a)pyrene	Rat	27.3	Growth
	Geometric Mean:	**43.13407**	

APPENDIX E
ACUTE NOAEL DOSE CALCULATIONS FOR COPPER

AVIAN TOXICITY

TEST ORGANISM	NOAEL	ENDPOINT
Chicken	16.7	Reproduction
Chicken	18	Reproduction
Chicken	22.4	Reproduction
Chicken	22.5	Reproduction
Chicken	27.2	Reproduction
Chicken	2.75	Growth
Chicken	7.63	Growth
Chicken	8.59	Growth
Chicken	8.59	Growth
Duck	10.2	Growth
Duck	12.6	Growth
Chicken	15.7	Growth
Chicken	16.7	Growth
Chicken	18	Growth
Turkey	18.3	Growth
Chicken	19.6	Growth
Chicken	21.3	Growth
Chicken	21.5	Growth
Chicken	21.5	Growth
Chicken	21.7	Growth
Chicken	22.4	Growth
Turkey	26.6	Growth
Chicken	35.2	Growth
Chicken	35.5	Growth
Chicken	36.3	Growth
Chicken	41	Growth
Chicken	65.4	Growth
Chicken	2.75	Survival
Turkey	18.3	Survival
Turkey	26.6	Survival
Chicken	85.9	Survival
Chicken	92.9	Survival
Duck	201	Survival
Geometric Mean:	**21.04535**	

TEST ORGANISM	LOAEL	ENDPOINT
Chicken	34	Reproduction
Chicken	28	Reproduction
Chicken	44.8	Reproduction
Chicken	45	Reproduction
Chicken	54.4	Reproduction
Chicken	42.9	Growth
Chicken	42.9	Growth
Duck	51.6	Growth
Chicken	25.8	Growth
Chicken	33.4	Growth
Chicken	28	Growth
Chicken	30.5	Growth
Chicken	42.7	Growth
Chicken	42.9	Growth
Chicken	44.8	Growth
Chicken	63.9	Growth
Chicken	26.4	Growth
Chicken	26.4	Growth
Chicken	35.5	Growth
Chicken	42.9	Growth
Chicken	50.1	Growth
Chicken	55.2	Growth
Chicken	57.2	Growth
Chicken	59	Growth
Chicken	85.9	Growth
Chicken	92.9	Growth
Chicken	138	Growth
Duck	78.5	Survival
Duck	201	Survival
Chicken	536	Survival
Geometric Mean:	**52.27097**	

APPENDIX E
ACUTE NOAEL DOSE CALCULATIONS FOR LEAD

AVIAN TOXICITY

TEST ORGANISM	NOAEL	ENDPOINT
Japanese quail	2.77	Growth
Japanese quail	4.64	Growth
Japanese quail	12.6	Growth
Japanese quail	13.5	Growth
American Kestrel	25	Growth
Japanese quail	34.5	Growth
Chicken	61.3	Growth
Mallard	66.9	Growth
Mallard	66.9	Survival
American Kestrel	125	Survival
Geometric Mean:	**24.04741**	

TEST ORGANISM	LOAEL	ENDPOINT
Japanese quail	93.1	Reproduction
Japanese quail	126	Growth
Japanese quail	67.4	Growth
Japanese quail	125	Growth
Japanese quail	123	Growth
American Kestrel	124	Growth
Japanese quail	152	Growth
Chicken	262	Growth
Mallard	270	Growth
Mallard	273	Growth
American Kestrel	282	Growth
American Kestrel	625	Survival
Chicken	400	Survival
Geometric Mean:	**185.6843**	

APPENDIX E
ACUTE NOAEL DOSE CALCULATIONS FOR LEAD

MAMMALIAN TOXICITY

TEST ORGANISM	NOAEL	ENDPOINT
Rat	47.3	Reproduction
Hamster	64.9	Reproduction
Rat	100	Reproduction
Rat	601	Reproduction
Rat	1.27	Growth
Rat	2.4	Growth
Rabbit	10.7	Growth
Mouse	16.3	Growth
Rat	75	Growth
Rat	230	Growth
Rat	400	Growth
Rat	400	Growth
Mouse	534	Growth
Cattle	16	Survival
Rabbit	29.2	Survival
Hamster	64.9	Survival
Rat	400	Survival
Rat	400	Survival
Rat	2000	Survival
Rat	3200	Survival
Geometric Mean:	**96.07341**	

TEST ORGANISM	LOAEL	ENDPOINT
Rat	82	Reproduction
Rat	150	Reproduction
Rat	1500	Reproduction
Mouse	46.4	Reproduction
Rat	222	Reproduction
Rat	362	Reproduction
Mouse	381	Reproduction
Mouse	646	Reproduction
Mouse	762	Reproduction
Rat	828	Reproduction
Rat	833	Reproduction
Rat	2570	Reproduction
Rat	13	Growth
Rabbit	50.4	Growth
Mouse	163	Growth
Rat	225	Growth
Rat	460	Growth
Rat	800	Growth
Rat	800	Growth
Rat	3.3	Growth
Rat	29	Growth
Rat	29	Growth
Rat	29.9	Growth
Rat	30.4	Growth
Rat	328	Growth
Rat	400	Growth
Rat	442	Growth
Rat	1430	Growth
Rat	1600	Growth
Rat	2390	Growth
Rat	2400	Growth
Rat	2650	Growth
Cattle	43	Survival
Rat	800	Survival
Rat	800	Survival
Rat	2400	Survival
Cattle	20	Survival
Rat	328	Survival
Rat	400	Survival
Geometric Mean:	**275.3306**	

APPENDIX E
ACUTE NOAEL DOSE CALCULATIONS FOR ZINC

AVIAN TOXICITY

TEST ORGANISM	NOAEL	ENDPOINT
Chicken	15	Growth
Japanese quail	21.5	Growth
Japanese quail	43.3	Growth
Japanese quail	55.1	Growth
Chicken	55.3	Growth
Chicken	85.9	Growth
Japanese quail	86.8	Growth
Chicken	92.3	Growth
Chicken	103	Growth
Chicken	103	Growth
Chicken	142	Growth
Chicken	177	Growth
Chicken	367	Growth
Japanese quail	21.5	Survival
Japanese quail	55.1	Survival
Japanese quail	89.5	Survival
Chicken	109	Survival
Japanese quail	183	Survival
Chicken	319	Survival
Geometric Mean:	**81.24654**	

TEST ORGANISM	LOAEL	ENDPOINT
Chicken	88	Reproduction
Chicken	205	Reproduction
Chicken	367	Reproduction
Chicken	988	Reproduction
Japanese quail	86.6	Growth
Chicken	111	Growth
Chicken	172	Growth
Japanese quail	174	Growth
Chicken	185	Growth
Chicken	354	Growth
Chicken	480	Growth
Chicken	21.6	Growth
Chicken	39	Growth
Chicken	65.7	Growth
Mallard duck	126	Growth
Chicken	252	Growth
Chicken	190	Growth
Chicken	284	Growth
Chicken	315	Growth
Chicken	757	Growth
Chicken	914	Growth
Chicken	988	Growth
Chicken	1370	Growth
Chicken	219	Survival
Chicken	366	Survival
Duck	401	Survival
Duck	803	Survival
Geometric Mean:	**247.584566**	

APPENDIX E
ACUTE NOAEL DOSE CALCULATIONS FOR ZINC

MAMMALIAN TOXICITY

TEST ORGANISM	NOAEL	ENDPOINT
Mouse	8.89	Reproduction
Mouse	30	Reproduction
Rat	34	Reproduction
Rat	42.5	Reproduction
Rabbit	60	Reproduction
Hamster	88	Reproduction
Rat	89.6	Reproduction
Rat	181	Reproduction
Rat	975	Reproduction
Rat	11.7	Growth
Rat	18	Growth
Mouse	30	Growth
Rat	34	Growth
Rat	42.5	Growth
Rat	56	Growth
Rabbit	60	Growth
Hamster	88	Growth
Rat	97.5	Growth
Pig	103	Growth
Rat	470	Growth
Mouse	825	Growth
Mouse	845	Growth
Mouse	846	Growth
Mouse	8.89	Survival
Mouse	30	Survival
Rat	42.5	Survival
Rabbit	60	Survival
Hamster	88	Survival
Geometric Mean:	**72.92447**	

TEST ORGANISM	LOAEL	ENDPOINT
Rat	452	Reproduction
Rat	81.1	Reproduction
Rat	326	Reproduction
Rat	81.1	Growth
Rat	956	Growth
Rat	968	Growth
Geometric Mean:	**310.5431**	

APPENDIX C

SITE CONTROL DOCUMENTATION

APPENDIX C-1

ORDER APPOINTING RECEIVER

CAUSE NO. 2013-CI-13622

BAE SYSTEMS RESOLUTION INC., BRIDGESTONE AMERICAS TIRE OPERATIONS, LLC, PERKIN ELMER AUTOMOTIVE RESEARCH, INC., FLINT GROUP INCORPORATED, and STRUCTURAL METALS, INC. Plaintiffs, v. PARTNERS TERMINAL CO., INC., a dissolved corporation, T.C. GOLDEN, INC., a dissolved corporation, and TROPICANA ENERGY COMPANY, INC. Defendants	§	IN THE DISTRICT COURT OF BEXAR COUNTY, TEXAS 131st JUDICIAL DISTRICT

Order Appointing Receiver

Plaintiffs BAE Systems Resolution Inc., Bridgestone Americas Tire Operations, LLC, PerkinElmer Automotive Research, Inc., Flint Group Incorporated and Structural Metals, Inc. filed Plaintiff's Verified Original Petition and Application for Appointment of Receiver (the "Petition") seeking, among other relief, appointment of a receiver for the Site.[1] The Court has reviewed the papers filed in this matter and has heard any statements offered by counsel. Being duly advised in the premises and for good cause shown, the Court hereby finds and orders as follows:

[1] "Site" for the purposes of this Order means, as defined in the Petition, the real estate commonly known as the R&H Oil/Tropicana Energy Site, consisting of two tracts of land located a 403 and 507 Somerset Road, approximately 5 miles southwest of downtown San Antonio.

IT IS HEREBY ORDERED AND ADJUDGED as follows:

1. The Court finds that the appointment of a receiver for the Site is proper for good cause shown. Specifically, the appointment of a receiver is necessary to allow Plaintiffs to remediate the Site.

2. Eva S. Engelhart, Ross, Banks, May, Cron & Cavin, P.C., 2 Riverway, Suite 700 Houston, Texas 77056, (713) 626-1200 (tel.), (713) 623-6014 (fax), email: eengelhart@rossbanks.com, possesses the necessary qualifications, is not an attorney for or related to any party to this action and is hereby appointed receiver of the Site ("**Receiver**").

3. Receiver is authorized, subject to control of this Court and the laws regarding receivership, to do any and all acts necessary for the proper and lawful conduct of the receivership. Specifically, the following orders are entered:

(a) **Receiver's Exclusive and Complete Control over the Site.** Receiver be allowed to take and have complete and exclusive control and possession of the Site, along with any and all information necessary to operate the Site, for the purpose of effectuating the clean up and remediation of the Site by Plaintiffs and the other Group members;

(b) **Receiver's Right to Prevent Waste of, and to Preserve, the Site.** Effective immediately, Receiver be ordered to take any and all actions Receiver deems reasonable and appropriate to prevent waste to the Site and to preserve, secure, manage, maintain, and safeguard

the Site and all other forms of property to which Receiver is entitled to take possession and control under the order appointing receiver;

(c) **Receiver's Right to Manage, Maintain, and Operate the Site.** Receiver be authorized to manage and operate, the Site and to employ such managers, agents, employees, brokers, accountants, and attorneys as may in her judgment be advisable or necessary in the management, conduct, control, or custody of the Site, be authorized to make payments and disbursements in the ordinary course of business and to make such payments and disbursements as may be needed and proper for the preservation of the Site;

(d) **Receiver's Right to Record Deed Restrictions on the Site Tracts.** Receiver be authorized to record deed restrictions and restrictive covenants to limit the uses of and activities on the Site. The deed restrictions and restrictive covenants may include restrictions deemed necessary, in Receiver's sole discretion, to cause the Site to be remediated. Such deed restrictions may include, but are not limited to: land use and development restrictions, restrictions on the use of soil or groundwater, requirements to implement appropriate health and safety measures during future construction activities, requirements to further evaluate potential risks prior to land use or development, and requirements to implement specific construction techniques to mitigate potential risks. The Receiver may establish

deed restrictions and restrictive covenants to grant regulatory agencies the authority to enforce the restrictions placed on the property;

(e) **Legal Actions Related to the Site.** Receiver be authorized to institute, prosecute, defend, compromise, and/or intervene in or become a party to such actions or proceedings in state or federal courts or settle any claims necessary for the protection, maintenance, and preservation of the Site and to carry out the terms of the Court's order appointing Receiver;

(f) **Insurance.** Receiver be authorized to obtain and maintain appropriate property insurance for the Site, public liability insurance, worker's compensation insurance, fire and extended coverage insurance, burglary and theft insurance, and other types of insurance normally obtained in connection with the operation and management of the Site; and be authorized to continue any current policies in place and to purchase further insurance as Receiver deems appropriate;

(g) **Negotiation with Taxing Authorities for the Site.** Receiver be authorized to negotiate with Taxing Authorities holding tax liens on the Site in order to ensure that any deed restrictions and restrictive covenants established pursuant to the remediation of the Site are

effective. Neither Receiver nor Plaintiffs are responsible for the payment of past property taxes for the Site;

(h) **Leases; Payment of Utilities; Maintenance of the Site; Compliance with Laws.** Receiver be authorized to: (1) negotiate and enter into new leases, occupancy agreements, and contracts in the ordinary course of the business of the Site; (2) modify existing leases, occupancy agreements, and contracts in the ordinary course of the business of the Site; (3) pay all utilities, expenses, and other obligations secured by the Site or which may give rise to liens on the Site, and all other outstanding obligations to suppliers and service providers in the ordinary course of business, including obligations incurred prior to the commencement of the receivership, so long as Receiver has determined that it is prudent to do so in order to maintain business relationships that are beneficial to the conduct of the receivership; (4) make repairs necessary to the maintenance of the Site in order to preserve the Site in the ordinary course of business; and (5) comply with all requirements and regulations applicable to the Site, including all laws and regulations related to the environment and the protection of human health;

(i) **Application of Income from the Site.** Receiver be permitted to apply income from the Site, if any, as follows: (1) Receiver's approved fees and expenses; (2) the current operating expenses of

the receivership in the ordinary course of business; and (3) to reimburse Plaintiffs for monies expended in connection with the receivership;

(j) **Receiver's Cash on Hand.** Receiver be permitted to maintain sufficient cash on hand to enable Receiver to meet those expenses, the payment of which is authorized herein, in an amount to be agreed to between Receiver and Plaintiffs;

(k) **Payment of Site Expenses.** Receiver be permitted to pay all expenses incurred with regard to the Site in the normal and ordinary course of business of the Site by Receiver on or after the date Receiver is appointed. Neither Receiver nor Plaintiffs shall be liable for any expenses incurred with regard to the Site prior to Receiver taking possession of the Site, nor shall Receiver or Plaintiffs be required to use any rents or additional funds advanced by Plaintiffs or other revenues collected after Receiver takes possession of the Site in payment of such expenses. It shall be incumbent upon Receiver, in Receiver's sole and absolute discretion, to make a determination as to which expenses, if any, incurred prior to the Receiver's taking possession of the Site, were incurred in the normal and ordinary course of business and the payment of which is necessary and critical to the ongoing operation of the Site. Receiver's determination of such is binding on the parties hereto and

will not be overturned by this Court. Otherwise, no pre-existing expenses shall be paid by Receiver without written approval by Plaintiffs or further order of this Court;

(l) **Receiver's Liability.** Except in the event of gross negligence, willful misconduct, or actions in violation of orders of the Court, Receiver has no personal liability for any obligations incurred in the course of the receivership including site remediation, any and all such liabilities being limited to the assets (including the cash and cash equivalents) received and generated by Receiver in the course of the receivership; and

(m) **Receiver's Right to Convey and Accept Conveyances.** Receiver is authorized to convey and accept conveyances of the Site.

(n) **Application of Proceeds from Sale of the Site.** Receiver be permitted to apply the proceeds from any sale of the Site or portions of the Site as follows: (1) to pay Receiver's approved fees and expenses that have not been otherwise paid; (2) to reimburse any money advanced by Plaintiffs for fees, expenses, attorney fees or other costs in connection with the receivership and; (3) to reimburse, on a pro rata basis, parties or persons who have contributed to the costs of the investigation or remedation of the Site; and

(o) **Receiver's Authority.** The authority granted to Receiver be self-executing. The Receiver is authorized to take any and all actions

necessary to effectuate the clean up and remediation of the Site by Plaintiffs and the other Group members, and to perform any other acts in regard to the Site as authorized by this Court.

4. On filing a receiver's bond, to be posted by personal or business check, in the amount of $100 conditioned as provided by law and approved by this Court, together with the oath prescribed by law, Receiver is authorized, subject to control of this Court, to do any and all of the above acts necessary to the proper and lawful conduct of the receivership.

5. Pursuant to TEXAS RULE OF CIVIL PROCEDURE 695a, Plaintiffs shall file a bond in the amount of $100 conditioned as provided by law, in case it should be decided that Receiver was wrongfully appointed to take charge of the Site.

6. To ensure the orderly operation of the receivership and maximize the value of the assets, Receiver shall be compensated as follows:

> Receiver, her employees and retained professionals shall prepare periodic statements of services rendered and time expended during the course of the receivership. Those periodic statements shall be sent to Plaintiffs in care of de maximis, inc., 2203 Timberloch Place, Suite 213, The Woodlands, Texas 77380.

7. In order to promote judicial efficiency, all persons who receive actual or constructive notice of this Order are enjoined in any way from disturbing the receivership assets or from prosecuting any new proceedings (including collection or enforcement proceedings) that involve Receiver, the receivership assets or the Site (including any proceeding initiated pursuant to the United States Bankruptcy Code) unless such person or persons first obtains the permission of this Court.

IT IS FURTHER ORDERED that all persons, firms and corporations are hereby enjoined from proceeding to levy upon or from otherwise interfering with Receiver's exclusive possession of the Site until final judgment of this Court.

IT IS FURTHER ORDERED that no lien, claim or other security interest in any property affected by this receivership will in any manner be affected by this Order. Any party's failure to oppose the appointment of Receiver, any party's consent to the appointment or any party's procurement of the appointment will not constitute waiver of any lien, claim or right.

IT IS FURTHER ORDERED that any person or any agent of any person with actual notice of this Order shall not interfere with any property in the control of Receiver or subject to this Order, nor interfere with Receiver in the carrying out of any duty under this Order.

IT IS FURTHER ORDERED that all third parties (including but not limited to financial institutions) in possession of assets subject to this Order are hereby

ordered to turn over such assets to Receiver within five (5) business days of receipt of a copy of this Order.

IT IS FURTHER ORDERED that this receivership will continue in effect until further order of this Court.

Signed this 23rd day of September, 2013.

JUDGE PRESIDING

CAUSE NO. 2013-CI-13622

BAE SYSTEMS RESOLUTION INC., BRIDGESTONE AMERICAS TIRE OPERATIONS, LLC, PERKIN ELMER AUTOMOTIVE RESEARCH, INC., FLINT GROUP INCORPORATED, and STRUCTURAL METALS, INC. Plaintiffs,	§	IN THE DISTRICT COURT OF
	§	BEXAR COUNTY, TEXAS
v.	§	
PARTNERS TERMINAL CO., INC., a dissolved corporation, T.C. GOLDEN, INC., a dissolved corporation, and TROPICANA ENERGY COMPANY, INC. Defendants	§	131st JUDICIAL DISTRICT

ORDER CLARIFYING DEFINITION OF THE "SITE"
SUBJECT TO RECEIVERSHIP

The Court, having considered Plaintiffs' unopposed motion to clarify the definition of "Site" subject to the receivership, GRANTS the motion. It is therefore ORDERED that the definition of "Site" as used in the Court's September 23, 2013 order is amended to include the property identified by the bold line in the survey attached to this order as Exhibit A, and the legal descriptions of the tracts attached to this order as Exhibit B, Exhibit C, and Exhibit D.

Date: March 21, 2014 Presiding Judge: _____

EXHIBIT A

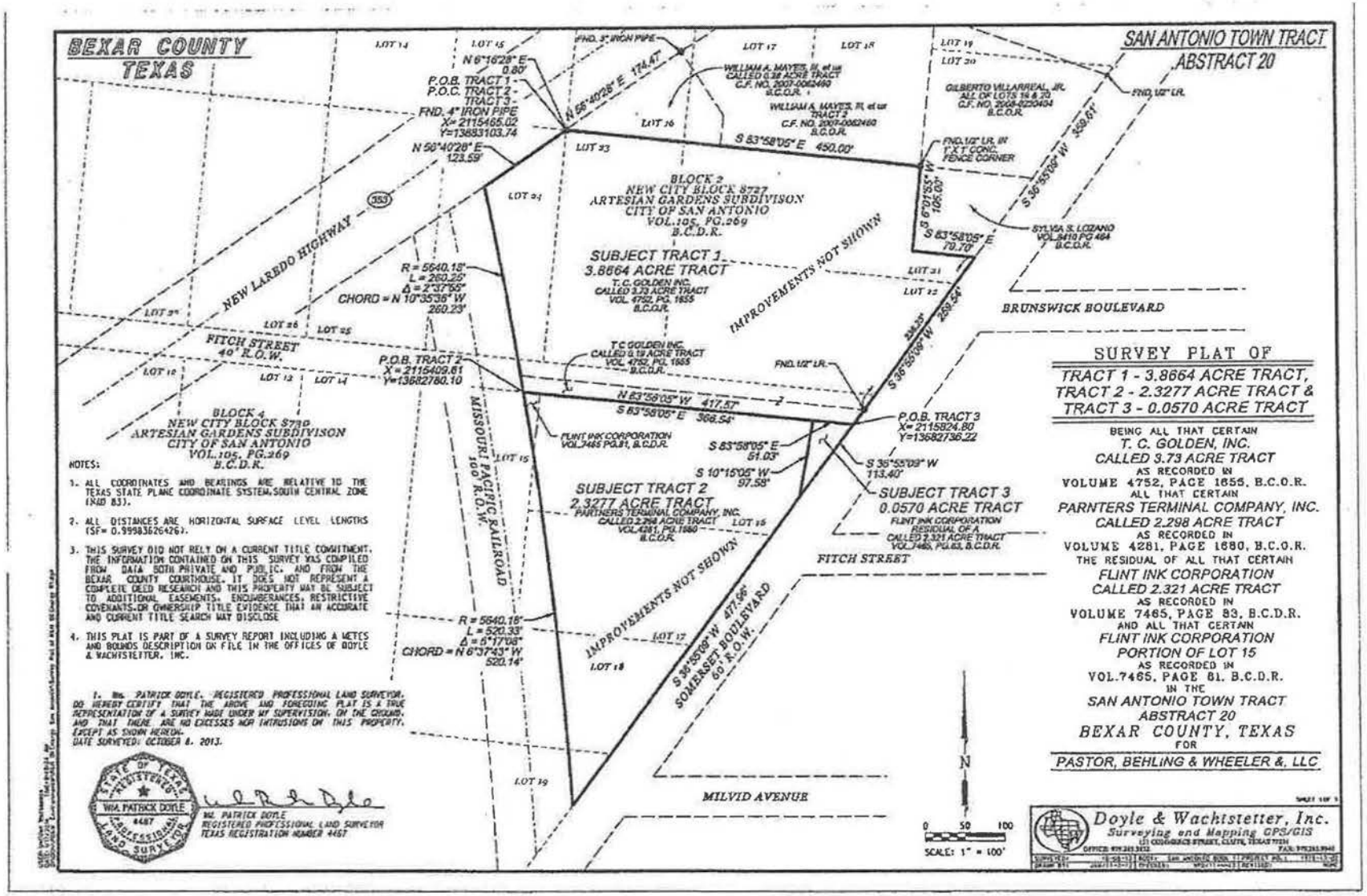

BEXAR COUNTY
TEXAS
SAN ANTONIO TOWN TRACT
ABSTRACT 20
P.O.B. TRACT 1 -
P.O.C. TRACT 2 -
TRACT 3 -
FND. 4" IRON PIPE
X= 2115465.02
Y=13883103.74
N 6°16'28" E
0.80'
N 56°40'28" E 174.47'
N 56°40'28" E
123.59'
FND. 3" IRON PIPE
WILLIAM A. MAYES, III, et ux
CALLED 0.38 ACRE TRACT
C.F. NO. 2007-0062460
O.C.O.R.
WILLIAM A. MAYES, III, et ux
TRACT 2
C.F. NO. 2007-0062460
O.C.O.R.
S 83°58'05" E 450.00'
GILBERTO VILLARREAL, JR.
ALL OF LOTS 14 & 20
C.F. NO. 2008-0220404
O.C.O.R.
FND. 1/2" I.R.
FND. 1/2" I.R. IN
Y.K.T. CONC.
FENCE CORNER
S 6°01'55" W
105.00'
S 36°55'09" W 258.01'
S 83°58'05" E
70.70'
STS VGA S. LOZANO
VOL. 8418 PG 484
O.C.O.R.
BLOCK 2
NEW CITY BLOCK 8727
ARTESIAN GARDENS SUBDIVISON
CITY OF SAN ANTONIO
VOL. 105, PG. 269
B.C.D.R.
SUBJECT TRACT 1
3.8664 ACRE TRACT
T.C. GOLDEN INC.
CALLED 3.73 ACRE TRACT
VOL. 4752, PG. 1655
B.C.O.R.
IMPROVEMENTS NOT SHOWN
NEW LAREDO HIGHWAY
(359)
R = 5640.18'
L = 260.25'
Δ = 2°37'55"
CHORD = N 10°35'36" W
260.23'
FITCH STREET
40' R.O.W.
BRUNSWICK BOULEVARD
P.O.B. TRACT 2
X = 2115409.61
Y=13882780.10
T.C. GOLDEN INC.
CALLED 0.19 ACRE TRACT
VOL. 4752, PG. 1655
B.C.O.R.
FND. 1/2" I.R.
S 36°55'09" W 269.54'
N 83°58'05" W 417.57'
S 83°58'05" E 366.54'
FLINT INK CORPORATION
VOL. 7465 PG. 81, B.C.D.R.
P.O.B. TRACT 3
X= 2115824.80
Y=13882736.22
S 83°58'05" E
61.03'
S 10°15'05" W
97.58'
S 36°55'09" W
113.40'
BLOCK 4
NEW CITY BLOCK 8730
ARTESIAN GARDENS SUBDIVISON
CITY OF SAN ANTONIO
VOL. 105, PG. 269
B.C.D.R.
MISSOURI PACIFIC RAILROAD
100' R.O.W.
SUBJECT TRACT 2
2.3277 ACRE TRACT
PARTNERS TERMINAL COMPANY, INC.
CALLED 2.298 ACRE TRACT
VOL. 4281, PG. 1680
B.C.O.R.
SUBJECT TRACT 3
0.0570 ACRE TRACT
FLINT INK CORPORATION
RESIDUAL OF A
CALLED 2.321 ACRE TRACT
VOL. 7465, PG. 83, B.C.D.R.
FITCH STREET
IMPROVEMENTS NOT SHOWN
R = 5640.18'
L = 520.33'
Δ = 5°17'08"
CHORD = N 6°37'43" W
520.14'
S 36°55'09" W 477.96'
SOMERSET BOULEVARD
60' R.O.W.
MILVID AVENUE
N
0 50 100
SCALE: 1" = 100'
SURVEY PLAT OF
TRACT 1 - 3.8664 ACRE TRACT,
TRACT 2 - 2.3277 ACRE TRACT &
TRACT 3 - 0.0570 ACRE TRACT
BEING ALL THAT CERTAIN
T. C. GOLDEN, INC.
CALLED 3.73 ACRE TRACT
AS RECORDED IN
VOLUME 4752, PAGE 1655, B.C.O.R.
ALL THAT CERTAIN
PARNTERS TERMINAL COMPANY, INC.
CALLED 2.298 ACRE TRACT
AS RECORDED IN
VOLUME 4281, PAGE 1680, B.C.O.R.
THE RESIDUAL OF ALL THAT CERTAIN
FLINT INK CORPORATION
CALLED 2.321 ACRE TRACT
AS RECORDED IN
VOLUME 7465, PAGE 83, B.C.D.R.
AND ALL THAT CERTAIN
FLINT INK CORPORATION
PORTION OF LOT 15
AS RECORDED IN
VOL. 7465, PAGE 81, B.C.D.R.
IN THE
SAN ANTONIO TOWN TRACT
ABSTRACT 20
BEXAR COUNTY, TEXAS
FOR
PASTOR, BEHLING & WHEELER &, LLC
NOTES:
1. ALL COORDINATES AND BEARINGS ARE RELATIVE TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).
2. ALL DISTANCES ARE HORIZONTAL SURFACE LEVEL LENGTHS (SF= 0.999836426).
3. THIS SURVEY DID NOT RELY ON A CURRENT TITLE COMMITMENT. THE INFORMATION CONTAINED ON THIS SURVEY WAS COMPILED FROM DATA BOTH PRIVATE AND PUBLIC AND FROM THE BEXAR COUNTY COURTHOUSE. IT DOES NOT REPRESENT A COMPLETE DEED RESEARCH AND THIS PROPERTY MAY BE SUBJECT TO ADDITIONAL EASEMENTS, ENCUMBERANCES, RESTRICTIVE COVENANTS OR OWNERSHIP TITLE EVIDENCE THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE
4. THIS PLAT IS PART OF A SURVEY REPORT INCLUDING A METES AND BOUNDS DESCRIPTION ON FILE IN THE OFFICES OF DOYLE & WACHTSTETTER, INC.
I, Wm. PATRICK DOYLE, REGISTERED PROFESSIONAL LAND SURVEYOR, DO HEREBY CERTIFY THAT THE ABOVE AND FOREGOING PLAT IS A TRUE REPRESENTATION OF A SURVEY MADE UNDER MY SUPERVISION, ON THE GROUND, AND THAT THERE ARE NO EXCESSES NOR INTRUSIONS ON THIS PROPERTY, EXCEPT AS SHOWN HEREON.
DATE SURVEYED: OCTOBER 8, 2013.
STATE OF TEXAS
REGISTERED
WM. PATRICK DOYLE
4467
PROFESSIONAL
LAND SURVEYOR
Wm. PATRICK DOYLE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NUMBER 4467
Doyle & Wachtstetter, Inc.
Surveying and Mapping GPS/GIS

EXHIBIT B

Doyle & Wachtstetter, Inc
Surveying and Mapping • GPS/GIS

ENVIRONMENTAL RESTRICTED 3.8664 ACRE TRACT
ARTESIAN GARDENS SUBDIVISION
SAN ANTONIO TOWN TRACT, ABSTRACT 20
BEXAR COUNTY, TEXAS
PAGE 1 OF 3

ALL THAT CERTAIN 3.8664 ACRE tract of land lying in and situated in the San Antonio Town Tract, Abstract 20, Bexar County, Texas, being all that certain called 3.73 acre tract of land and all that certain called 0.19 acre tract of land conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc., as recorded in Volume 4752, Page 1655 of the Bexar County Official Records (B.C.O.R.), being all of Lot 22 and Lot 23 and a portion of Lot 21 and Lot 24, Block 2, New City Block 8727, and the North ½ of abandoned 40 foot wide Fitch Street of Artesian Gardens Subdivision, according to the map or plat thereof recorded in Volume 105, Page 269 of the Bexar County Deed Records (B.C.D.R.), the herein described 3.8664 acre tract of land being more particularly described by metes and bounds, using survey terminology which refers to the Texas State Plane Coordinate System, South Central Zone (NAD83), in which the directions are Lambert grid bearings and the distances are surface level horizontal lengths (S.F.= 0.99983626426) as follows:

BEGINNING at a 4" iron pipe found marking the northwest corner of said Lot 23, the southwest corner of Lot 16, Block 2, New City Block 8727, of Artesian Gardens Subdivision, same being the southwest corner of all that certain called 0.28 acre tract of land conveyed by deed recorded on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., located on the southeastern right-of-way boundary line of New Laredo Highway, Loop 353, for the northwest corner of said T. C. Golden, Inc. called 3.73 acre tract and the herein described 3.8664 acre tract, said Point of Beginning being located at Texas State Plane Coordinate position X=2115465.02 and Y=13683103.74;

THENCE South 83°58'05" East, coincident with the southern boundary line of Lots 16, 17 and 18, the northern boundary line of Lots 21 and 23, Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southern boundary line of said William A. Mayes III, et ux, called 0.28 acre tract, the southern boundary line of that certain Tract 2, conveyed by deed recorded on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., the northern boundary line of said T. C. Golden, Inc. called 3.73 acre tract, a distance of 450.00 feet to a ½" iron rod found marking the southeast corner of said Lot 18, the southeast corner of said William A. Mayes, III, et ux Tract 2, the southwest corner of Lot 20 of said Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southwest corner of all that certain tract of land conveyed by deed recorded on October 23, 2008 from Alfred Castellano to Gilberto Villarreal, Jr., as recorded in Clerk's File No. 2008-0230404 of the B.C.O.R., the northwest corner of the certain tract of land conveyed by deed recorded on May 16, 2000 from Leticia S. Lozano to Sylvia S. Lozano, as recorded in Volume 8410, Page 464 of the B.C.O.R., same being the northeast corner of said T. C. Golden, Inc. called 3.73 acre tract, for the northeast corner of the herein described 3.8664 acre tract, at position X=2115912.46 and Y=13683056.46;

THENCE South 6°01'55" West, coincident with the western boundary line of said Sylvia S. Lozano tract, a distance of 105.00 feet to a point for the southwest corner of said Sylvia s. Lozano tract, for an angle corner of the herein described 3.8664 acre tract, at position X=2115901.43 and Y=13682952.05;

THENCE South 83°58'05" East, coincident with the southern boundary line of said Sylvia S. Lozano tract, a distance of 79.70 feet to a point for the southeast corner of said Sylvia S. Lozano tract, located on the northwestern right-of-way boundary line of 60 foot wide Somerset Boulevard, for the northeast corner of the herein described 3.8664 acre tract, at position X=2115980.68 and Y=13682943.68;

THENCE South 36°55'09" West, coincident with the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard, at a distance of 236.23 feet pass a ½" iron rod found marking the southeast corner of said T. C. Golden, Inc. called 3.73 acre tract, same being the northeast corner of said T. C. Golden, Inc. called 0.19 acre tract, located on the centerline of abandoned 40 foot wide Fitch Street, continuing a total distance of 259.54 feet to a point for the northeast corner of the residual of all that certain called 2.321 acre tract of land conveyed by deed recorded on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the B.C.D.R., the southeast corner of said T. C. Golden, Inc. called 3.73 acre tract, same being the northeast corner of Lot 16, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, for the southeast corner of the herein described 3.8664 acre tract, at position X=2115824.80 and Y=13682736.22;

THENCE North 83°58'05" West, coincident with the northern boundary line of said Flint Ink Corporation, residual of that certain called 2.231 acre tract, the northern boundary line of all that certain called 2.298 acre tract of land conveyed by deed recorded on March 11, 1988 from Southern State Bank to Tropicana Energy Company, Inc., as recorded in Volume 4255, Page 381 of the B.C.O.R., the northern boundary line of that certain tract of land, being a portion of Lot 15, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, conveyed by deed recorded on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 81 of the B.C.D.R., same being the southern right-of-way boundary line of said 40 foot wide Fitch Street, the northern boundary line of Lots 15 and 16, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, a distance of 417.57 feet to a point for the northwest corner of said Flint Ink Corporation, residual tract, the southwest corner of said T. C. Golden called 0.19 acre tract, located on the eastern right-of-way boundary line of 100 foot wide Missouri Pacific Railroad right-of-way, on a curve to the left, having a radius of 5640.18 feet, for the southwest corner of the herein described 3.8664 acre tract, at position X=2115409.61 and Y=13682780.10;

THENCE in a northerly direction, coincident with the eastern boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way and said curve to the left having a central angle of 2°37'55", a radius of 5640.18 feet, an arc length of 260.25 feet, a chord bearing North 10°35'36" West and a distance of 260.23 feet to a point at the intersection of the eastern right-of-way boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way with the southeastern right-of-way boundary line of said New Laredo Highway, Loop 353, for the northwest corner of said T. C. Golden called 3.73 acre tract, same being the northwest corner of the herein described 3.8664 acre tract, at position X=2115361.78 and Y=13683035.85;

THENCE North 56°40'28" East, coincident with the southeastern right-of-way boundary line of said New Laredo Highway, Loop 353, a distance of 123.59 feet to the **POINT OF BEGINNING,** containing 3.8664 acres of land, more or less.

Wm. Patrick Doyle
Registered Professional Land Surveyor
Texas Registration Number 4467
November 4, 2013

This description is based on a survey, a plat of which, November 4, 2013 is on file in the office of Doyle & Wachtstetter, Inc.
Legal\pat\Pastor Behling & Wheeler\ PBW - R&H Oil Energy - 3.8664 acre tract.doc

EXHIBIT C

Doyle & Wachtstetter, Inc
Surveying and Mapping • GPS/GIS

ENVIRONMENTAL RESTRICTED 2.3277 ACRE TRACT
ARTESIAN GARDENS SUBDIVISION
SAN ANTONIO TOWN TRACT, ABSTRACT 20
BEXAR COUNTY, TEXAS
PAGE 1 OF 2

ALL THAT CERTAIN 2.3277 ACRE tract of land lying in and situated in the San Antonio Town Tract, Abstract 20, Bexar County, Texas, being all that certain called 2.298 acre tract of land conveyed by deed recorded on April 18, 1988 from Tropicana Energy Company, Inc. to Partners Terminal Company, Inc., as recorded in Volume 4281, Page 1680 of the Bexar County Official Records (B.C.O.R.), being a portion of Lot 15, 16, 17, 18 and 19, Block 4, New City Block 8730, of Artesian Gardens Subdivision,, according to the map or plat thereof recorded in Volume 105, Page 269 of the Bexar County Deed Records (B.C.D.R.), the herein described 2.3277 acre tract of land being more particularly described by metes and bounds, using survey terminology which refers to the Texas State Plane Coordinate System, South Central Zone (NAD83), in which the directions are Lambert grid bearings and the distances are surface level horizontal lengths (S.F.= 0.99983626426) as follows:

COMMENCING at a 4" iron pipe found marking the northwest corner of said Lot 23, the southwest corner of Lot 16, Block 2, New City Block 8727, of Artesian Gardens Subdivision, same being the southwest corner of all that certain called 0.28 acre tract of land conveyed by deed recorded on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., the northwest corner of all that certain called 3.73 acre tract conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc. as recorded in Volume 4752, Page 1655 of the B.C.O.R., located on the southeastern right-of-way boundary line of New Laredo Highway, Loop 353, said Point of Commencement being located at Texas State Plane Coordinate position X=2115465.02 and Y=13683103.74;

THENCE South 56°40'28" West, coincident with the southeastern right-of-way line boundary of said New Laredo Highway, Loop 353, a distance of 123.59 feet to a point for corner, located at the intersection of the southeastern right-of-way boundary line of said New Laredo Highway, Loop 353 with the eastern right-of-way boundary line of 100 foot wide Southern Pacific Railroad right-of-way, on a curve to the right having a radius of 5640.18 feet, at position X=2115361.78 and Y=13683035.85;

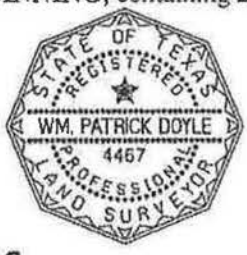
THENCE in a southerly direction, coincident with the eastern boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way, along said curve to the right having a central angle of 2°37'55", a radius of 5640.18 feet, an arc length of 260.25 feet, a chord bearing South 10°35'36" East and a distance of 260.23 feet to a point for the southwest corner of all that certain called 0.19 acre tract conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc. as recorded in Volume 4752, Page 1655 of the B.C.O.R., same being the northwest corner of said Flint Ink Corporation portion of Lot 15, located on the southern right-of-way boundary line of abandoned 40 foot wide Fitch Street, the northern boundary line of said Lot 15, Block 4, New City Block 8730, of Artesian Gardens Subdivision, for the **POINT OF BEGINNING** and the northwest corner of the herein described 2.3277 acre tract, at position X=2115409.61 and Y=13682780.10;

THENCE South 83°58'05" West, coincident with the southern boundary line of said T. C. Golden, Inc. called 0.19 acre tract, the southern right-of-way boundary line of abandoned 40 foot wide Fitch Street, same being the northern boundary line of said Flint Ink Corporation portion of Lot 15, the northern boundary line of said Partners Terminal Company, Inc., called 2.298 acre tract and the northern boundary line of said Lot 15 and 16, Block 4, New City Block 8730, of Artesian Gardens Subdivision, a distance of 366.54 feet to a point for the northwest corner of the residual of all that certain called 2.321 acre tract of land conveyed by deed on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the B.C.D.R., for the northeast corner of the herein described 2.3277 acre tract, at position X=2115774.06 and Y=13682741.58;

THENCE South 10°15'05" West, coincident with western boundary line of the said Flint Ink Corporation residual of a called 2.321 acre tract, a distance of 97.58 feet to a point for the south corner of said Flint Ink Corporation residual of a called 2.321 acre tract, located on the northwestern right-of-way boundary line of 60 foot wide Somerset Boulevard, for an angle corner of the herein described 2.3277 acre tract, at position X=2115756.70 and Y=13682645.58;

THENCE South 36°55'09" West, coincident with the northwest right-of-way of said 60 foot wide Somerset Boulevard, a distance of 477.96 feet to a point for corner, located at the intersection of the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard with the eastern right-of-way boundary line of said 100 foot wide Southern Pacific Railroad right-of-way, located on the curve to the left, having a radius of 5640.18 feet, for the South corner of the herein described 2.3277 acre tract, at position X=2115469.64 and Y=13682263.52;

THENCE in a northerly direction, coincident with the eastern boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way and said curve to the left having a central angle of 5°17'08", a radius of 5640.18 feet, an arc length of 520.33 feet, a chord bearing North 6°37'43" West and a distance of 520.14 feet to the **POINT OF BEGINNING**, containing 2.3277 acres of land, more or less.



Wm. Patrick Doyle
Registered Professional Land Surveyor
Texas Registration Number 4467
November 4, 2013
Revised: January 16, 2014

This description is based on a survey, a plat of which, November 4, 2013 is on file in the office of Doyle & Wachtstetter, Inc.
Legal\pat\Pastor Behling & Wheeler\PBW - R & H Oil Energy - 2.3664 acre tract R1.doc

EXHIBIT D

Doyle & Wachtstetter, Inc
Surveying and Mapping • GPS/GIS

ENVIRONMENTAL RESTRICTED 0.0570 ACRE TRACT
ARTESIAN GARDENS SUBDIVISION
SAN ANTONIO TOWN TRACT, ABSTRACT 20
BEXAR COUNTY, TEXAS
PAGE 1 OF 3

ALL THAT CERTAIN 0.0570 ACRE tract of land lying in and situated in the San Antonio Town Tract, Abstract 20, Bexar County, Texas, being the residual of all that certain called 2.321 acre tract of land conveyed by deed recorded on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the Bexar County Deed Records (B.C.D.R.), being a portion of Lot 16 Block 4, New City Block 8730, of Artesian Gardens Subdivision, according to the map or plat thereof recorded in Volume 105, Page 269 of the B.C.D.R., the herein described 0.0570 acre tract of land being more particularly described by metes and bounds, using survey terminology which refers to the Texas State Plane Coordinate System, South Central Zone (NAD83), in which the directions are Lambert grid bearings and the distances are surface level horizontal lengths (S.F.= 0.99983626426) as follows:

COMMENCING at a 4" iron pipe found marking the northwest corner of said Lot 23, the southwest corner of Lot 16, Block 2, New City Block 8727, of Artesian Gardens Subdivision, same being the southwest corner of all that certain called 0.28 acre tract of land conveyed by deed on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., for the northwest corner of all that certain called 3.73 acre tract conveyed by deed on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc., as recorded in Volume 4752, Page 1655 of the Bexar County Official Records, (B.C.O.R.), located on the southeastern right-of-way boundary line of New Laredo Highway, Loop 353, said Point of Commencement being located at Texas State Plane Coordinate position X=2115465.02 and Y=13683103.74;

THENCE South 83°58'05" East, coincident with the southern boundary line of Lots 16, 17 and 18, the northern boundary line of Lots 21 and 23, Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southern boundary line of said William A. Mayes III, et ux, called 0.28 acre tract, the southern boundary line of that certain Tract 2, conveyed by deed on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., the northern boundary line of said T. C. Golden, Inc. called 3.73 acre tract, a distance of 450.00 feet to a ½" iron rod found marking the southeast corner of said Lot 18, the southeast corner of said William A. Mayes, III, et ux Tract 2, the southwest corner of Lot 20 of said Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southwest corner of that certain tract of land conveyed by deed on October 23, 2008 from Alfred Castellano to Gilberto Villarreal, Jr., as recorded in Clerk's File No. 2008-0230404 of the B.C.O.R., the northwest corner of all that certain tract of land conveyed by deed on May 16, 2000 from Leticia S. Lozano to Sylvia S. Lozano, as recorded in Volume 8410, Page 464 of the B.C.O.R., same being the northeast corner of said T. C. Golden, Inc. called 3.73 acre tract, at position X=2115912.46 and Y=13683056.46;

THENCE South 6°01'55" West, coincident with the western boundary line of said Sylvia S. Lozano tract, a distance of 105.00 feet to a point for the southwest corner of said Sylvia s. Lozano tract, at position X=2115901.43 and Y=13682952.05;

THENCE South 83°58'05" East, coincident with the southern boundary line of said Sylvia S. Lozano tract, a distance of 79.70 feet to point for the southeast corner of said Sylvia S. Lozano tract, located on the northwestern right-of-way boundary line of 60 foot wide Somerset Boulevard, for the northeast corner of the herein described 3.8664 acre tract, at position X=2115980.68 and Y=13682943.68;

THENCE South 36°55'09" West, coincident with the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard, at a distance of 236.23 feet pass a ½" iron rod found marking the southeast corner of said T. C. Golden, Inc. called 3.73 acre tract, same being the northeast corner of all that certain called 0.19 acre tract of land conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc., as recorded in Volume 4752, Page 1655 B.C.D.R., located on the centerline of abandoned 40 foot wide Fitch Street, continuing a total distance of 259.54 feet to the **POINT OF BEGINNING**, for the northeast corner of the residual of all that certain called 2.321 acre tract of land conveyed by deed on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the B.C.D.R., the southeast corner of said T. C. Golden, Inc. called 0.19 acre tract, same being the northeast corner of Lot 16, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, for the northeast corner of the herein described 0.0570 acre tract, at position X=2115824.80 and Y=13682736.22;

THENCE South 36°55'09" West, coincident with the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard, a distance of 113.40 feet to a point for an angle corner of all that certain called 2.298 acre tract conveyed by deed recorded on March 11, 1988 from Southern State Bank to Tropicana Energy Company, Inc., as recorded in Volume 4255, Page 381 of the B.C.O.R., for the South corner of the herein described 0.0570 acre tract, at position X=2115756.70 and Y=13682645.58;

THENCE North 10°15'05" East, coincident with the eastern boundary line of said Tropicana Energy Company called 2.298 acre tract, a distance of 97.58 feet to a point for the northeast corner of said Tropicana Energy Company called 2.298 acre tract, located in northern boundary line of said Lot 16, Block 4, New City Block 8730, of Artesian Gardens Subdivision, same being the southern right-of-way boundary line of abandoned 40 foot wide Fitch Street, the southern boundary line of T. C. Golden, Inc. called 0.19 acre tract, for the northwest corner of the herein described 0.0570 acre tract, at position X=2115774.06 and Y=13682741.58;

RECORDER'S MEMORANDUM
AT THE TIME OF RECORDATION, THIS INSTRUMENT WAS FOUND TO BE INADEQUATE FOR THE BEST PHOTOGRAPHIC REPRODUCTION BECAUSE OF ILLEGIBILITY, CARBON OR PHOTO COPY, DISCOLORED PAPER ETC.

ENVIRONMENTAL RESTRICTED 0.0570 ACRE TRACT
ARTESIAN GARDENS SUBDIVISION
SAN ANTONIO TOWN TRACT, ABSTRACT 20
BEXAR COUNTY, TEXAS

THENCE South 83°58'05" East, coincident with the northern boundary line of said Lot 16, Block 4, New City Block 8730, of Artesian Gardens Subdivision, the southern right-of-way boundary line of said abandoned 40 foot wide Fitch Street, the southern boundary line of said T. C. Golden called 0.19 acre tract, a distance of 51.03 feet to the **POINT OF BEGINNING**, containing 0.0570 acre of land, more or less.

Wm. Patrick Doyle
Registered Professional Land Surveyor
Texas Registration Number 4467
November 4, 2013

This description is based on a survey, a plat of which, November 4, 2013 is on file in the office of Doyle & Wachtstetter, Inc.
Legal\pat\Pastor Behling & Wheeler\ PBW - R&H Oil Energy – 0.0570 acre tract.doc

Any provision herein which restricts the sale, or use of the described real property because of race is invalid and unenforceable under Federal law
STATE OF TEXAS, COUNTY OF BEXAR
I hereby Certify that this Instrument was FILED in File Number Sequence on this date and at the time stamped hereon by me and was duly RECORDED in the Official Public Record of Real Property of Bexar County, Texas on:

JUN 0 6 2014

COUNTY CLERK BEXAR COUNTY, TEXAS

Doc# 20140094347 Fees: $162.00
06/06/2014 1:47PM # Pages 35
Filed & Recorded in the Official
Public Records of BEXAR COUNTY
GERARD C. RICKHOFF COUNTY CLERK

APPENDIX C-2

RESTRICTIVE COVENANTS

PI2-20140094347-35

RESTRICTIVE COVENANT FOR LIMITATION ON USES, CONSTRUCTION AND GROUNDWATER USE

STATE OF TEXAS §
COUNTY OF BEXAR §

This Restrictive Covenant is filed to provide information concerning certain use limitations upon that parcel of real property (the "Property") described in Exhibits A, B and C, attached hereto and incorporated herein by reference.

Certain portions of the Property previously contained oil refining operations and oil recycling operations which were removed during removal actions performed by the United States Environmental Protection Agency ("EPA") in 2001. An environmental investigation is currently being performed on portions of the Property under the direction of EPA and Texas Commission on Environmental Quality ("TCEQ"). The appropriate land use for the Property is commercial/industrial.

On September 23, 2013, and by Order Clarifying Definition Of The "Site" Subject To Receivership issued on March 21, 2014, the 131st District Court in Bexar County, Texas appointed Eva S. Engelhart as Receiver over the Property described in Exhibits A, B and C. The Orders of the Court are attached in Exhibit C and are incorporated herein by reference. In her capacity as Receiver, Eva S. Engelhart has the authority to place, and has agreed to place, the following restrictions on the Property in favor of BAE Systems Resolution, Inc. (f/k/a Santana Resolution Corporation; f/k/a Stewart and Stephenson, Inc.); Bridgestone Americas Tire Operations, LLC (f/k/a Bridgestone Firestone, Inc.); Department of State Health Services ("DSHS") on behalf of San Antonio State Chest Hospital n/k/a Texas Center for Infectious Disease; PerkinElmer Automotive Research, Inc. (f/k/a EG&G Automotive Research, Inc.); Exxon Mobil Corporation; Flint Group Incorporated (f/k/a Flint Ink Corporation); Structural Metals, Inc. (collectively herein, "Respondents"); and the TCEQ, the State of Texas, and EPA.

NOW THEREFORE, in consideration of the premises, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the following restrictive covenants in favor of the Respondents, TCEQ, the State of Texas, and EPA are placed on the Property, to-wit:

1. Commercial/Industrial Use

   The Property shall not be used for any purposes other than commercial/industrial uses, as that term is defined under 30 Texas Administrative Code §350.4(a)(13), and thus shall not be used for human habitation or for other purposes with a similar potential for human exposure. Portions of the soils and/or groundwater of the Property contain certain identified chemicals of concern. Future users of the Property are advised to review and take into consideration environmental data from publicly available sources (i.e., TCEQ and EPA) prior to utilizing the Property for any purpose.

2. Groundwater

The groundwater underlying the Property shall not be used for any beneficial purpose, including: (1) drinking water or other potable uses; (2) the irrigation or watering of landscapes or (3) agricultural uses. For any activities that may result in potential exposure to the groundwater, a plan must be in place to address and ensure the appropriate handling, treatment and disposal of any affected soils or groundwater.

3. Construction

Additional response actions, such as measures to protect against indoor vapor intrusion, may be necessary before construction of a building on the Property. If any person desires to construct a building on the Property, that person must first notify EPA and TCEQ of the planned construction and submit and obtain EPA and TCEQ approval of a plan for protection against the potential for indoor vapor intrusion. The agencies may require other measures during construction to assure protection from any other conditions remaining on the Property. The costs for any additional response actions will be borne by the person(s) desiring to construct upon the Property.

4. These restrictions shall be a covenant running with the land.

For additional information, contact:

U.S. Environmental Protection Agency, Region 6
Superfund Division (6RC-S)
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
ATTN: Assistant Regional Counsel

TCEQ
Central Records
12100 Park 35 Circle, Building E
Austin, TX 78753

Mail: TCEQ
Remediation Division/Superfund
P.O. Box 13087
Austin, TX 78711-3087

State of Texas
Office of the Texas Attorney General
Natural Resources Division
300 W. 15th Street
Austin, TX 78701

Eva S. Engelhart
Receiver for the R&H Oil/Tropicana Energy Site
Ross, Banks, May, Cron & Cavin, P.C.
2 Riverway, Suite 700
Houston, Texas 77056

The restrictions imposed by this Restrictive Covenant may be rendered of no further force or

effect only by a release executed by the Respondents, TCEQ, the State of Texas, and EPA or their successors and filed in the same Real Property Records as those in which this Restrictive Covenant is filed.

EXECUTED this 2ND day of June, 2014.

Eva S. Engelhart
Receiver for the R&H Oil/Tropicana Energy Site

By: _____

Name: Eva S. Engelhart
Title: Receiver

STATE OF TEXAS §
§
COUNTY OF HARRIS §

BEFORE ME, on this the 2nd day of June, personally appeared Eva S. Engelhart, Receiver for the R&H Oil/Tropicana Energy Site, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that she executed the same for the purposes and consideration and in the capacity herein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this 2nd day of June, 20___.

CHRISTINE ESCAMILLA
My Commission Expires
October 31, 2017

C Christine Escamilla
Notary Public in and for the State of Texas

My Commission Expires: 10-31-17

EXHIBIT "A"

LEGAL DESCRIPTION OF THE PROPERTY

EXHIBIT
A

Doyle & Wachtstetter, Inc
Surveying and Mapping • GPS/GIS

ENVIRONMENTAL RESTRICTED 3.8664 ACRE TRACT
ARTESIAN GARDENS SUBDIVISION
SAN ANTONIO TOWN TRACT, ABSTRACT 20
BEXAR COUNTY, TEXAS
PAGE 1 OF 3

ALL THAT CERTAIN 3.8664 ACRE tract of land lying in and situated in the San Antonio Town Tract, Abstract 20, Bexar County, Texas, being all that certain called 3.73 acre tract of land and all that certain called 0.19 acre tract of land conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc., as recorded in Volume 4752, Page 1655 of the Bexar County Official Records (B.C.O.R.), being all of Lot 22 and Lot 23 and a portion of Lot 21 and Lot 24, Block 2, New City Block 8727, and the North ½ of abandoned 40 foot wide Fitch Street of Artesian Gardens Subdivision, according to the map or plat thereof recorded in Volume 105, Page 269 of the Bexar County Deed Records (B.C.D.R.), the herein described 3.8664 acre tract of land being more particularly described by metes and bounds, using survey terminology which refers to the Texas State Plane Coordinate System, South Central Zone (NAD83), in which the directions are Lambert grid bearings and the distances are surface level horizontal lengths (S.F.= 0.99983626426) as follows:

BEGINNING at a 4" iron pipe found marking the northwest corner of said Lot 23, the southwest corner of Lot 16, Block 2, New City Block 8727, of Artesian Gardens Subdivision, same being the southwest corner of all that certain called 0.28 acre tract of land conveyed by deed recorded on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., located on the southeastern right-of-way boundary line of New Laredo Highway, Loop 353, for the northwest corner of said T. C. Golden, Inc. called 3.73 acre tract and the herein described 3.8664 acre tract, said Point of Beginning being located at Texas State Plane Coordinate position X=2115465.02 and Y=13683103.74;

THENCE South 83°58'05" East, coincident with the southern boundary line of Lots 16, 17 and 18, the northern boundary line of Lots 21 and 23, Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southern boundary line of said William A. Mayes III, et ux, called 0.28 acre tract, the southern boundary line of that certain Tract 2, conveyed by deed recorded on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., the northern boundary line of said T. C. Golden, Inc. called 3.73 acre tract, a distance of 450.00 feet to a ½" iron rod found marking the southeast corner of said Lot 18, the southeast corner of said William A. Mayes, III, et ux Tract 2, the southwest corner of Lot 20 of said Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southwest corner of all that certain tract of land conveyed by deed recorded on October 23, 2008 from Alfred Castellano to Gilberto Villarreal, Jr., as recorded in Clerk's File No. 2008-0230404 of the B.C.O.R., the northwest corner of the certain tract of land conveyed by deed recorded on May 16, 2000 from Leticia S. Lozano to Sylvia S. Lozano, as recorded in Volume 8410, Page 464 of the B.C.O.R., same being the northeast corner of said T. C. Golden, Inc. called 3.73 acre tract, for the northeast corner of the herein described 3.8664 acre tract, at position X=2115912.46 and Y=13683056.46;

THENCE South 6°01'55" West, coincident with the western boundary line of said Sylvia S. Lozano tract, a distance of 105.00 feet to a point for the southwest corner of said Sylvia s. Lozano tract, for an angle corner of the herein described 3.8664 acre tract, at position X=2115901.43 and Y=13682952.05;

THENCE South 83°58'05" East, coincident with the southern boundary line of said Sylvia S. Lozano tract, a distance of 79.70 feet to a point for the southeast corner of said Sylvia S. Lozano tract, located on the northwestern right-of-way boundary line of 60 foot wide Somerset Boulevard, for the northeast corner of the herein described 3.8664 acre tract, at position X=2115980.68 and Y=13682943.68;

THENCE South 36°55'09" West, coincident with the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard, at a distance of 236.23 feet pass a ½" iron rod found marking the southeast corner of said T. C. Golden, Inc. called 3.73 acre tract, same being the northeast corner of said T. C. Golden, Inc. called 0.19 acre tract, located on the centerline of abandoned 40 foot wide Fitch Street, continuing a total distance of 259.54 feet to a point for the northeast corner of the residual of all that certain called 2.321 acre tract of land conveyed by deed recorded on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the B.C.D.R., the southeast corner of said T. C. Golden, Inc. called 3.73 acre tract, same being the northeast corner of Lot 16, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, for the southeast corner of the herein described 3.8664 acre tract, at position X=2115824.80 and Y=13682736.22;

THENCE North 83°58'05" West, coincident with the northern boundary line of said Flint Ink Corporation, residual of that certain called 2.231 acre tract, the northern boundary line of all that certain called 2.298 acre tract of land conveyed by deed recorded on March 11, 1988 from Southern State Bank to Tropicana Energy Company, Inc., as recorded in Volume 4255, Page 381 of the B.C.O.R., the northern boundary line of that certain tract of land, being a portion of Lot 15, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, conveyed by deed recorded on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 81 of the B.C.D.R., same being the southern right-of-way boundary line of said 40 foot wide Fitch Street, the northern boundary line of Lots 15 and 16, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, a distance of 417.57 feet to a point for the northwest corner of said Flint Ink Corporation, residual tract, the southwest corner of said T. C. Golden called 0.19 acre tract, located on the eastern right-of-way boundary line of 100 foot wide Missouri Pacific Railroad right-of-way, on a curve to the left, having a radius of 5640.18 feet, for the southwest corner of the herein described 3.8664 acre tract, at position X=2115409.61 and Y=13682780.10;

THENCE in a northerly direction, coincident with the eastern boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way and said curve to the left having a central angle of 2°37'55", a radius of 5640.18 feet, an arc length of 260.25 feet, a chord bearing North 10°35'36" West and a distance of 260.23 feet to a point at the intersection of the eastern right-of-way boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way with the southeastern right-of-way boundary line of said New Laredo Highway, Loop 353, for the northwest corner of said T. C. Golden called 3.73 acre tract, same being the northwest corner of the herein described 3.8664 acre tract, at position X=2115361.78 and Y=13683035.85;

THENCE North 56°40'28" East, coincident with the southeastern right-of-way boundary line of said New Laredo Highway, Loop 353, a distance of 123.59 feet to the **POINT OF BEGINNING,** containing 3.8664 acres of land, more or less.

Wm. Patrick Doyle
Registered Professional Land Surveyor
Texas Registration Number 4467
November 4, 2013

This description is based on a survey, a plat of which, November 4, 2013 is on file in the office of Doyle & Wachtstetter, Inc.
Legal\pat\Pastor Behling & Wheeler\PBW - R&H Oil Energy – 3.8664 acre tract.doc

Doyle & Wachtstetter, Inc
Surveying and Mapping • GPS/GIS

ENVIRONMENTAL RESTRICTED 2.3277 ACRE TRACT
ARTESIAN GARDENS SUBDIVISION
SAN ANTONIO TOWN TRACT, ABSTRACT 20
BEXAR COUNTY, TEXAS
PAGE 1 OF 2

ALL THAT CERTAIN 2.3277 ACRE tract of land lying in and situated in the San Antonio Town Tract, Abstract 20, Bexar County, Texas, being all that certain called 2.298 acre tract of land conveyed by deed recorded on April 18, 1988 from Tropicana Energy Company, Inc. to Partners Terminal Company, Inc., as recorded in Volume 4281, Page 1680 of the Bexar County Official Records (B.C.O.R.), being a portion of Lot 15, 16, 17, 18 and 19, Block 4, New City Block 8730, of Artesian Gardens Subdivision,, according to the map or plat thereof recorded in Volume 105, Page 269 of the Bexar County Deed Records (B.C.D.R.), the herein described 2.3277 acre tract of land being more particularly described by metes and bounds, using survey terminology which refers to the Texas State Plane Coordinate System, South Central Zone (NAD83), in which the directions are Lambert grid bearings and the distances are surface level horizontal lengths (S.F.= 0.99983626426) as follows:

COMMENCING at a 4" iron pipe found marking the northwest corner of said Lot 23, the southwest corner of Lot 16, Block 2, New City Block 8727, of Artesian Gardens Subdivision, same being the southwest corner of all that certain called 0.28 acre tract of land conveyed by deed recorded on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., the northwest corner of all that certain called 3.73 acre tract conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc. as recorded in Volume 4752, Page 1655 of the B.C.O.R., located on the southeastern right-of-way boundary line of New Laredo Highway, Loop 353, said Point of Commencement being located at Texas State Plane Coordinate position X=2115465.02 and Y=13683103.74;

THENCE South 56°40'28" West, coincident with the southeastern right-of-way line boundary of said New Laredo Highway, Loop 353, a distance of 123.59 feet to a point for corner, located at the intersection of the southeastern right-of-way boundary line of said New Laredo Highway, Loop 353 with the eastern right-of-way boundary line of 100 foot wide Southern Pacific Railroad right-of-way, on a curve to the right having a radius of 5640.18 feet, at position X=2115361.78 and Y=13683035.85;

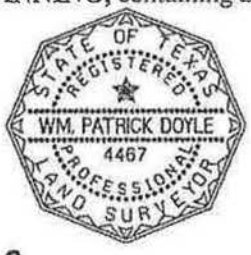
THENCE in a southerly direction, coincident with the eastern boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way, along said curve to the right having a central angle of 2°37'55", a radius of 5640.18 feet, an arc length of 260.25 feet, a chord bearing South 10°35'36" East and a distance of 260.23 feet to a point for the southwest corner of all that certain called 0.19 acre tract conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc. as recorded in Volume 4752, Page 1655 of the B.C.O.R., same being the northwest corner of said Flint Ink Corporation portion of Lot 15, located on the southern right-of-way boundary line of abandoned 40 foot wide Fitch Street, the northern boundary line of said Lot 15, Block 4, New City Block 8730, of Artesian Gardens Subdivision, for the **POINT OF BEGINNING** and the northwest corner of the herein described 2.3277 acre tract, at position X=2115409.61 and Y=13682780.10;

THENCE South 83°58'05" West, coincident with the southern boundary line of said T. C. Golden, Inc. called 0.19 acre tract, the southern right-of-way boundary line of abandoned 40 foot wide Fitch Street, same being the northern boundary line of said Flint Ink Corporation portion of Lot 15, the northern boundary line of said Partners Terminal Company, Inc., called 2.298 acre tract and the northern boundary line of said Lot 15 and 16, Block 4, New City Block 8730, of Artesian Gardens Subdivision, a distance of 366.54 feet to a point for the northwest corner of the residual of all that certain called 2.321 acre tract of land conveyed by deed on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the B.C.D.R., for the northeast corner of the herein described 2.3277 acre tract, at position X=2115774.06 and Y=13682741.58;

THENCE South 10°15'05" West, coincident with western boundary line of the said Flint Ink Corporation residual of a called 2.321 acre tract, a distance of 97.58 feet to a point for the south corner of said Flint Ink Corporation residual of a called 2.321 acre tract, located on the northwestern right-of-way boundary line of 60 foot wide Somerset Boulevard, for an angle corner of the herein described 2.3277 acre tract, at position X=2115756.70 and Y=13682645.58;

THENCE South 36°55'09" West, coincident with the northwest right-of-way of said 60 foot wide Somerset Boulevard, a distance of 477.96 feet to a point for corner, located at the intersection of the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard with the eastern right-of-way boundary line of said 100 foot wide Southern Pacific Railroad right-of-way, located on the curve to the left, having a radius of 5640.18 feet, for the South corner of the herein described 2.3277 acre tract, at position X=2115469.64 and Y=13682263.52;

THENCE in a northerly direction, coincident with the eastern boundary line of said 100 foot wide Missouri Pacific Railroad right-of-way and said curve to the left having a central angle of 5°17'08", a radius of 5640.18 feet, an arc length of 520.33 feet, a chord bearing North 6°37'43" West and a distance of 520.14 feet to the **POINT OF BEGINNING,** containing 2.3277 acres of land, more or less.



Wm. Patrick Doyle
Registered Professional Land Surveyor
Texas Registration Number 4467
November 4, 2013
Revised: January 16, 2014

This description is based on a survey, a plat of which, November 4, 2013 is on file in the office of Doyle & Wachtstetter, Inc.
Legal\pat\Pastor Behling & Wheeler\ PBW - R & H Oil Energy - 3.8664 acre tract R1 doc

Doyle & Wachtstetter, Inc
Surveying and Mapping • GPS/GIS

ENVIRONMENTAL RESTRICTED 0.0570 ACRE TRACT
ARTESIAN GARDENS SUBDIVISION
SAN ANTONIO TOWN TRACT, ABSTRACT 20
BEXAR COUNTY, TEXAS

ALL THAT CERTAIN 0.0570 ACRE tract of land lying in and situated in the San Antonio Town Tract, Abstract 20, Bexar County, Texas, being the residual of all that certain called 2.321 acre tract of land conveyed by deed recorded on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the Bexar County Deed Records (B.C.D.R.), being a portion of Lot 16 Block 4, New City Block 8730, of Artesian Gardens Subdivision, according to the map or plat thereof recorded in Volume 105, Page 269 of the B.C.D.R., the herein described 0.0570 acre tract of land being more particularly described by metes and bounds, using survey terminology which refers to the Texas State Plane Coordinate System, South Central Zone (NAD83), in which the directions are Lambert grid bearings and the distances are surface level horizontal lengths (S.F.= 0.99983626426) as follows:

COMMENCING at a 4" iron pipe found marking the northwest corner of said Lot 23, the southwest corner of Lot 16, Block 2, New City Block 8727, of Artesian Gardens Subdivision, same being the southwest corner of all that certain called 0.28 acre tract of land conveyed by deed on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., for the northwest corner of all that certain called 3.73 acre tract conveyed by deed on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc., as recorded in Volume 4752, Page 1655 of the Bexar County Official Records, (B.C.O.R.), located on the southeastern right-of-way boundary line of New Laredo Highway, Loop 353, said Point of Commencement being located at Texas State Plane Coordinate position X=2115465.02 and Y=13683103.74;

THENCE South 83°58'05" East, coincident with the southern boundary line of Lots 16, 17 and 18, the northern boundary line of Lots 21 and 23, Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southern boundary line of said William A. Mayes III, et ux, called 0.28 acre tract, the southern boundary line of that certain Tract 2, conveyed by deed on March 16, 2007 from Mable B. Helgren to William A. Mayes, III, et ux, as recorded in Clerk's File No. 2007-0062460 of the B.C.O.R., the northern boundary line of said T. C. Golden, Inc. called 3.73 acre tract, a distance of 450.00 feet to a ½" iron rod found marking the southeast corner of said Lot 18, the southeast corner of said William A. Mayes, III, et ux Tract 2, the southwest corner of Lot 20 of said Block 2, New City Block 8727, of Artesian Gardens Subdivision, the southwest corner of that certain tract of land conveyed by deed on October 23, 2008 from Alfred Castellano to Gilberto Villarreal, Jr., as recorded in Clerk's File No. 2008-0230404 of the B.C.O.R., the northwest corner of all that certain tract of land conveyed by deed on May 16, 2000 from Leticia S. Lozano to Sylvia S. Lozano, as recorded in Volume 8410, Page 464 of the B.C.O.R., same being the northeast corner of said T. C. Golden, Inc. called 3.73 acre tract, at position X=2115912.46 and Y=13683056.46;

THENCE South 6°01'55" West, coincident with the western boundary line of said Sylvia S. Lozano tract, a distance of 105.00 feet to a point for the southwest corner of said Sylvia s. Lozano tract, at position X=2115901.43 and Y=13682952.05;

THENCE South 83°58'05" East, coincident with the southern boundary line of said Sylvia S. Lozano tract, a distance of 79.70 feet to point for the southeast corner of said Sylvia S. Lozano tract, located on the northwestern right-of-way boundary line of 60 foot wide Somerset Boulevard, for the northeast corner of the herein described 3.8664 acre tract, at position X=2115980.68 and Y=13682943.68;

THENCE South 36°55'09" West, coincident with the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard, at a distance of 236.23 feet pass a ½" iron rod found marking the southeast corner of said T. C. Golden, Inc. called 3.73 acre tract, same being the northeast corner of all that certain called 0.19 acre tract of land conveyed by deed recorded on February 12, 1990 from El Dorado Refining Company and Marketing, Inc. to T. C. Golden, Inc., as recorded in Volume 4752, Page 1655 B.C.D.R., located on the centerline of abandoned 40 foot wide Fitch Street, continuing a total distance of 259.54 feet to the **POINT OF BEGINNING**, for the northeast corner of the residual of all that certain called 2.321 acre tract of land conveyed by deed on October 21, 1974 from Wing Corporation to Flint Ink Corporation, as recorded in Volume 7465, Page 83 of the B.C.D.R., the southeast corner of said T. C. Golden, Inc. called 0.19 acre tract, same being the northeast corner of Lot 16, Block 4, New City Block 8730, of said Artesian Gardens Subdivision, for the northeast corner of the herein described 0.0570 acre tract, at position X=2115824.80 and Y=13682736.22;

THENCE South 36°55'09" West, coincident with the northwestern right-of-way boundary line of said 60 foot wide Somerset Boulevard, a distance of 113.40 feet to a point for an angle corner of all that certain called 2.298 acre tract conveyed by deed recorded on March 11, 1988 from Southern State Bank to Tropicana Energy Company, Inc., as recorded in Volume 4255, Page 381 of the B.C.O.R., for the South corner of the herein described 0.0570 acre tract, at position X=2115756.70 and Y=13682645.58;

THENCE North 10°15'05" East, coincident with the eastern boundary line of said Tropicana Energy Company called 2.298 acre tract, a distance of 97.58 feet to a point for the northeast corner of said Tropicana Energy Company called 2.298 acre tract, located in northern boundary line of said Lot 16, Block 4, New City Block 8730, of Artesian Gardens Subdivision, same being the southern right-of-way boundary line of abandoned 40 foot wide Fitch Street, the southern boundary line of T. C. Golden, Inc. called 0.19 acre tract, for the northwest corner of the herein described 0.0570 acre tract, at position X=2115774.06 and Y=13682741.58;

THENCE South 83°58'05" East, coincident with the northern boundary line of said Lot 16, Block 4, New City Block 8730, of Artesian Gardens Subdivision, the southern right-of-way boundary line of said abandoned 40 foot wide Fitch Street, the southern boundary line of said T. C. Golden called 0.19 acre tract, a distance of 51.03 feet to the **POINT OF BEGINNING**, containing 0.0570 acre of land, more or less.

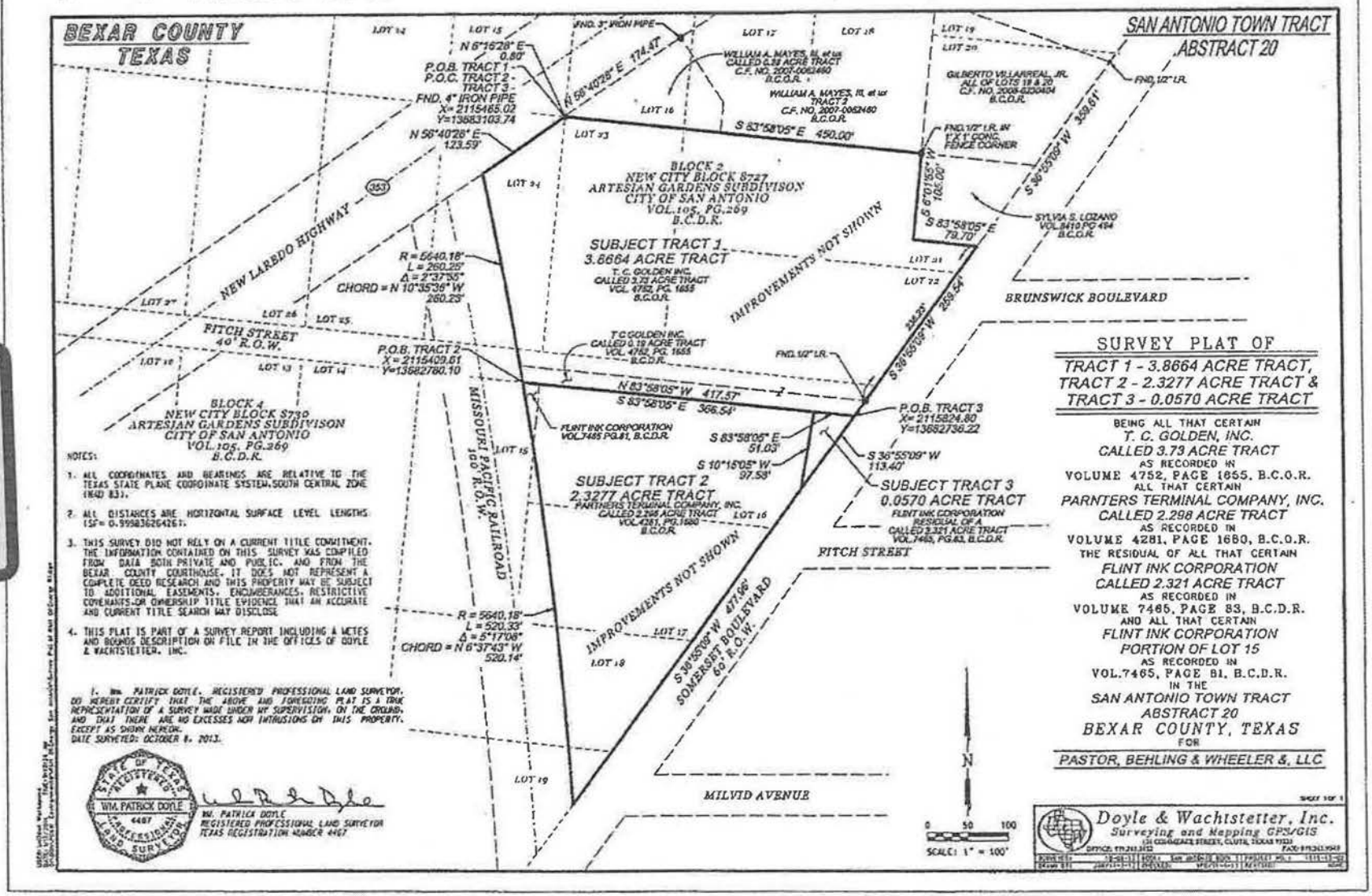
Wm. Patrick Doyle
Registered Professional Land Surveyor
Texas Registration Number 4467
November 4, 2013

This description is based on a survey, a plat of which, November 4, 2013 is on file in the office of Doyle & Wachtstetter, Inc.
Legal\pat\Pastor Behling & Wheeler\ PBW - R&H Oil Energy – 0.0570 acre tract.doc

EXHIBIT "B"

PLAT MAP OF THE PROPERTY

EXHIBIT B



NOTES:

1. ALL COORDINATES AND BEARINGS ARE RELATIVE TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD 83).
2. ALL DISTANCES ARE HORIZONTAL SURFACE LEVEL LENGTHS (SF= 0.99983626426).
3. THIS SURVEY DID NOT RELY ON A CURRENT TITLE COMMITMENT. THE INFORMATION CONTAINED ON THIS SURVEY WAS COMPILED FROM DATA BOTH PRIVATE AND PUBLIC, AND FROM THE BEXAR COUNTY COURTHOUSE. IT DOES NOT REPRESENT A COMPLETE DEED RESEARCH AND THIS PROPERTY MAY BE SUBJECT TO ADDITIONAL EASEMENTS, ENCUMBERANCES, RESTRICTIVE COVENANTS OR OWNERSHIP TITLE EVIDENCE THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE.
4. THIS PLAT IS PART OF A SURVEY REPORT INCLUDING A METES AND BOUNDS DESCRIPTION ON FILE IN THE OFFICES OF DOYLE & WACHTSTETTER, INC.

I, WM. PATRICK DOYLE, REGISTERED PROFESSIONAL LAND SURVEYOR, DO HEREBY CERTIFY THAT THE ABOVE AND FOREGOING PLAT IS A TRUE REPRESENTATION OF A SURVEY MADE UNDER MY SUPERVISION, ON THE GROUND, AND THAT THERE ARE NO EXCESSES NOR INTRUSIONS ON THIS PROPERTY, EXCEPT AS SHOWN HEREON.
DATE SURVEYED: OCTOBER 8, 2013.

STATE OF TEXAS
REGISTERED
WM. PATRICK DOYLE
4487
PROFESSIONAL
LAND SURVEYOR

WM. PATRICK DOYLE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NUMBER 4487

SURVEY PLAT OF

TRACT 1 - 3.8664 ACRE TRACT, TRACT 2 - 2.3277 ACRE TRACT & TRACT 3 - 0.0570 ACRE TRACT

BEING ALL THAT CERTAIN
T. C. GOLDEN, INC.
CALLED 3.73 ACRE TRACT
AS RECORDED IN
VOLUME 4752, PAGE 1655, B.C.O.R.
ALL THAT CERTAIN
PARNTERS TERMINAL COMPANY, INC.
CALLED 2.298 ACRE TRACT
AS RECORDED IN
VOLUME 4281, PAGE 1680, B.C.O.R.
THE RESIDUAL OF ALL THAT CERTAIN
FLINT INK CORPORATION
CALLED 2.321 ACRE TRACT
AS RECORDED IN
VOLUME 7465, PAGE 83, B.C.D.R.
AND ALL THAT CERTAIN
FLINT INK CORPORATION
PORTION OF LOT 15
AS RECORDED IN
VOL.7465, PAGE 81, B.C.D.R.
IN THE
SAN ANTONIO TOWN TRACT
ABSTRACT 20
BEXAR COUNTY, TEXAS
FOR
PASTOR, BEHLING & WHEELER &, LLC

Doyle & Wachtstetter, Inc.
Surveying and Mapping GPS/GIS

EXHIBIT "C"

SEPTEMBER 23, 2013 AND MARCH 21, 2014 ORDERS OF THE 131ST DISTRICT COURT IN BEXAR COUNTY, TEXAS, CAUSE NO. 2013-CI-13622

CAUSE NO. 2013-CI-13622

BAE SYSTEMS RESOLUTION INC., BRIDGESTONE AMERICAS TIRE OPERATIONS, LLC, PERKIN ELMER AUTOMOTIVE RESEARCH, INC., FLINT GROUP INCORPORATED, and STRUCTURAL METALS, INC. Plaintiffs, v. PARTNERS TERMINAL CO., INC., a dissolved corporation, T.C. GOLDEN, INC., a dissolved corporation, and TROPICANA ENERGY COMPANY, INC. Defendants	§	IN THE DISTRICT COURT OF BEXAR COUNTY, TEXAS 131st JUDICIAL DISTRICT

Order Appointing Receiver

Plaintiffs BAE Systems Resolution Inc., Bridgestone Americas Tire Operations, LLC, PerkinElmer Automotive Research, Inc., Flint Group Incorporated and Structural Metals, Inc. filed Plaintiff's Verified Original Petition and Application for Appointment of Receiver (the "Petition") seeking, among other relief, appointment of a receiver for the Site.[1] The Court has reviewed the papers filed in this matter and has heard any statements offered by counsel. Being duly advised in the premises and for good cause shown, the Court hereby finds and orders as follows:

[1] "Site" for the purposes of this Order means, as defined in the Petition, the real estate commonly known as the R&H Oil/Tropicana Energy Site, consisting of two tracts of land located a 403 and 507 Somerset Road, approximately 5 miles southwest of downtown San Antonio.

IT IS HEREBY ORDERED AND ADJUDGED as follows:

1. The Court finds that the appointment of a receiver for the Site is proper for good cause shown. Specifically, the appointment of a receiver is necessary to allow Plaintiffs to remediate the Site.

2. Eva S. Engelhart, Ross, Banks, May, Cron & Cavin, P.C., 2 Riverway, Suite 700 Houston, Texas 77056, (713) 626-1200 (tel.), (713) 623-6014 (fax), email: eengelhart@rossbanks.com, possesses the necessary qualifications, is not an attorney for or related to any party to this action and is hereby appointed receiver of the Site ("**Receiver**").

3. Receiver is authorized, subject to control of this Court and the laws regarding receivership, to do any and all acts necessary for the proper and lawful conduct of the receivership. Specifically, the following orders are entered:

(a) **Receiver's Exclusive and Complete Control over the Site.** Receiver be allowed to take and have complete and exclusive control and possession of the Site, along with any and all information necessary to operate the Site, for the purpose of effectuating the clean up and remediation of the Site by Plaintiffs and the other Group members;

(b) **Receiver's Right to Prevent Waste of, and to Preserve, the Site.** Effective immediately, Receiver be ordered to take any and all actions Receiver deems reasonable and appropriate to prevent waste to the Site and to preserve, secure, manage, maintain, and safeguard

the Site and all other forms of property to which Receiver is entitled to take possession and control under the order appointing receiver;

(c) **Receiver's Right to Manage, Maintain, and Operate the Site.** Receiver be authorized to manage and operate, the Site and to employ such managers, agents, employees, brokers, accountants, and attorneys as may in her judgment be advisable or necessary in the management, conduct, control, or custody of the Site, be authorized to make payments and disbursements in the ordinary course of business and to make such payments and disbursements as may be needed and proper for the preservation of the Site;

(d) **Receiver's Right to Record Deed Restrictions on the Site Tracts.** Receiver be authorized to record deed restrictions and restrictive covenants to limit the uses of and activities on the Site. The deed restrictions and restrictive covenants may include restrictions deemed necessary, in Receiver's sole discretion, to cause the Site to be remediated. Such deed restrictions may include, but are not limited to: land use and development restrictions, restrictions on the use of soil or groundwater, requirements to implement appropriate health and safety measures during future construction activities, requirements to further evaluate potential risks prior to land use or development, and requirements to implement specific construction techniques to mitigate potential risks. The Receiver may establish

deed restrictions and restrictive covenants to grant regulatory agencies the authority to enforce the restrictions placed on the property;

(e) **Legal Actions Related to the Site.** Receiver be authorized to institute, prosecute, defend, compromise, and/or intervene in or become a party to such actions or proceedings in state or federal courts or settle any claims necessary for the protection, maintenance, and preservation of the Site and to carry out the terms of the Court's order appointing Receiver;

(f) **Insurance.** Receiver be authorized to obtain and maintain appropriate property insurance for the Site, public liability insurance, worker's compensation insurance, fire and extended coverage insurance, burglary and theft insurance, and other types of insurance normally obtained in connection with the operation and management of the Site; and be authorized to continue any current policies in place and to purchase further insurance as Receiver deems appropriate;

(g) **Negotiation with Taxing Authorities for the Site.** Receiver be authorized to negotiate with Taxing Authorities holding tax liens on the Site in order to ensure that any deed restrictions and restrictive covenants established pursuant to the remediation of the Site are

effective. Neither Receiver nor Plaintiffs are responsible for the payment of past property taxes for the Site;

(h) **Leases; Payment of Utilities; Maintenance of the Site; Compliance with Laws.** Receiver be authorized to: (1) negotiate and enter into new leases, occupancy agreements, and contracts in the ordinary course of the business of the Site; (2) modify existing leases, occupancy agreements, and contracts in the ordinary course of the business of the Site; (3) pay all utilities, expenses, and other obligations secured by the Site or which may give rise to liens on the Site, and all other outstanding obligations to suppliers and service providers in the ordinary course of business, including obligations incurred prior to the commencement of the receivership, so long as Receiver has determined that it is prudent to do so in order to maintain business relationships that are beneficial to the conduct of the receivership; (4) make repairs necessary to the maintenance of the Site in order to preserve the Site in the ordinary course of business; and (5) comply with all requirements and regulations applicable to the Site, including all laws and regulations related to the environment and the protection of human health;

(i) **Application of Income from the Site.** Receiver be permitted to apply income from the Site, if any, as follows: (1) Receiver's approved fees and expenses; (2) the current operating expenses of

the receivership in the ordinary course of business; and (3) to reimburse Plaintiffs for monies expended in connection with the receivership;

(j) **Receiver's Cash on Hand.** Receiver be permitted to maintain sufficient cash on hand to enable Receiver to meet those expenses, the payment of which is authorized herein, in an amount to be agreed to between Receiver and Plaintiffs;

(k) **Payment of Site Expenses.** Receiver be permitted to pay all expenses incurred with regard to the Site in the normal and ordinary course of business of the Site by Receiver on or after the date Receiver is appointed. Neither Receiver nor Plaintiffs shall be liable for any expenses incurred with regard to the Site prior to Receiver taking possession of the Site, nor shall Receiver or Plaintiffs be required to use any rents or additional funds advanced by Plaintiffs or other revenues collected after Receiver takes possession of the Site in payment of such expenses. It shall be incumbent upon Receiver, in Receiver's sole and absolute discretion, to make a determination as to which expenses, if any, incurred prior to the Receiver's taking possession of the Site, were incurred in the normal and ordinary course of business and the payment of which is necessary and critical to the ongoing operation of the Site. Receiver's determination of such is binding on the parties hereto and

will not be overturned by this Court. Otherwise, no pre-existing expenses shall be paid by Receiver without written approval by Plaintiffs or further order of this Court;

(l) **Receiver's Liability.** Except in the event of gross negligence, willful misconduct, or actions in violation of orders of the Court, Receiver has no personal liability for any obligations incurred in the course of the receivership including site remediation, any and all such liabilities being limited to the assets (including the cash and cash equivalents) received and generated by Receiver in the course of the receivership; and

(m) **Receiver's Right to Convey and Accept Conveyances.** Receiver is authorized to convey and accept conveyances of the Site.

(n) **Application of Proceeds from Sale of the Site.** Receiver be permitted to apply the proceeds from any sale of the Site or portions of the Site as follows: (1) to pay Receiver's approved fees and expenses that have not been otherwise paid; (2) to reimburse any money advanced by Plaintiffs for fees, expenses, attorney fees or other costs in connection with the receivership and; (3) to reimburse, on a pro rata basis, parties or persons who have contributed to the costs of the investigation or remedation of the Site; and

(o) **Receiver's Authority.** The authority granted to Receiver be self-executing. The Receiver is authorized to take any and all actions

necessary to effectuate the clean up and remediation of the Site by Plaintiffs and the other Group members, and to perform any other acts in regard to the Site as authorized by this Court.

4. On filing a receiver's bond, to be posted by personal or business check, in the amount of $100 conditioned as provided by law and approved by this Court, together with the oath prescribed by law, Receiver is authorized, subject to control of this Court, to do any and all of the above acts necessary to the proper and lawful conduct of the receivership.

5. Pursuant to TEXAS RULE OF CIVIL PROCEDURE 695a, Plaintiffs shall file a bond in the amount of $100 conditioned as provided by law, in case it should be decided that Receiver was wrongfully appointed to take charge of the Site.

6. To ensure the orderly operation of the receivership and maximize the value of the assets, Receiver shall be compensated as follows:

> Receiver, her employees and retained professionals shall prepare periodic statements of services rendered and time expended during the course of the receivership. Those periodic statements shall be sent to Plaintiffs in care of de maximis, inc., 2203 Timberloch Place, Suite 213, The Woodlands, Texas 77380.

7. In order to promote judicial efficiency, all persons who receive actual or constructive notice of this Order are enjoined in any way from disturbing the receivership assets or from prosecuting any new proceedings (including collection or enforcement proceedings) that involve Receiver, the receivership assets or the Site (including any proceeding initiated pursuant to the United States Bankruptcy Code) unless such person or persons first obtains the permission of this Court.

IT IS FURTHER ORDERED that all persons, firms and corporations are hereby enjoined from proceeding to levy upon or from otherwise interfering with Receiver's exclusive possession of the Site until final judgment of this Court.

IT IS FURTHER ORDERED that no lien, claim or other security interest in any property affected by this receivership will in any manner be affected by this Order. Any party's failure to oppose the appointment of Receiver, any party's consent to the appointment or any party's procurement of the appointment will not constitute waiver of any lien, claim or right.

IT IS FURTHER ORDERED that any person or any agent of any person with actual notice of this Order shall not interfere with any property in the control of Receiver or subject to this Order, nor interfere with Receiver in the carrying out of any duty under this Order.

IT IS FURTHER ORDERED that all third parties (including but not limited to financial institutions) in possession of assets subject to this Order are hereby

ordered to turn over such assets to Receiver within five (5) business days of receipt of a copy of this Order.

IT IS FURTHER ORDERED that this receivership will continue in effect until further order of this Court.

Signed this 23rd day of September, 2013.

JUDGE PRESIDING

APPENDIX C-3

CITY ORDINANCE

Sec. 34-567. - Permit for drilling new well required.

(a) It shall be unlawful for anyone to drill, maintain, or otherwise construct or have constructed, any new water well, or any other artificial excavation to explore for or produce groundwater, or geothermal borehole for the purpose of a earth-coupled heat exchange system, within the City of San Antonio or SAWS service area, without first applying for and securing a well drilling permit from the SAWS Resource Protection and Compliance (RPC) Department. This section shall not apply to: (1) monitoring wells and test wells with a depth of less than fifty (50) feet; (2) blast holes in quarries and mines; and (3) wells or excavations for the exploration or production of oil, gas, or minerals, unless, without regard to the original purpose, the well is used as a source of water.

(b) All drilling or construction of water wells, and injection wells for the purpose of an earth-coupled heat exchange system, shall be done in strict compliance with the terms of the well drilling permit, the SAWS Water Well Permitting Procedures, International Ground Source Heat Pump Association (IGSHPA) and 30 Texas Administrative Code (TAC), Chapter 331.

(c) In addition to the requirements of paragraphs (a) and (b) of this section, any water well which will penetrate the Edwards Aquifer shall be drilled and maintained in strict compliance with 30 TAC, Chapter 213 et seq., as amended. This paragraph does not apply to borehole loops for the purpose of an earth-coupled heat exchange system.

(d) To preserve the water quality of the Edwards Aquifer, the construction of any bore hole, injection well for the purpose of an earth-coupled heat exchange system, or water well for the purpose of an earth-coupled heat exchange system located over the Edwards Aquifer Recharge Zone and Transition Zone shall be prohibited.

(e) An open system, geothermal well that draws water from an aquifer that is circulated through a heat exchange system or geothermal wells which inject water into an aquifer, or to a surface water body, will not be permitted within the limits of the City of San Antonio, City of San Antonio ETJ, or within SAWS service area.

(Ord. No. 2014-06-19-0472 , § 1(Exh. A), 6-19-14)

Sec. 34-570. - Inspection before issuance of permit.

It shall be the duty of the SAWS RPC Department to consider every permit application submitted under this division, to inspect the property where any well will be drilled, sunk, dug, or bored, and to refuse issuance of a permit when:

(a) The location or manner of construction of the proposed well does not meet with the SAWS RPC Department's approval of drainage and other sanitary conditions, or does not meet applicable State well construction requirements; or

(b) The proposed well would be located on property to which water service is currently available from SAWS or any other water purveyor; or

(c) Water service from existing SAWS water mains or service lines, or from any other water purveyor, could be established to the property on which the proposed well is located at a cost equal to or less than the cost of drilling the well as required by the RPC Department; or

(d) The intended use of the water to be produced by the proposed well could be accomplished using reuse water, and reuse water service is available to the property or could be made available at a cost equal to or less than the cost of drilling the proposed well.

(e) Subsection (b), (c) and (d) of this section do not apply to injection wells for the purpose of an earth-coupled heat exchange system.

(Ord. No. 2014-06-19-0472 , § 1(Exh. A), 6-19-14)

GG
06/19/14
Item No. 37

AN ORDINANCE 2014-06-19-0472

AMENDING CHAPTER 34, ARTICLE III, DIVISION 4; ARTICLE V, DIVISIONS 3 AND 5; AND ARTICLE VI, DIVISIONS 2 AND 3 OF THE SAN ANTONIO CITY CODE FOR THE PURPOSE OF UPDATING PROGRAM REQUIREMENTS TO REDUCE OR ELIMINATE THE DISCHARGE OF HARMFUL POLLUTANTS INTO THE SAWS SANITARY SEWER SYSTEM AND THE CITY'S STORM WATER SYSTEM IN COMPLIANCE WITH CURRENT STATE AND FEDERAL REGULATIONS.

* * * * *

WHEREAS, the federal Clean Water Act (33 U.S.C §§1251, et. seq.) includes regulations applicable to publicly owned treatment works (POTWs) which are administered by the United States Environmental Protection Agency (EPA) (40 C.F.R. Pts. 403 and 122) implementing the National Pollutants Discharge Elimination System (NPDES); and

WHEREAS, POTWs collect domestic sources of wastewater from homes, commercial buildings, and industrial facilities and transport it via collection pipes to treatment plants in order to remove harmful organisms and other contaminants from the sewer sludge so it can be discharged safely into receiving streams and rivers; and

WHEREAS, POTWs also receive nondomestic wastewater from industrial users (IUs) which may pass through or interfere with the treatment process and contaminate sewer sludge; and

WHEREAS, the EPA has established the National Pretreatment Program as part of the NPDES regulations outlining responsibilities of federal, state, and local governments to implement Pretreatment Standards applicable to IUs to control nondomestic industrial pollutants that may contaminate sewer effluent discharged into streams and rivers; and

WHEREAS, the objectives of the National Pretreatment Program are achieved by applying and enforcing three types of discharge standards:

- Prohibited Discharge Standards – prohibit the discharge of any industrial pollutants to a POTW that cause pass through or interfere with the sewer treatment process.
- Categorical Pretreatment Standards – limit industrial pollutants discharged in wastewater to the POTW from specific industrial categories.
- Local Limits – prohibit the discharge of specific industrial pollutants based on the specific needs and capabilities of the POTW.

WHEREAS, the Texas Commission on Environmental Quality (TCEQ) is charged with administration of the Texas Pollutant Discharge Elimination System (TPDES) pursuant to Texas Water Code – Chapter 26 (TCEQ general regulatory authority), 30 T.A.C. Chapter 315 (implementation of EPA Pretreatment Program), and Texas Health & Safety Code – Chapter 361 and 30 T.A.C. Chapter 312 (Implementation of EPA Sewer Sludge Program).

WHEREAS the San Antonio Water System (SAWS) sanitary sewer system and the City of San Antonio (City) storm water system are separate qualifying POTWs subject to the National Pretreatment Program as implemented by the EPA and TCEQ; and

WHEREAS, the City's storm water system is managed by the Transportation and Capital Improvements Department (TCI) which is assisted by SAWS in meeting regulatory compliance requirements associated with its Municipal Separate Storm System (MS4) Program; and

WHEREAS, there is a need and desire to update local storm water and sewer environmental protection regulations found in Chapter 34 of the City Code in order to bring them into compliance with the National Pretreatment Program based on current state and federal standards; and

WHEREAS, SAWS and TCI staff recommend updates to Chapter 34 of the San Antonio City Code as follows:

1. Article III, Division 4 – Rates and Charges
    - o Clarification to Industrial Waste Surcharge Formula
2. Article V, Division 3 – Industrial Waste
    - o Incorporating TCEQ pretreatment regulations and updating the Industrial Waste permitting program to incorporate the changes
3. Article V, Division 5 – Fats, Oils and Grease
    - o Correct reference to Chapter 10 of the Plumbing Code
    - o Allows for correct disposal of Grease trap waste from self-cleaning for interceptors with a capacity of less than 100 gallons
4. Article VI, Division 5 Subdivision B – Storm Water Compliance for Construction Activity
    - o Incorporates changes to the TCEQ Construction General Permit
        - Updates language to cover construction projects 1 acre and larger or part of a planned development and includes fill sites under the definition requiring incorporation of Best Management Practices to control erosion
        - Updates requirements for development of Storm Water Pollution Prevention Plans
        - Updates requirements for inspection of projects
        - Incorporates efficiencies to streamline inspections of sites that have both storm water requirements and are located over the EARZ and subject to Water Pollution Abatement Plans
5. Article VI, Division 5 subdivision C – Storm Water Compliance for Industrial & Commercial activities
    - o Incorporates an addition Subdivision to regulate Industrial facilities under TCEQ Multi-sector Industrial Storm Water permit

6. Article VI, Division 2 -Wells
    - o Corrects water well permit fees to reflect the current charges
    - o Adds definitions to provide clarifications
    - o Adds an expiration date for water well drilling permits

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SAN ANTONIO:

SECTION 1. The amendments to Chapter 34, Article III, Division 4; Article V, Divisions 3 and 5; and Article IV, Divisions 2 and 5 of the San Antonio Municipal Code attached as Exhibit A, are hereby approved, adopted, and incorporated into this Ordinance for all purposes.

SECTION 2. The City Council directs the City Clerk to amend the City Code as authorized in this Ordinance by submitting the revised Chapter 34 provisions to the Municipal Code Corporation as attached in **Exhibit A.**

SECTION 3. The recitals set out above are fully incorporated into this Ordinance.

SECTION 4. This Ordinance shall become effective immediately upon the passage by eight (8) votes of the City Council and if passed upon fewer than eight (8) votes after the tenth (10th) day after passage. The revisions to Chapter 34 of the San Antonio Municipal Code, as found in Exhibit A, will become effective upon passage of this Ordinance.

PASSED AND APPROVED, this 19th day of June, 2014.

M A Y O R
Julian Castro

ATTEST:

Leticia M. Vacek, City Clerk

APPROVED AS TO FORM:

Robert F. Greenblum, City Attorney

Subdivision B. - Stormwater Compliance for Construction Activity

Sec. 34-801. - Statement of purpose.
Sec. 34-802. - Definitions.
Sec. 34-803. - Applicability of Subdivision B entitled "Storm Water Compliance for Construction Activity," and declaration of nuisance for violation; no culpable mental state required.
Sec. 34-804. - General prohibition against construction pollution of the municipal separate storm sewer; measurable volumes for violation.
Sec. 34-805. - Additional federal and state requirements generally applicable to responsible parties associated with one (1) acre or larger projects: proper custody of federal or state storm water pollution prevention plans (SWPPP); applicable to parties required to provide notice of intent (NOI) to EPA or TCEQ; requirement to post NOI at site; requirement to make SWPPP and WPAP (as applicable) available to city inspector; copy of notice of termination required by EPA or TCEQ.
Sec. 34-806. - Best management practices (BMP) guidelines; compliance with this subdivision should not be relied upon by the regulated community to automatically effect compliance with what may be more stringent federal or state regulations pertaining to EPA/ TCEQ permitted construction sites; explanation of federal jurisdiction.
Sec. 34-807. - Enforcement procedures.
Sec. 34-808. - Criminal and civil enforcement.
Sec. 34-809. - Declaration of nuisance within applicable limits of the city's ETJ; city's authority to enforce within five thousand (5,000) feet outside the city limits.
Secs. 34-810-34-900. - Reserved.

Sec. 34-801. - Statement of purpose.

The intent of the ordinance from which this subdivision derives, creating subdivision B, is to satisfy conditions imposed by the City's Texas Pollutant Discharge Elimination System (TPDES) Permit issued by the Texas Commission on Environmental Quality (TCEQ).

All construction addressed by the ordinance from which this subdivision derives is intended to conform to Best Management Practices. Applicable Best Management Practices (BMP) are presently outlined in the Texas Commission on Environmental Quality (TCEQ) Technical Guidance On Best Management Practices, June 1999, Document No. RG-348 (Revised July 2005). The TCEQ guidance may be updated by the agency or revised by the City of San Antonio for integration into the City's technical guidance manual for local construction activity. All these sources are merely recommended guidance and examples for responsible parties. Choice of techniques is at the option of the responsible party.

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-802. - Definitions.

When used in this Subdivision B, the following terms shall have the following meanings:

Best Management Practices (BMP): A technique or series of structural and non-structural techniques and practices which, when used in an erosion control plan or considered as part of a construction site's housekeeping efforts, are proven to be effective in controlling construction-related runoff, erosion, sedimentation, and associated pollutants. Applicable BMP's can be found in TCEQ approved BMP Guidance manuals.

Construction activity: Clearing, grading or filling of land, dozing or mechanical removal of trees which dozing or mechanical removal disturbs the soil, excavation for installation of utility lines, streets, drainage facilities, and site preparation for housing and commercial development, as well as on-going construction activities which produce waste products. Land being modified by either excavation or fill of material upon an existing mantle of soils is considered a construction activity and subject to the terms of this Ordinance unless otherwise permitted under a Multi-sector Industrial Storm Water Permit. Prior to any modification to an existing mantle soil grade the owner of the property must meet City requirements for grading and drainage applicable to property modifications.

Director of public works: The Director of Public Works of the City of San Antonio, including his/her designees.

EPA: The United States Environmental Protection Agency.

Erosion: the wearing away of the ground surface as a result of the movement of wind, water and/or ice.

Extraterritorial jurisdiction (ETJ): The un-incorporated area contiguous to corporate boundaries of the city that is located within five (5) miles of those boundaries, defined by the Texas Local Government Code and as such Code may be amended. Applicable limits of the ETJ, for enforcement purposes of this subdivision, are only those areas within the first five thousand (5,000) feet of San Antonio's corporate boundaries within the ETJ.

Final inspection: Occurs after responsible party meets definition of final stabilization and files a Notice of Termination (NOT) form, if required by state or federal law, at which time SAWS will conduct a final inspection to verify both compliance with final stabilization and removal of the temporary BMP's from the site has occurred. Final inspections will be required at both small Construction Sites and Large Construction Sites. Secondary Operators are required to complete Site Notices and complete a NOT form as required under the TPDES permit.

Final stabilization: Reference to standards in the TCEQ TPDES General Permit for Storm Water Discharges for Construction Activities concerning development acreage that: (1) where state or federally regulated development acreage is concerned, all soil disturbing activities at the site have been completed, and a uniform perennial vegetative cover, with a density of seventy (70) percent of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures or equivalent permanent stabilization measures have been employed and (2) where local, individual lots associated with residential or commercial construction are concerned, by

either (a) the responsible party complying with cover requirements guided by federal or state standards recited above, or (b) the responsible party establishing temporary stabilization including perimeter controls and informing the home buyer or commercial purchaser in writing of the need for and benefits of final stabilization.

Grade: The vertical location of the ground surface.

Grading: Any land disturbance or land fill, or combination thereof including land development, fill material sites or demolition sites.

Improved: Altered by man-made conditions.

Land disturbance/land-disturbing activities: Any moving or-removing or filling by manual or mechanical means of the soil mantle or top six (6) inches of soil, whichever is shallower, including but not limited to excavations. Any planned disturbance of an existing land grade (fill or excavation) is considered a land disturbing activity. Prior to any modifications to existing mantle soil grade, the owner of the property must meet City requirements for grading and drainage on property modifications.

Land fill: Any human activity involving the disposition of soil, earth, or other earthen or aggregate materials.

Municipal separate storm sewer system (MS4): All natural and man-made collection and conduit facilities within the corporate limits of the City of San Antonio and within applicable limits of its extraterritorial jurisdiction, and for which MS4 protection the City of San Antonio has been issued a Texas Pollutant Discharge Elimination System (TPDES) Permit by TCEQ, which collection and conduit facilities constitute a system of conveyances, including but not limited to, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, creeks, streams, tributaries, man-made channels, or storm drains, which provide collection or conveyance of storm water, rain water, flood water, or other surface water, and may be located on public property, drainage easements, or other property, and are not designated and intended to be part of the collection system of a sanitary sewer system utilized by a publicly owned treatment works (POTW) as defined by federal regulation at 40 CFR 122.2.

NOI: Notice of intent filed by a responsible party with EPA or TCEQ. This NOI is required under state regulation for certain construction activity. The NOI is part of the state general permit process for construction activity concerning projects or runoff deemed to potentially impact waters of the State of Texas and of the United States of America.

NOT: Notice of termination. The notice required by the EPA or TCEQ for permitted projects within the jurisdiction of either agency, which notice verifies "final stabilization" of the site has been achieved, as described above; EPA form 3510-7 terminating coverage under the TPDES general permit or corresponding TCEQ form for the TPDES Texas Pollutant Discharge Elimination System general permit.

NPDES: National pollutant discharge elimination system.

Ordinance: This ordinance in its entirety, pertaining to new Subdivision B, under Article VI, Division 5,

Chapter 34, Code of Ordinances of the City of San Antonio.

Person: Any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, governmental entity, or any other legal entity, or the legal representatives, agents, or assigns thereof.

Pollutant: Any substance introduced into the environment that adversely affects a resource. Pollutant includes, but is not limited to, soil, soil material, sediment, human waste, other wastes and debris generated at construction sites.

Qualified Inspector: Person with credible certification or training or skills such as Certified Erosion, Sedimentation and Storm Water Inspector (CESSWI) or Certified Inspector of Sediment and Erosion Control (CISEC) or equal certification program or as may be required by the State of Texas that demonstrates proficiency in evaluating, interpreting and implementing Best Management Practices and elements of a Storm Water Pollution Prevention Plan (SWPPP). Additionally, a Qualified Inspector must receive a certificate of completion to the SAWS TPDES Inspector Training Workshop.

Responsible party: Any person or legal entity, individual or corporate, including an owner, operator, contractor, or subcontractor, any or all of whom may be engaged in, consent to, or actually perform a construction project or construction activity.

SAWS: The San Antonio Water System, a municipally owned utility, a co-permittee to the City's MS4 Permit and one of the city's enforcement and compliance arms for water quality, pollution control and prevention.

Sediment: Earth material deposited by water or wind.

Site: The location of construction activity, subject of this Subdivision B, being within the corporate limits of the city and within the first five thousand (5,000) feet, outside such limits, within the ETJ.

Soil and/or soil material: Naturally occurring superficial deposits of earth mantle overlaying bedrock or clay; any naturally occurring surface deposit of sand, gravel, silt, clay, or any mixture thereof.

Storm water: Storm water runoff, snow melt runoff, and surface runoff and drainage, as per TPDES Permit Construction General Permit No.TXR1500000.

SWPPP: Storm Water Pollution Prevention Plan: The state or federally required plan for identifying and implementing appropriate measures to reduce pollutants in storm water discharges into the city's municipal separate storm water sewer systems (MS4), which pollutants include eroded sediments. Protective measures include, but are not limited to, natural and man-made collection components, good house-keeping for site maintenance, and other common sense actions, all frequently referred to as best management practices (BMP).

TCEQ: Texas Commission on Environmental Quality.

Unimproved: Natural conditions, unaltered.

Water Pollution Abatement Plan (WPAP): The State required plan that is described in 30 Texas Administrative Code, Chapter 213 for identifying and implementing appropriate measures to reduce pollutants in Storm Water Discharges into identified sensitive areas of the Edwards Aquifer. The TCEQ TPDES Construction General Permit TXR150000, page 12, Item 5 "Discharge to the Edwards Aquifer Recharge Zone" identifies the requirement of protective measures of the Edwards Aquifer.

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-803. - Applicability of Subdivision B entitled "Storm Water Compliance for Construction Activity," and declaration of nuisance for violation.

Within the corporate limits of the city and within applicable limits of the city's extraterritorial jurisdiction (ETJ), no person shall perform construction activity that violates provisions of this subdivision. Construction activity in violation of this subdivision is hereby declared unlawful.

Violations committed within the corporate limits and within five thousand (5,000) feet outside the city's corporate limits shall also constitute public nuisance, as further provided below at Sec. 34-809, Violations of any provision of this subdivision within the City's corporate limits shall be deemed a criminal Class C misdemeanor. Violations of any provision of this subdivision within the city's corporate limits or any part of the applicable ETJ shall be further subject to a civil enforcement option, more particularly described in Sec. 34-808 (b) below.

Some of the requirements of this subdivision may be generally characterized as good house-keeping protocols, those expected to be employed by a reasonably prudent contractor, operator, owner, or other person having responsibilities for various activities on a construction site. Where state or federal permits require the site operator, owner, or other responsible party, to make a storm water pollution prevention plan (SWPPP), such plans must be readily available on the site for city inspection.

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-804. - General prohibition against construction pollution of the municipal separate storm sewer; measurable volumes for violation; required TCEQ TPDES Permit; SWPPP and WPAP (as applicable).

(a) It is unlawful for any person to engage in construction activity which activity results in a measurable volume of sediment, soils, soils material, or pollutants entering the city's municipal separate storm sewer system (MS4).

(b) "Measurable volume" of sediment, soil, soil material, or pollutant, for purposes of determining a violation, shall be such volume as is capable of being truly and correctly depicted in a photograph, motion picture, or video recording of the sediment, soil, soil material, or pollutant in question.

(c) Nothing in this section shall diminish or change the general prohibitions against MS4 pollution found in section 34-702, Subdivision A, Division 5, of this Chapter 34, Prohibited discharges into the municipal separate storm sewer system. SAWS shall continue to exercise all enforcement powers set out in this Chapter 34, and to gather such evidence as may include, but not be limited to, samples and analysis

appropriate to enforcement of Chapter 34 provisions.

(d) The responsible party shall use best management practices (BMP) to prevent sediment, soils, soils materials, and pollutants from entering the city's MS4.

(e) It is unlawful for any person to engage in construction activity without employing BMP necessary to protect the city's MS4 from run-off or other media capable of transporting sediment, soil, soil material, and pollutants into the city's MS4.

(f) The Responsible Party shall post at the main entrance of the site all operator notices including without limitation, such as Notice of Construction, Construction Site Notice, Contact Information and WPAP Notice of Construction (as examples).

(g) Portions of the Edwards Aquifer Recharge Zone and Edwards Aquifer Contributing Zone within the City of San Antonio extraterritorial jurisdiction shall be considered inclusive in this Section.

(h) The operator shall have available and maintain on the construction site a copy of the SWPPP and where applicable, the WPAP.

(i) It is unlawful for any person to engage in construction activity without a complete SWPPP (as defined in TCEQ TXR 150000 or WPAP (as applicable) available on the construction site

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-805. - Additional federal and state requirements generally applicable to responsible parties associated with TPDES Regulated Projects: proper custody of federal or state storm water pollution prevention plans (SWPPP); applicable to parties required to provide TPDES notice of intent (NOI) or Small Construction Site Notice (CSN) to EPA or TCEQ and San Antonio Water System (SAWS); requirement to post TPDES Notices at site; requirement to make SWPPP available to city inspector; copy of Notice of Termination (NOT) or Small Construction Site or Large Construction Site Secondary Operator completed site notices required by TCEQ or SAWS.

(a) Concerning projects for which the EPA or TCEQ or the City have permitting authority, the responsible party shall post at the site, as required by federal or state regulations, a true and correct copy of the NOI, Permit Number, Large Construction Site Notice or Small Construction Site Notice. A copy of the NOI, Permit Number, Large Construction Site Notice or Small Construction Site Notice and the WPAP Notice of Construction shall also be sent to SAWS Resource Protection and Compliance Department at the same time it is sent to EPA or TCEQ when applicable.

(b) The responsible party shall have available for city inspection, on site, the storm water pollution prevention plan (SWPPP) imposed by EPA or TCEQ, when the site in question is subject to such plans imposed by federal or state law.

(c) The responsible party shall make the SWPPP available to the city inspector, on reasonable request made during normal working hours.

(d) Failure, refusal, or inability to provide such plan for inspection, when the plan is required under state or federal law, constitutes a violation of this subdivision.

(e) It shall be unlawful for any person to engage in construction activity in violation of the elements of an applicable SWPPP and applicable WPAP.

(t) The responsible party shall provide SAWS a true and correct copy of any notice of termination (NOT), Small Construction Site completed site notice or Large Construction Site Secondary Operator completed site notice necessary to close out a project regulated by EPA or TCEQ. This copy shall be sent to SAWS, to the attention of SAWS Resource Protection and Compliance Department, at the time it is sent to EPA or TCEQ.

(g) Where permanent improvements have been constructed, the final inspection shall verify whether or not the "final stabilization" criteria have been met.

(h) Where no permanent improvements are planned, temporary BMPs shall continue to be maintained until site has reached final stabilization.

(i) A site shall continue to be regulated and maintain an open, active permit until final stabilization is achieved; and, where applicable to state and federally regulated sites, until a "notice of termination" (NOT) or Small Construction Site completed site notice or Large Construction Site Secondary Operator completed site notice has been filed. A copy of the NOT, if applicable, will also be filed with the SAWS as described above at subsection (t).

(k) Where the site has met final stabilization requirements, but the controls or measures implemented thereafter fail, each discharge of construction related contamination by the responsible party shall constitute a violation of this subdivision B.

(k) Removal of temporary BMPs shall be required after the site achieves final stabilization.

(l) The responsible party shall have available for City inspection on the construction site, a true copy of an approved master plan of development.

(m) The Responsible Party shall have available on the construction site the Water Pollution Abatement Plan (WPAP) and WPAP Approval Notice imposed by TCEQ when the site in question is subject to such plans required by TCEQ in 30 Texas Administrative Code, Chapter 213.

(n) The Responsible Party shall have available for City inspection all records and documents required by the EPA or TCEQ SWPPP and TCEQ WPAP (as applicable).

(o) All SWPPP documents shall be designed and signed by a Licensed Professional Engineer (Texas) with competence in this area as required by Texas Engineering Practice Act, Section 137, or a Certified Professional in Erosion and Sedimentation Control (CPESC), or other registered/certified professional with competence in this area (such as a landscape architect) or as required by the State of Texas TCEQ.

(p) To assure continued effective compliance with best management practice methodology on the construction/development site, the owner and/or engineer or certified inspector such as CPESC, Certified Erosion, Sediment and Storm Water Inspector (CESSWI) or Certified Inspector of Sediment and Erosion Control (CISEC) or other equal certification as may be required by the State of Texas, (hereafter referred to as owner's representative) shall conduct ongoing inspections of all erosion/sedimentation controls and direct the person or firm responsible for maintenance to make any repairs or modifications necessary within 48 hours of the initial notification.

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-806. - Best management practices (BMP) guidelines; compliance with this subdivision should not be relied upon by the regulated community to automatically effect compliance with what may be more stringent federal or state regulations pertaining to EPA/TNRCC TCEQ permitted construction sites; explanation of federal jurisdiction.

(a) BMP applications recommended to responsible parties are those techniques described in TCEQ's "Technical Guidance on Best Management Practices," document no. RG-348, Revised July- 2005, as such document may be updated and revised, or when available, the city's Technical Guidance Manual for Construction Activity.

(b) Responsible parties are advised that the city's recognition of BMP and other good house-keeping protocols are not necessarily synonymous with federal standards directly associated with EPA's Construction General Permit for other construction sites regulated under federal law or the TCEQ's Construction General Permit. Some sites will be federally regulated construction sites while most construction sites will be permitted by the State of Texas under guidelines similar to those of EPA. Responsible parties whose projects of scale fall within state or federal parameters are responsible to EPA or TCEQ to fulfill requirements that may differ from or may be more stringent than the provisions of this ordinance applying to local, individual construction sites of a scale not regulated by state or federal authorities.

(c) In contrast, the purpose of this subdivision and its requirements for BMP are to satisfy the City's own State permit which specifically requires the City to adopt a construction site regulation. Consequently, the intent of this subdivision is to protect MS4 from pollutants generated from local construction sites. Federal and State jurisdiction to support this directive is found in the conduit of urban runoff traversing the San Antonio area into rivers, streams, and especially bays regulated as "waters of the United States of America" and "waters of the State of Texas". Hence, storm water generated in the area of San Antonio may enter into and impact state and federal waters.

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-807. - Enforcement procedures.

(a) The director of public works may designate additional field enforcement staff to supplement SAWS Resource Protection and Compliance Department staff, here designated and referred to above and hereafter as city inspectors (inspectors).

(b) Upon observation of an alleged violation or condition an inspector believes constitutes a violation of this subdivision, the Inspector shall issue a Field Correction Notice (FCN) to a responsible party. The Field Correction Notice shall be personally delivered to a responsible party, if such person is available on site; or, in the absence of such person, shall be posted at the construction site and mailed by U.S. Mail or by electronic e-mail. Field Correction Notices shall afford two (2) 24-hour periods to correct the violation alleged. The first 24-hour period should be used to remediate and remove the offending material, if any, from the city's MS4, or obtain and post permit documents and/or provide a copy of a complete SWPPP and WPAP (as applicable). A second 24-hour grace period shall follow immediately to allow the responsible party to appropriately install or repair corrective BMP which was lacking or failed to protect city property.

(c) If the violation is cured within forty-eight (48) hours, as described above, no further city action is required.

(d) If correction is not made timely, the inspector may issue a stop work order.

(e) If a stop work order is not honored at the site and/or corrective action is not timely accomplished to protect the city's MS4, citations may be issued or civil injunctive remedies with appropriate penalties may be pursued.

(f) Additional or cumulative enforcement action may be taken as the seriousness of the alleged pollutant encroachment in the MS4 may warrant.

(g) Additional compliance time may be afforded, if within the judgment and discretion of the inspector, municipal obligations to environmental health and safety and municipal stormwater compliance obligations to enforcement agencies are not compromised.

(h) Upon observation of an alleged violation or condition an inspector believes constitutes a violation of a Water Pollution Abatement plan within the Edwards Aquifer Recharge Zone, the Inspector shall have the authority to issue a Field Correction Notice (FCN) to a responsible party. Delivery of the FCN shall be in accordance with the process as identified in paragraph (b) of this Section. The Field Correction Notice shall require immediate correction of the violation alleged or within 24 hours of observation of alleged violation as specified and documented by the Inspector on the FCN. If correction is not made timely, the Inspector may issue a Stop Work Order.

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-808. - Criminal and civil enforcement.

(a) A penalty is hereby established whereby any person who shall violate any provision of this subdivision shall be deemed to be guilty of a misdemeanor and shall upon conviction be fined a minimum amount of not less than two hundred dollars ($200.00) per violation and a maximum amount of not more than two thousand dollars ($2,000.00) per violation. Each day of violation shall constitute a separate offense for purposes of the enforcement of this subdivision.

(b) The city attorney has authority to pursue all legal, equitable, and criminal remedies appropriate to

enforce all provisions of this subdivision, including, but not limited to, authority under the Texas Local Government Code, Chapter 54, providing for injunctive relief and court imposed civil penalties up to five thousand dollars ($5,000.00) a day for violation of ordinances relating to discharge of a pollutant into a storm sewer system controlled by a municipality.

(c) Upon the written direction of the director of public works, advising of an alleged violation of any section of this subdivision, the city attorney, pursuant to subsection (d) above, is authorized to petition any court of competent jurisdiction for an injunction to enjoin the continuance of such violation and to secure any and all civil penalties within the jurisdiction of the appropriate court. This remedy shall be cumulative of and to all other enforcement remedies available to the city.

(d) The authority set out above shall in no way diminish the authority and responsibility of the city attorney to diligently prosecute violations of this subdivision through the municipal prosecutor's office.

(e) The SAWS is a co-permittee, under the federal permit, and a contractual enforcement arm of the City of San Antonio. In consultation with the city attorney, SAWS legal officers may exercise all or specific enforcement options enumerated in this subdivision B on behalf of the city.

(Ord. No. 94002, § 1, 5-24-01)

Sec. 34-809. - Declaration of nuisance within applicable limits of the city's ETJ; city's authority to enforce within five thousand (5,000) feet outside the city limits.

Under authority of the Texas Local Government Code, Sec. 217.042 (a) (b), noncompliance with provisions of this subdivision B, or violation of its provisions, is here declared a nuisance and by authority of the enabling statute such declaration of nuisance extends to and shall be applicable within both the corporate limits of the city and within five thousand (5,000) feet outside the limits. Accordingly, summary abatement authority rests in the city's enforcement officials when imminent threat to the public health, safety, or welfare may arise.

(Ord. No. 94002, § 1, 5-24-01)

Secs. 34-810-34-900. - Reserved.

Sec. 34-226.3. Industrial waste surcharges.

(a) Persons or owners discharging industrial wastes which exhibit none of the characteristics of wastes prohibited by Ordinance Number 77784, or as may be amended, other than excessive BOD or TSS, but having a concentration in excess of normal domestic sewage, that is, concentrations of BOD in excess of 250 mg/l and TSS in excess of 250 mg/l, shall pretreat the industrial waste to meet the concentrations of normal domestic sewage; however, such excessive BOD and TSS waste may be accepted for treatment if all the following requirements are met:

~~(1) Neither BOD nor TSS waste concentrations shall exceed 10,000 mg/l concentration.~~

~~(2)~~1) The wastes will not cause damage to the collection system.

~~(3)~~(2) The wastes will not impair the system's treatment process.

~~(4)~~(3) The wastes will not cause contamination of POTW sludges thus limiting sludge disposal options or practices.

~~(5)~~(4) The person(s) or owners responsible for the wastes pays an industrial surcharge, in addition to the regular water and sewer charges, in accordance with the following cost factors and formula:

V	=	Volume of water use reported in millions of gallons (MG) per month
BOD	=	Biochemical oxygen demand analyzed in accordance with the procedures approved under 40 CFR Part 136, or the latest Environmental Protection Agency (EPA) approved method, and reported in units of milligrams per liter (mg/l).
TSS	=	Total suspended solids analyzed in accordance with the procedures approved under 40 CFR Part 136, or the latest Environmental Protection Agency (EPA) approved method, and reported in units of milligrams per liter (mg/l).

Cost factor BOD = $1.62

Cost factor TSS = $1.50

IWS = Industrial waste surcharge computed in dollars as follows: IWS Volume of discharge (in MG per Month) [$1.62 × (BOD mg/l - 250 mg/l) + $1.50 × (TSS mg/l) - 250 mg/l].

~~= V [$1.62 × (BOD mg/l - 250 mg/l) + $1.50 × (TSS mg/l) - 250 mg/l].~~(b) *Surcharge review.* ~~(1)~~

(1) The San Antonio Water System as the Control Authority (CA) shall review the basis for determining surcharges at least once every two (2) years, or more frequently as needed.

~~Quality control shall review the basis for determining surcharges at least once every two (2) years, or more frequently as needed.~~

(2) The discharger may employ an independent registered professional engineer, at the discharger's cost, to perform additional sampling and analysis provided this activity is coordinated with the CA ~~quality control.~~ Upon consideration of all available information, the CA ~~system~~ shall determine the final values and/or charges to be assessed.

(c) *Sample point.*

(1) Each sampling point shall be installed and maintained by the discharger so that any authorized representative of the CA ~~system~~ may readily and safely obtain samples of the flow at all times.

(2) Each sampling point shall be near the outlet of each sewer, drain, pipe, or channel which connects with the sanitary sewer or wastewater facility.

(3) Each sampling point shall be designed and constructed to prevent infiltration by ground and surface water and maintained so that any authorized representative of the CA ~~the system~~ may readily and safely obtain samples of the flow at all times.

(4) Before beginning construction of a sampling point, a person shall submit plans to the CA ~~quality control~~ for review and approval to insure compliance with these provisions. Plans must include the sewage metering device if one is to be installed.

(d) *Measurement of waste volumes.*

(1) The volume of wastes may be determined by the same methods used to calculate the general sewer service rate.

(2) On premises where all or part of the water is obtained from a source other than the public water supply and no sewage metering device is installed, the owner shall provide and maintain a metering device of a type approved by the CA ~~the San Antonio Water System~~ to measure sources of private water.

(e) *Sampling of wastes.*

(1) The CA ~~Quality control~~ shall take samples of waste discharges from establishments as often as determined necessary to adequately monitor and control the discharges. If an owner desires additional samples, the owner shall pay the cost of the additional service.

(2) Samples collected by the CA ~~quality control~~ may be either flow-proportional or time proportional composite samples as appropriate to achieve the most representative samples, or via the best available sampling method given the constraints and limitations present at the discharge point source.

(f) *Sampling and analysis fees.* A person discharging concentrations of BOD and/or TSS in excess of normal domestic sewage concentrations shall compensate the CA ~~the system~~ for the cost of sample collection and analysis when an industrial surcharge is established.

(g) *Industrial surcharges for class groups.*

(1) The CA ~~Quality control~~ shall assess an industrial surcharge rate for each class group based on waste strength determinations established by averaging grab or composite samples or both, taken from a representative number of establishments in each group, and shall apply this rate to the water consumption or metered wastewater of the establishment. If the establishment is within a larger facility for which water usage is determined from a master meter, ~~customer service~~the San Antonio Water System Customer Service Department (CSD) shall determine an estimated volume for the establishment on which the surcharge rate is applied. ~~Customer service~~CSD shall then add the appropriate industrial surcharge to billings for regular water and sewer service for each establishment classified into a class group.

(2) If an establishment contains operations from more than one of the class groups, ~~and Ccustomer service~~ CSD determines that the surcharge rate for a particular class group would not adequately compensate the system for its cost of treatment, ~~Ccustomer service~~CSD shall add an appropriate industrial waste surcharge to adequately compensate the system for its cost of treatment.

(3) The CA ~~Quality control~~ may, from time to time, revise surcharge class groups based on analysis of current samples.

(Ord. No. 80330, § 1, 6-16-94; Ord. No. 97395, 3-27-03)

DIVISION 2. - WELLS [135]

Sec. 34-566. - Powers and duties of the SAWS board.
Sec. 34-566.5.- Definitions
Sec. 34-567. - Permit for drilling new well required.
Sec. 34-568. - Permit for repair or closure of existing well required.
Sec. 34-569. - Application for permit—Information required.
Sec. 34-570. - Inspection before issuance of permit.
Sec. 34-571. - Execution of permit.
Sec. 34-572. - Permit fees.
Sec. 34-573. - Nuisance of defective or contaminating wells, abatement.
Sec. 34-574. - Abandoned wells.
Sec. 34-575. - Failure to abate nuisance, remedies.
Sec. 34-576. - Variance and appeal.
Sec. 34-577. - Criminal penalty.
Sec. 34-578. - Civil penalty.
Sec. 34-579. - Additional enforcement remedies.
Sec. 34-580. - Conflict.
Sec. 34-581. - Severability.
Secs. 34-582—34-590. - Reserved.

Sec. 34-566. Powers and duties of the SAWS board.

(a) The San Antonio Water System (SAWS) Board shall have the following powers:

(1) To make or have made examinations of all wells, privately owned or otherwise, within the limits of the City of San Antonio or within SAWS service area~~;~~ , or as a requirement to obtain a Utility Service Agreement;

(2) To sample or have sampled water from any well and make or have made analyses or tests of such water from any well located within the City of San Antonio, the City of San Antonio extra-territorial jurisdiction (ETJ), SAWS service area, or as a condition to obtaining a Utility Service Agreement and to require a well owner to obtain a well log if no such log is available;~~To make or have made at any time the necessary analyses or tests of water therefrom;~~

(3) To go upon the land and property of the owner of a well for any purpose allowed in this division;

(4) To require the owner to furnish all available information when requested concerning a well, including, in the case of new wells, complete logs of the well showing depth to and depth through all geologic formations encountered. This requirement includes at least one borehole per geothermal system;

(5) To supervise the construction, repair, and plugging of wells and the operation of such wells. The SAWS Board or its duly authorized agent shall keep a register of all wells within the limits of the City of San Antonio, City of San Antonio ETJ or within SAWS service area. This register shall, at a minimum, show for each well the name of the owner, exact location, date of construction, depth and diameter, the purpose for which the well was constructed, and, if applicable, date of plugging.

(b) It shall be a violation of this division for any person to refuse or otherwise fail to comply with any requirement of this division, or with any order of the SAWS Board made in conformity with and under the authority of this division.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-566.5. - *Definitions*

a. Abandoned well means any water supply well that is no longer in use, is not properly maintained and operated, or is in such a state of disrepair that using it to obtain water is impractical or a health or environmental hazard.
b. City means the City of San Antonio a Texas home rule city
c. Contaminating well means a well that allows the detrimental alteration of the naturally occurring physical, thermal, chemical, or biological quality of groundwater
d. Defective well means a well that is structurally compromised, either at the ground surface or in the subsurface that would potentially allow the entrance of surface water into the well or the mixing of waters within the wellbore that is not permitted by applicable regulations.
e. Geothermal borehole means a borehole drilled or bored into the earth into which piping is inserted for use in a geothermal system
f. Geothermal system means a geothermal system uses the Earth's thermal properties in conjunction with electricity to provide greater efficiency in the heating and cooling of buildings.
g. TCEQ means the Texas Commission on Environmental Quality

Sec. 34-567. - Permit for drilling new well required.

(a)

It shall be unlawful for anyone to drill, maintain, or otherwise construct or have constructed, any new water well, or any other artificial excavation to explore for or produce groundwater, or geothermal borehole ~~or injection wells~~ for the purpose of a earth-coupled heat exchange system, within the City of San Antonio or SAWS service area, without first applying for and securing a well drilling permit from the SAWS Resource Protection & Compliance (RPC) Department.~~Water Quality Division.~~ This section shall not apply to: (i) monitoring wells and test wells with a depth of less than fifty (50) feet; (2) blast holes in quarries and mines; and (3) wells or excavations for the exploration or production of oil, gas, or minerals, unless, without regard to the original purpose, the well is used as a source of water.

(b)

All drilling or construction of water wells, and injection wells for the purpose of an earth-coupled heat exchange system, shall be done in strict compliance with the terms of the well drilling permit, the SAWS Water Well Permitting Procedures, International Ground Source Heat Pump Association (IGSHPA) and 30 Texas Administrative Code (TAC), Chapter 331.~~, and 30 TAC, Chapter 238~~

(c)

In addition to the requirements of paragraphs (a) and (b) of this section, any water well which will penetrate the Edwards Aquifer shall be drilled and maintained in strict compliance with 30 TAC, ~~Sections~~ Chapter 213 et seq., as amended. This paragraph does not apply to borehole loops for the purpose of an earth-coupled heat exchange system.

(d) To preserve the water quality of the Edwards Aquifer~~the aquifer~~, the construction of any bore hole, injection well for the purpose of an earth-coupled heat exchange system, or water well for the purpose of an earth-coupled heat exchange system located over the Edwards Aquifer Recharge Zone and Transition Zone shall be prohibited.

(e)

An open system, geothermal well that draws water from an aquifer that~~and~~ is circulated through a ~~the~~ heat exchange system or geothermal wells which inject water into an aquifer, or to a surface water body, will not be permitted within the limits of the

City of San Antonio, City of San Antonio ETJ, or ~~and~~ within SAWS service area.
(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-568. - Permit for repair or plugging of existing well required.

It shall be unlawful for any person to reconstruct, repair, correct, or plug a well or injection well for the purpose of an earth-coupled heat exchange system, or to engage upon such work, within the City of San Antonio, San Antonio ETJ, or the SAWS service area, or to employ anyone else to engage in such work, without first applying for and securing a permit from the SAWS RPC Department ~~Water Quality Division~~.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-569. - Application for permit—Information required.

Every application for a permit for the drilling, construction, repair, or plugging of a well or the construction of an injection well for the purpose of an earth-coupled heat exchange system, shall be considered incomplete unless all information requested by the SAWS application form has been provided. The SAWS RPC Department ~~Water Quality Division~~ shall maintain and update permit application terms to request all information necessary to carry out the intent of this division and to assure protection of the ground water aquifers by detecting and preventing the drilling or use of wells in a manner that may cause damage to or waste of water in an aquifer.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-570. - Inspection before issuance of permit.

It shall be the duty of the SAWS RPC Department ~~Water Quality Division~~ to consider every permit application submitted under this division, to inspect the property where any well will be drilled, sunk, dug, or bored, and to refuse issuance of a permit when

(a) The location or manner of construction of the proposed well does not meet with the SAWS RPC Department's ~~water quality division's~~ approval of drainage and other sanitary conditions , or does not meet applicable State well construction requirements; or~~or~~

(b)

The proposed well would be located on property to which water service is currently available from SAWS or any other ~~recognized~~ water purveyor; or

(c)

Water service from existing SAWS water mains or service lines, or from any other water purveyor, could be established to the property on which the proposed well is located at a cost equal to or less than the cost of drilling the well as required by the RPC Department; or~~well; or~~

(d)

The intended use of the water to be produced by the proposed well could be accomplished using reuse water, and reuse water service is available to the property or could be made available at a cost equal to or less than the cost of drilling the proposed well.

(e)

Subsection (b), (c) and (d) of this section do not apply to injection wells for the purpose of an earth-coupled heat exchange system.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-571. - Execution of permit.

All permits shall be executed in triplicate, one (1) copy to be delivered to the applicant and two (2) copies to be retained in the SAWS Resource Protection & Compliance Department. A permit is valid for 6 months from the date of issuance of the permit.~~Water Quality Division.~~

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-572. - Permit fees.

The fees to be paid to SAWS for the permits required by this article shall be as follows:

Permit for closure or repair of existing well .....~~$320.00~~ $385.00

Permit for drilling new well .....~~384.00~~$455.00

Permit for the construction of a geothermal heat exchange system 200.00

The San Antonio Water System Board of Trustees is hereby authorized to amend the fee schedule, as needed, by official resolution, when a change in the amount of fees is required to adequately recover the costs reasonably related to the performance of these functions for which the fee is charged.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97; Ord. No. 2007-12-13-1345, § 2(Att. B), 12-13-07)

Sec. 34-573. - Nuisance of defective or contaminating wells, abatement.

(a)

Any defective or contaminating well, as described herein, is hereby found to be a threat to the water supply of the City of San Antonio, a potential source of disease, injurious to the public health, and is hereby declared a nuisance.

(b)

For the purpose of this division a contaminating well is considered to be any well or other opening which penetrates the underground water supply and which in any way pollutes or contaminates any other well or the city's water supply.

(c)

For the purpose of this division a defective well is considered to be: any well, whether dug or drilled, which for any reason does not completely prevent, or which has the potential to allow, the mixing of water or other liquid from above and below the source of the city's water supply (the ground water aquifers) with the water in the source of the city's water supply; or any water well that was constructed without a permit and associated inspections.

(d)

The City of San Antonio, acting through the SAWS Board, pursuant to said § 217.042 or § 401.002 of the Texas Local Government Code Ann. (Vernon's 1994), and § 342.001 of the Texas Health & Safety Code Ann. (Vernon's 1994), may require the abatement of such nuisance. The SAWS RPC Department ~~Water Quality Division~~ may, on its own initiative or upon information or complaint from any source, make an examination of any well suspected of being defective. If such examination indicates in the opinion of the SAWS RPC Department Water Quality Division that the well is a contaminating or defective well or that the water from such well is unsafe for human consumption, then the director, or his authorized representative of the SAWS RPC Department ~~Water Quality Division~~ shall issue an order or written instructions to the owner or his agent in charge of such well or the property upon which it is situated to plug this well in such a manner as prescribed by the SAWS Board and in compliance

with TNRCC regulations and SAWS Water Well Permitting Procedures. In the event that a surface or subsurface release of contaminants occurs within the immediate area of a well, the owner of that well shall allow SAWS to conduct an inspection, or to conduct monitoring activity of that well. If that well is later found to be contaminated, SAWS may direct the owner to plug and abandon that well.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-574. - Abandoned wells.

(a)

For the purpose of this division a well is considered to be an abandoned well if it has not been used for a period of six (6) consecutive months or longer. A well is considered to be in use in the following cases:

(i)

A non-deteriorated, non-defective or non-contaminating well which contains the casing, pump and pump column in good condition, and which is connected to an active electrical or other power source; or

(ii)

A non-deteriorated, non-defective or non-contaminating well which has been properly capped, and for which a variance has been granted by the SAWS RPC Department ~~Water Quality Division~~.

(b)

It is hereby declared that an abandoned well, as defined in subsection (a) above, has the potential to pollute the water supply or be otherwise injurious to the public health, and, pursuant to Tex. Loc. Govt. Code Ann. §§ 217.042 and 401.002 (Vernon's 1994), is hereby declared a nuisance, for which the City of San Antonio, acting through the SAWS Board, pursuant to the Code, may require the abatement of such nuisance.

(c)

The owner, operator, or agent in charge of an abandoned well shall notify the SAWS ~~Water Quality Division~~RPC Department of that condition. Every abandoned well shall be ~~filled and~~ plugged in accordance with all applicable TCEQ~~TNRCC~~ regulations and SAWS Water Well Permitting Procedures and with such materials and in such manner as in the judgment of the Director of the SAWS RPC Department ~~Water Quality Division~~ will prevent the pollution and contamination of the City of San Antonio's water supply or of any other well within the limits of the city of the SAWS service area.

(d)

Whenever SAWS shall receive notice from any source of the existence of an

abandoned well which has not been plugged and filled in accordance with the provisions of this division, the SAWS RPC Department ~~Water quality Division~~ shall notify the owner, operator, or agent in charge of such well or of the property upon which it is situated that such well is abandoned and shall order such person to fill and plug the well in accordance with this division of the Code.

(e)

The SAWS RPC Department ~~Water Quality Division~~ may require any owner of a capped well to take any action necessary or to provide any information or materials necessary to establish that such a capped well is not defective, contaminating, or deteriorated.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-575. - Failure to abate nuisance, remedies.

Should the owner, operator, or agent in charge responsible for the contaminating, defective, or abandoned well which has been declared a nuisance, or for the property on which it is situated, fail to abate such nuisance within the prescribed time from the date of issuance of notice of nuisance or order issued pursuant to sections 34-573 or 34-574 hereof, or if, after exercising reasonable diligence, the SAWS Board is unable to locate the owner, operator, or agent in charge, the City of San Antonio, acting through the SAWS Board, pursuant to the Health & Safety Code §§ 342.001 et seq., shall have the right to go on the property upon which the well is situated and abate such nuisance in the manner provided, and the owner thereof shall be liable to the City of San Antonio for the cost of such work and shall pay such cost upon demand, and the City of San Antonio, acting through the SAWS Board, shall have the right to file a lien on the property to secure payment of the costs of such work

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-576. - Variance and appeal.

(a)

A person who has properly applied for and has been denied a permit by the SAWS RPC Department ~~Water Quality Division~~ under sections 34-567 through 34-570 hereof may request a variance from the application of this division. All requests for variances shall be made in writing to the SAWS RPC Department ~~Water Quality Division~~ and shall include:

(i)

The subject of the requested variance, and

(ii)

The justification for granting a variance.

(b)

The party requesting a variance has the burden of demonstrating that sufficient evidence exists for the granting of a variance to these rules, and the SAWS RPC Department ~~Water Quality Division~~ shall consider and provide a written response to all such variances.

(c)

If a variance is granted for the construction of a water well, the water well shall be constructed by a state-licensed driller and according to the methods outlined in the SAWS Water Wells Permitting Procedures. This construction shall occur under the authority of the permit to drill issued by the SAWS Board and under the inspections associated with the permit.

(d)

Any variance granted under this section shall have a term of three (3) years from the date of issuance, and any activity which would otherwise be prohibited by this division except for the existence of a variance may not continue after the expiration of the applicable variance.

(e)

Any person who properly requests a variance pursuant to this section which is denied by decision of the SAWS RPC Department ~~Water Quality Division~~, may appeal such denial to the president and CEO of SAWS by filing a request for appeal within ten (10) days from the date notice of denial is received. The president and CEO may require additional information from or request a meeting with the person making the appeal, and the decision of the president and CEO on the issuance of a variance or permit under this division shall be considered final.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-577. - Criminal penalty.

(a)

The president/CEO of the San Antonio Water System is hereby authorized to designate qualified San Antonio Water System personnel to serve notices of violations of this section and take all necessary action to file a complaint with the municipal prosecutor's office.

(b)

A conviction for violation of this division shall constitute a class C misdemeanor. A person convicted of a violation of this division shall be fined a minimum amount of not less than two hundred dollars ($200.00) per violation and a maximum amount of not more than two thousand dollars ($2,000.00) per violation. Each violation of a particular section of this division shall constitute a separate offense, and each day an offense continues shall be considered a new violation for purposes of enforcing this division. A culpable mental state is not required to prove an offense under this ordinance.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-578. - Civil penalty.

A civil penalty in an amount not to exceed one thousand dollars ($1,000.00) per violation of this division may be imposed. Each violation of a particular section of this division shall constitute a separate offense, and each day such an offense continues shall be considered a new violation for purposes of enforcing this division. A culpable mental state is not required to prove an offense under this division.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-579. - Additional enforcement remedies.

In addition to any other remedies provided by this division, the City of San Antonio and SAWS may, at any time, seek legal and/or equitable remedies or file criminal charges against any person, corporation or other entity believed to be in violation of this division. In furtherance thereof, ~~the SAWS Environmental Counsel for~~ SAWS is authorized and instructed to commence any action, in law or in equity, including the filing of criminal charges for the purpose of enforcing this division.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-580. - Conflict.

No provision of this division is intended nor shall any part or portion hereof be construed so as to conflict with the Texas Water Code, any regulations adopted by the TCEQ, or any other Charter Code provision or ordinance pertaining to reuse or conservation.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Sec. 34-581. - Severability.

If any provision of this division or the application thereof to any person or circumstance shall be held to be void or invalid for any reason, the remainder of this division and the application of such provision to other persons and circumstances shall nevertheless be valid, and the city council hereby declares that this division would have been enacted without such invalid provision.

(Ord. No. 80574, § 15, 8-4-94; Ord. No. 86747, § 1, 10-2-97)

Secs. 34-582—34-590. - Reserved.

ADD: This is a new subdivision (Sub Division C) under Article VI, Division 5.

ARTICLE VI. WATER QUALITY CONTROL & POLLUTION PREVENTION

DIVISION 5. PROHIBITED DISCHARGES INTO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM

Subdivision C. Storm Water Compliance for Industrial & Commercial Activities

Section 34 – 750. General Provisions.

1. Purpose: This subdivision sets forth requirements for all facilities discharging to the San Antonio Municipal Separate Storm Sewer System (MS4) and those facilities required maintain a Texas Pollutant Discharge Elimination System (TPDES) Multi-Sector General Permit (MSGP) for Industrial Storm Water Discharges.

2. Administration: Pursuant to the TPDES permit no. WQ0004284000 issued to the City of San Antonio, San Antonio Water System (SAWS) and the Texas Department of Transportation requiring the establishment of an Industrial and High Risk Runoff Program SAWS shall have responsibility for administering, implementing, and enforcing the Industrial Inspection Program as outlined in the San Antonio Storm Water Management Plan and established by this subdivision.

3. Objectives: The objective of this subdivision is to prevent the introduction of pollutants to the maximum extent practicable into the MS4 from industrial and/or commercial facilities, including but not limited to those regulated categories that must maintain a TPDES discharge permit. All facilities that discharge storm water defined as being "associated with industrial activity" under provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code that discharge directly to waters of the State, the United States, or through a municipal separate storm sewer system are required to obtain either a MSGP or obtain a conditional No Exposure Exclusion (NEC) from permit requirements from the TCEQ.

Section 34-751. MSGP Permit Required

The following facilities are required to obtain MSGP permit coverage and provide a copy to SAWS:

a. Those facilities operating under the Industrial Sectors of the MSGP, and

b. SAWS may require that an industrial or commercial facility not specifically referenced by the North American Industry Classification System to comply with SWP3 requirements of the MSGP in order to control to the maximum extent practicable the discharge of pollutants of concern into the MS4.

Section 34 – 752. Conditional No Exposure Certification

Facilities regulated under the industrial activities described by one or more sectors of the MSGP may be excluded from permit requirements if there is no exposure of industrial materials or activities to precipitation or runoff. To qualify for this conditional exclusion from permit requirements, the operator must apply to the TCEQ for the NEC permit exclusion and provide certification that those regulated industrial activities and materials mobilized by storm water are isolated from storm water and storm water runoff by storm resistant shelters (as defined in the MSGP). Facilities that qualify for this exclusion shall provide a copy of the NEC to SAWS upon request. Facilities that operate under a conditional NEC exclusion are subject to inspection to verify compliance. Facilities that previously qualified for a NEC and have made changes in their industrial process resulting in exposure must obtain a MSGP to discharge storm water associated with industrial activities.

Section 34 - 753. Storm Water Pollution Prevention Plan Requirements

1. SWP3 Components – Each facility requiring a MSGP Permit shall develop and implement a Storm Water Pollution Prevention Plan (SWP3) prior to submitting a Notice of Intent to the TCEQ for MSGP permit coverage. The SWP3 must be maintained onsite or made readily available for review by SAWS upon request. The SWP3 shall include all elements identified in the MSGP language and continuously meet the criteria including any SWP3 updates and Best Management Practices (BMPs) maintenance as necessary to control discharge of pollutants. The SWP3 shall be developed to identify actual and potential sources of pollution that may reasonably be expected to affect the quality of storm water discharges from the facility. The SWP3 shall establish BMPs and any necessary structural control necessary to reduce or eliminate pollutants from the facility's storm water discharge. The SWP3 shall describe how such practices are appropriate for the facility and how each will effectively prevent or lessen pollution.

2. Sampling criteria – Each regulated facility shall take the appropriate samples at the frequency prescribed in the current MSGP. These storm water samples include but are not limited to: effluent limitations for hazardous metals, benchmark sampling and any sector specific sampling required under the MSGP.

3. Industrial and/or commercial facilities determined to potentially contribute pollutant loading to the MS4 may be required to perform additional monitoring as outlined by the TCEQ Municipal TPDES Permit to validate improvements to the BMPs and changes in the SWP3. This additional sampling can include, but is not limited to:

    - Any pollutant limited in an existing TPDES permit for the facility
    - Oil and Grease (O/G)
    - Chemical Oxygen Demand (COD)
    - pH
    - Biochemical Oxygen Demand (BOD5)
    - Total Suspended Solids (TSS)
    - Phosphorus (P)
    - Total Kjeldahl Nitrogen (TKN)
    - Nitrate plus Nitrite Nitrogen
    - Ammonia-nitrogen
    - Temperature
    - Total Organic Carbon (TOC)
    - E. Coli and Fecal Coliform

4. The SWP3 and monitoring data must be submitted to SAWS upon request.

Section 34 – 754. Inspection and Entry

SAWS shall have the right to inspect the facilities of any industrial user to ascertain whether the purposes of this subdivision are being met and all applicable requirements are being fulfilled. Industrial users and their employees shall allow SAWS representatives displaying proper identification ready access to the premises at all reasonable times for the purpose of: inspecting industrial operations and processes, examination and reproduction of business records pertinent to storm water quality, including hazardous and non-hazardous waste manifests and where applicable, making photographic documentation and obtaining other information necessary to ascertain whether the information submitted is current, and to assess compliance by permittees with storm water permit requirements. Failure to allow access or impeding an investigation will be considered a violation of this subdivision. In the event SAWS reasonably believes discharges from a property into the MS4 may cause an imminent and substantial threat to human health or the environment, an inspection may take place at any time without notice to the owner of the property or a representative on-site.

Section 34-755. Falsifying Information

1. It is a violation of this subdivision to knowingly make any false statement, representation or certification in any application, record, report, plan, or other document filed or required to be maintained pursuant to this subdivision or pursuant to any condition or provision of an industrial storm water discharge permit.

2. It is a violation of this subdivision to tamper with, interfere with the operation of, or knowingly render inoperable any monitoring, sampling or surveillance devices or to improperly impede an inspection procedure required or authorized under this subdivision and/or any industrial discharge permit. In addition to any civil or criminal liability that may be imposed for a violation of this subdivision, a person who damages equipment used or necessary for monitoring compliance with an industrial discharge permit and/or this subdivision, shall also be liable for the cost associated with replacing or repairing such equipment.

Section 34-756. Enforcement and Penalties

1. *Violations*. The commission of any act that is prohibited by this subdivision or the failure to perform any act that is required by this subdivision is a violation of this subdivision. SAWS may require that a compliance meeting be held prior to implementing legal action to enforce the provisions of this subdivision; however, such a meeting shall not be a bar against or a prerequisite for taking any enforcement action.

2. *Penalties for violations.*

(a) *Criminal.* A conviction for a violation of this subdivision shall constitute a class C misdemeanor. A person convicted of a violation of this subdivision shall be fined a minimum amount of not less than two hundred dollars ($200.00) per violation and a maximum amount of not more than two thousand dollars ($2,000.00) per violation.

Each violation of this subdivision shall constitute a separate offense, and each day an offense continues shall be considered a new violation for purposes of enforcing this subdivision.

(b) *Civil.* A civil penalty in an amount not to exceed five thousand dollars ($5,000.00) per violation of this subdivision may be imposed. Each violation of this subdivision shall constitute a separate violation, and each day such violation continues shall be considered a new violation for purposes of enforcing this subdivision, and calculating the amount of civil penalties.

3. *Additional remedies*

In addition to the penalties for violations that may be imposed pursuant to this subdivision, SAWS may commence actions for any other legal and/or equitable relief or for the imposition of civil penalties authorized by any applicable law, statute, ordinance, or regulation.

Sec. 34-471 General Provisions.

(6) ***Definitions.*** Unless a provision explicitly states otherwise, the following terms and phrases, as used in this division, shall have the meanings hereinafter designated.

Best Management Practices (BMPs): A schedule of activities, prohibitions of practices, maintenance procedures, and other management practices to implement the requirements listed in Sec. 34-472(1) and (2). BMPs include treatment requirements, operating procedures, and practices to control plant site runoff, spillage, or leaks, sludge or waste disposal, or drainage from raw materials storage.

Control authority*:* The term "control authority or CA" shall refer to SAWS or the POTW defined hereinafter, the resource compliance division, or the designated representative or agent, in accordance with the provisions of 40 CFR 403.12 insofar as the pretreatment program was originally approved and effective as of February 15, 1985.

Daily Discharge: The wastewater discharge from a facility during a normal 24 hour period to the sanitary sewer.

Daily Maximum Limit: *The* maximum allowable discharge limit of a pollutant during a calendar day. Where a daily maximum limit is expressed in units of mass, the daily discharge is the total mass discharged over the course of a day. Where a Daily Maximum Limits is expressed in terms of a concentration, the daily discharge is the arithmetic average measurement of the pollutant concentration derived from all measurements taken that day.

Industrial user or user (IU)*:* Any user who contributes, causes, or allows an indirect discharge (as defined in subparagraph 34-471(6) of this section) of non-domestic pollutants or other wastewater which does not constitute a "direct discharge" to a receiving stream under regulations issued pursuant to Section 402, of the Act, (33 U.S.C. 1342).

Monthly Average Limit: The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

NAICS: North American Industrial Classification System, an industrial classification system that groups establishments into industries based on the similarity in the processes used to produce the principal goods or services and the economic activities in which they are primarily engaged.

Narrative Standard: Narrative criteria are statements that describe the desired water quality goal that is used when pollutants cannot be precisely measured to express the limit on a parameter in a quantitative form. This criteria is used for pollutants for which numeric criteria are difficult to specify, such as those that offend the senses (e.g., color and odor) or for requirements as might be specified in a compliance agreement (e.g., employee training or visual postings).

New source:

(1) Any building, structure, facility, or installation from which there is (or may be) a discharge of pollutants, the construction of which commenced after the publication of proposed pretreatment standards under Section 307(c) of the Act which will be applicable to such source if such standards are thereafter promulgated in accordance with that action, provided that:

(a) The building, structure, facility, or installation is constructed at a site at which no other source is located; or

(b) The building, structure, facility, or installation totally replaces the process or product equipment that causes the discharge of pollutants at an existing source; or

(c) The production or wastewater generating processes of the building, structure, facility, or installation are substantially independent of ~~an~~ existing sources at the same site. In determining whether these are substantially independent, factors such as the extent to which the new facility is integrated with the existing plant, and the extent to which the new facility is engaged in the same general type of activity as the existing source, should be considered.

Pollution Prevention Plan: A plan designed for the reduction of generation of hazardous waste and toxic chemicals as outlined in the Waste Reduction Policy Act of 1991 (under 30 Texas Administrative Code (TAC) 335 Subchapter Q) by avoiding the disposal or release of harmful substances into the environment by means of source reduction, waste minimization, reuse, recycling, and detoxifying treatments.

Process Wastewater: Any water which, during manufacturing of processing, comes into contact with or results from the production of use of any raw material, intermediate product, finished product, byproduct, or waste product.

Publicly owned treatment works (POTW): A "treatment works," as defined by Section 212 of the Act (33 U.S.C. 1292) which is owned by the control authority. This definition includes any devices or systems used in the recycling or reclamation, collection and treatment of sewage or industrial wastes of a liquid nature and any conveyances, which convey wastewater to a water recycling center.

Sharps: *Sharps* means any object contaminated with a pathogen or that may become contaminated with a pathogen through handling or during transportation and also capable of cutting or penetrating skin or a packaging material. *Sharps* includes needles, syringes, scalpels, broken glass, culture slides, culture dishes, broken capillary tubes, broken rigid plastic, and exposed ends of dental wires.

Significant noncompliance: For the purpose of this provision, an industrial user is significantly noncompliant (SNC), if its violation meets one or more of the following criteria:

(a) Chronic violations of numeric wastewater discharge limits, defined here as those in which sixty-six (66) percent or more of all measurements taken during a six-month period exceed (by any magnitude) the daily maximum limit or the average limit for the same pollutant parameter, including Instantaneous maximum allowable discharge limits as defined in Sec. 34-471; or

(b) Technical review criteria (TRC) violations, defined here as those in which thirty-three (33) percent or more of all of the numeric measurements for ~~each~~ the same pollutant parameter taken during a six-month period equal or exceed the product of the daily maximum limit or the average limit multiplied by the applicable TRC (TRC = 1.4 for BOD, TSS, FOG, and 1.2 for all other pollutants except pH.); or

(c) Any other violation of a pretreatment effluent limit (daily maximum or longer term average, instantaneous maximum allowable discharge limit, or Narrative Standard) that the control authority determines has caused, alone or in combination with other discharges, interference or pass through

(including endangering the health of POTW personnel or the general public); or

(d) Any discharge of a pollutant that has caused imminent endangerment to human health, welfare or to the environment or has resulted in the control authority's exercise of its emergency authority under paragraph (f)(1)(vi)(B) of this section to halt or prevent such a discharge; or

(e) Failure to meet, within ninety (90) days after the schedule date, a compliance schedule milestone contained in a local control mechanism or enforcement order for starting construction, completing construction, or attaining final compliance; or

(f) Failure to provide, within ~~thirty (30)~~ forty-five (45) days after the due date, required reports such as baseline monitoring reports, ninety-day compliance reports, periodic self-monitoring reports, and reports on compliance with compliance schedules; or,

(g) Failure to accurately report noncompliance; or

(h) Any other violation or group or violations which the control authority determines will adversely affect the operation or implementation of the local pretreatment program.

Slug discharge/slug load*:* Any single discharge episode at a flow rate or strength which could cause a violation of the prohibited discharge standards in section 34-472(1) of this division, and any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge. The discharge episode is not required to cause or have the potential to cause pass-through or interference with the POTW processes to be considered a slug load. In addition a slug discharge shall not violate the POTW's regulations, local limits, or individual permit conditions.

Standard industrial classification (SIC): A four (4) digit code created by the U.S. Office of Management & Budget (1987) for statistical classification purposes that describes an industrial activity that takes place at a facility or site. It is possible for a facility or site to have multiple SIC codes depending on the varying activities that take place. ~~classification pursuant to the Standard Industrial Classification Manual issued by the executive office of the president, office of management and budget, 1987 as amended or as may be amended.~~

Storm water: Any flow occurring during or following any form of natural precipitation, and resulting from such precipitation, including snowmelt runoff, rainfall runoff and surface runoff and drainage.

Waters of the United States: All navigable waters of the United States as defined at 33 USC 1362(7) and at 40 CFR §122.2.

Zero Discharger: An Industrial User subject to categorical pretreatment standards that does not discharge any categorical waste to the sanitary sewer collection system. This IU may not discharge waste that has categorical standards to the sanitary sewer collection system as outlined under their SIU permit requirements or local limits whichever is more stringent.

Sec. 34-472 Regulations.

(2) *Specific discharge prohibitions.* No user shall introduce or cause to be introduced into the POTW the following pollutants, substances, or wastewater:

(c) Solid or viscous substances in such quantities and/or qualities which may cause obstruction to the flow in a sewer or other interference with the operation of the wastewater treatment facilities such as, but not limited to: grease, solids or solids accumulation greater than one-half (1/2) inch in any dimension, animal guts or tissues, paunch manure, bones, hair, hides or fleshings, entrails, whole blood, asbestos, feathers, ashes, cinders, sand, spent lime, stone or marble dust, metal, glass, straw, shavings, grass clippings, rags, spent grains, spent hops, waste paper, wood, plastics, paint or chemical residues, tar, asphalt residues, residues from refining or processing of fuel or lubricating oil, mud or glass grinding or polishing wastes, fatty acids or esters of fatty acids, or food and vegetable wastes, sharps, regulated medical waste or used health care product (as defined in 49 CFR 173.134 class 6, Division 6.2 cleaning wipes, articles of clothing, or bedding), or any material which can be disposed of as trash;

(4) *Technically based local limits.*

(b) All samples shall be collected and analyzed in a manner consistent with the requirements of 40 CFR 136. No user as prescribed above shall discharge or allow the discharge of wastewater to the regional system having a pH less than 5.5 or greater than 10.5 standard units, and all concentrations and/or quality criteria shall apply where the effluent is

discharged to the POTW. Wastewater entering the regional collection system shall not exceed 65.5 degrees Centigrade (150 degrees Fahrenheit). The following pollutant limits are established to protect against Pass through and Interference at the POTW. No person shall discharge wastewater containing in excess of the following:

c) **Best Management Practices (BMPs) / Pollution Prevention (P2).** Users not regulated under local limits shall be regulated under the following guidelines relating to Best Management Practices and pollution prevention. Narrative BMPs may also be incorporated into individual permits.

The methodology involved in the application of Best Management Practices / Pollution Prevention may include but not be limited to the following:

(i) Source reduction
Operating practices
Inventory control
Employee training
Spill control
Input Material Substitutions
Product Changes
Technology Changes
Process changes
Equipment changes

(ii) Recycling
Reuse
Closed loop recycling
Other recycling
Reclaimation

There are existing non-permitted and/or unregistered industrial dischargers who typically have reasonable potential for violating a pretreatment standard or requirement. Therefore, the implementation of Best Management Practices, as stipulated by the ~~city~~ San Antonio W~~w~~ater S~~s~~ystem, is required to control and reduce specific pollutants. The

reduction of these specific pollutants at many facilities may have a significant impact on the total contribution based on the number of facilities involved. Upon determination by the control authority that it is necessary to regulate an individual user or group of industrial users based on potential for pollutants of concern, the following minimum requirements will be established to accomplish this goal:

- Industrial users within the identified grouping must either be regulated by the BMP guidelines and/or pretreatment standards (local limits).
- Users may be required to submit letters of authorization indicating the facility's intent to comply with the BMP guidelines.
- The control authority may require periodic reporting by these users demonstrating compliance with the BMP guidelines such as copies of equipment maintenance records or manifest records for waste disposal, or records demonstrating employee training.
- The control authority may conduct random inspections to determine compliance independent of the information supplied by an industrial user.

(8) Reserved

Sec. 34-473 Wastewater Pretreatment.

3) *Slug control plan.* ~~At least once every two (2) years~~, Within one (1) year of the effective date of the IU permit issuance date the control authority shall evaluate whether each significant industrial user needs a plan to control slug discharges. The control authority may require any user to develop, submit for review, and implement such a plan. In the event of a slug discharge by the IU, the facility will be required to revise, update the slug control plan and perform necessary upgrades to prevent reoccurrence. A plan shall address, at a minimum, the following:

(4) *Reporting of slug/accidental discharges.* In the case of a slug discharge, including any accidental spill or noncustomary batch discharges, the user shall notify the department and the appropriate water recycling center immediately by telephone and provide the following information:

(a) Time of discharge.

(b) Location of the discharge.

(c) Type of waste.
(d) Concentration and volume discharged.
(e) Corrective actions taken.
(f) Water recycling center receiving the waste.

Within five (5) calendar days following an accidental or slug discharge, the user shall submit to the director, or to the designated representative, a written report describing the cause of the discharge and the measures to be taken by the user to prevent similar future occurrences. The results of the report will be documented and available to the CA upon request. Such notification shall not relieve the user of any responsibility for, expense, loss, damage, or other liability which may be incurred as a result of damage to the POTW, the environment or any other damage to person or property; nor shall such notification relieve the user of any fines, penalties, or other liability which may be imposed by this division or other applicable law. Failure to notify the director of a slug or accidental discharge may result in legal action or discontinuation of service; and may be deemed a separate violation of this division.

(5) *Toxic organic management plan.* All industrial users in the electroplating, metal finishing, copper forming, aluminum forming, coil coating and electrical and electronic components categories may submit a toxic organic management plan (TOMP) in lieu of monitoring for total toxic organics (TTO) as referenced in 40 CFR 413.03(b), 40 CFR 433.12(b) and 40 CFR 469.13(b) respectively. Specifically after initial monitoring the TTO monitoring in years two, three, four and five of the permit cycle may be waived by the CA upon approval and proper implementation of the TOMP. The plan must specify at a minimum the following:

Sec. 34-474 - Wastewater discharge permit application.

(2) *Wastewater discharge permit application.*
(a) Significant industrial users shall, pursuant to the control authority's approved pretreatment program, obtain an industrial wastewater discharge permit, and shall complete and file an application on a form prepared by the control authority. (Refer to section 34-480 concerning confidential or proprietary information). The information requested shall at a minimum include the following items:

(19) NAICS number(s) according to the current edition of the North American Industrial Classification System Manual, 1997, Office of Management and Budget (OMB), as amended;

(4) *Certification*: data accuracy, truthfulness and completeness. All wastewater discharge permit applications, required documents, and other specified documents submitted to the control authority must contain the following certification statement, and must be signed by ~~an~~ the authorized representative of the industrial user:

Sec. 34-475 - Wastewater discharge permit issuance process.

Within sixty (60) calendar days from the date the permit application is approved (section 34-474(4)), the control authority shall issue the wastewater discharge permit to the user.

(2) *Permit contents.* A wastewater discharge permit shall include such conditions as are deemed reasonably necessary by the control authority to prevent pass through or interference, protect the quality of the water body receiving the treatment plant's effluent, protect worker health and safety, facilitate sludge management and disposal, and protect against damage to the POTW. Permits shall, at a minimum, address the following:
(q) Effluent limits, including Best Management Practices, based on applicable Pretreatment Standards,

Sec. 34-477 – Compliance monitoring.

(1) *Monitoring facilities.*

(d) There shall be adequate lighting of and ample room in or near such sampling manhole or facility to safely allow inspection personnel to position sampling, monitoring or surveillance equipment and prepare field samples for analysis. Whether construction on public or private property, the sampling and monitoring facilities shall be provided in accordance with the regional system requirements and all applicable local construction standards and specifications,

including applicable requirements contained in the plumbing code, chapter ~~24~~ 10 of the City Code, as amended or as may be amended.

(3) Inspection and sampling

(a) The Control Authority and EPA and/or TCEQ representatives shall have the right to inspect the facilities of any industrial user to ascertain whether the purposes of this division are being met and all applicable requirements are being fulfilled. Industrial users and their employees shall allow authorized regulatory representatives displaying proper identification ready access to the premises at all reasonable times for the purpose of: inspecting wastewater generating operations and processes; wastewater flow monitoring and sampling; examination and reproduction of business records pertinent to water and wastewater volume and quality; including hazardous and non-hazardous waste manifests; inspection of potential slug-related discharges; and where applicable, making photographic documentation and obtaining other information necessary to ascertain and ensure currentness of data and information submitted in the facility's permit application, and assure and assess compliance by users with pretreatment standards and requirements. Inspection frequency is at a minimum conducted once per year, and the frequency will depend on the nature and type of industrial processes as is specified in the control authority's pretreatment program. Failure to allow access, to permit photographic documentation, or to allow copying of pertinent records will be considered a direct violation of this division.

Sec. 34-478 – Reporting requirements.

(1) *Baseline monitoring reports.*

c) Users described above shall submit the information set forth below:

(5) *Measurement of pollutants.* Information regarding pretreatment standards sampling include the following:

(iv) The submission of a baseline report which utilizes only historical data so long as the data provides information sufficient to determine the need for industrial pretreatment measures.

(5) *Periodic compliance reports.*

(a) All significant industrial users shall, at a frequency determined by the control authority, but in no case less than twice per year (in June and December), submit a report indicating the nature and concentration of pollutants in the discharge which are limited by pretreatment standards and the measured or estimated average and maximum daily flows for the reporting period. All periodic compliance reports must be signed and certified in accordance with section 34-474(3) of this division. In cases where the Pretreatment Standard requires compliance with a BMP or P2 alternative, the User must submit documentation required by the Control Authority or the Pretreatment Standard necessary to determine the compliance status of the User.

8) *Notice of violation/repeat sampling and reporting.* If sampling performed by a user indicates a violation, the user must notify the Control Authority within twenty-four (24) hours of becoming aware of the violation. The user shall also repeat the sampling and analysis, and submit the results of the repeat analysis to the Control Authority within ~~thirty (30)~~ forty-five (45) days after becoming aware of the violation. The user is not required to resample if the Control Authority monitors at the user's facility at least once a month, or if the Control Authority samples between the user's initial sampling and when the user receives the results of this sampling. All sampling and notification performed by the user under this section shall comply with the requirements of 40 CFR 403.12 (g).

(13) *Record keeping.* Users subject to the reporting requirements of this division shall retain, and make available for inspection and copying, all records of information obtained pursuant to any monitoring activities required by this division and any additional records of information obtained pursuant to monitoring activities undertaken by the user independent of such requirements, and documentation associated with Best Management Practices established under 34-472(4)(c). Records shall include the date, exact place, method, and time of sampling, and the name of the person(s) taking the samples; the dates analyses were performed; who performed the analyses; the analytical techniques or methods used; and the results of such analyses. Documentation shall include all necessary data and reports necessary to show compliance with the narrative BMP as described in the IU Permit. These records shall remain available for a period of at least three (3) years by both the IU and CA. This period shall be automatically extended for the duration of any litigation concerning the user or the control authority, or where the user has been specifically notified of a longer retention period by the control authority.

Sec. 34-480. - Publication of users in significant noncompliance.

The control authority shall publish annually, in any paper of general circulation within the jurisdiction served by the POTW that provides meaningful public notice ~~the largest daily newspaper published in the municipality where the POTW is located~~, a list of the users which, during the previous twelve (12) months, were in significant noncompliance with applicable pretreatment standards and requirements as defined in section 34-471.

Sec. 34-481. - Enforcement.

Users who violate any term or condition of this division or of their permit shall be subject to enforcement action by the control authority. Such enforcement action will be applied in accordance with the enforcement response plan and may include legal action or other appropriate enforcement remedies as provided for below:

(3) *Notice of violation (NOV).* When the control authority determines that a user has violated, or continues to violate, any provision of this division, a wastewater discharge permit or order issued hereunder, or any other pretreatment standard or requirement, the control authority may serve (either personally or by registered or certified mail, return receipt requested) upon that user a written notice of violation. Within fifteen (15) working days of the mailing date or personal delivery date of such notice, an explanation for the violation and measures taken and/or to be taken for the satisfactory correction and prevention thereof, to include specific required actions, shall be submitted by the user to the control authority. Submission of this response in no way relieves the user of liability for any violations occurring before or after receipt of the notice of violation. Nothing in this section shall limit the authority of the control authority to take any action, including emergency actions or any other enforcement action, without first issuing a notice of violation. ~~The first notice issued shall be called an advisory notice.~~

DIVISION 5. Fats, Oils and Grease.

Sec. 34-525. General provisions.

(c) *Definitions*. As used anywhere in this division, the following terms are defined to mean:

City Code: The City of San Antonio, Texas Code of Ordinances.

Sec. 34-526. Interceptors.

(b) *Interceptor required*. Each FSE and FPE shall discharge all waste from sinks, dishwashers, drains, and any other fixtures or sources through which fats, oils, or grease may be discharged into the POTW into a properly maintained and functioning interceptor that complies with the requirements of Chapter ~~24~~10~~,~~ of the City Code ~~of Ordinances~~ and the International Plumbing Code and appendices as amended that are adopted by the City in that chapter.

(c) *Existing facilities*. Existing FSEs and FPEs that are not equipped with an interceptor that complies with the requirements of Chapter ~~24~~10~~,~~ of the City Code ~~of Ordinances~~ and the International Plumbing Code and appendices as amended that are adopted by the City in that chapter shall install such an interceptor not later than one hundred and eighty (180) days after the effective date of the ordinance from which this division derives.

(d) *New facilities*. New FSEs and FPEs shall be equipped with an interceptor that complies with the requirements of Chapter ~~24~~10~~,~~ of the City Code ~~of Ordinances~~ and the International Plumbing Code and appendices as amended that are adopted by the City in that chapter prior to commencement of any discharge into the POTW.

Sec. 34-529. Prohibitions.

(b) *Removed interceptor waste*. Liquids removed from an interceptor that has a capacity equal to or less than 100 gallons may be returned to an interceptor that complies with the requirements of this Division. Grease, solids, or any matter other than liquids removed from an interceptor that has a capacity equal to or less than 100 gallons shall not be returned to an interceptor and shall not be disposed of in any private sanitary sewer line or any portion of the POTW and must be disposed of in a facility that is authorized by law to receive such wastes. Liquids removed from an interceptor that has a capacity equal to or less

than 100 gallons that are not returned to an interceptor shall not be disposed of in any private sanitary sewer line or any portion of the POTW and must be disposed of in a facility that is authorized by law to receive such wastes. Grease, solids, liquids, or any other matter removed from an interceptor that has a capacity greater than 100 gallons shall not be returned to any interceptor, or disposed of in any private sanitary sewer line, any portion of the POTW, or any location other than a facility that is authorized by law to receive such wastes.

APPENDIX D

WORK PLAN REFINEMENT NOTICES

R&H OIL/TROPICANA ENERGY SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study Work Plan, Sampling and Analysis Plan, Field Sampling Plan (all dated September 24, 2010, as revised by letter dated December 21, 2010)

DATE: April 25, 2011

DESCRIPTION OF REFINEMENT/MODIFICATION:

Borings advanced on the Site for the purposes of groundwater and non-aqueous phase liquid (NAPL) monitoring well installation will be terminated upon reaching the base of the uppermost groundwater-bearing unit (GWBU), a silty sand (or similar material) underlain by a silty clay or similar fine grained material, rather than being advanced to the top of the Navarro Shale as described in the reference documents. Borings may penetrate into the underlying fine grained material to confirm the base of the GWBU has been reached and to evaluate the layer for evidence of potential impacts (visual, odor, organic vapor readings).

RATIONALE FOR REFINEMENT/MODIFICATION:

Information obtained during the initial stage of the RI/FS indicates that soil and groundwater impacts associated with the Site are likely limited to the vadose zone and uppermost GWBU (approximately 25 feet below ground surface), which is underlain by laterally extensive, unsaturated, fine-grained material. Draft cross-sections presenting the shallow geology of the Site are included with this Notice as Attachment A. Groundwater data collected from a deeper sand and gravel zone (below the fine-grained material) within the terrace deposit suggest that groundwater in this zone is not impacted by Site COCs. Terminating the soil borings and monitoring wells at the base of the uppermost GWBU is appropriate for the following reasons:

- It reduces the potential for contaminants in the vadose zone to be carried into a deeper, potentially non-impacted zone during drilling;
- It eliminates a potential conduit for transport of impacted groundwater within the uppermost GWBU to the deeper, potentially unimpacted sand and gravel zone;
- Existing site wells installed to the top of the Navarro Shale will be used to evaluate the presence of dense non-aqueous phase liquids and COC concentrations in groundwater within the sands and gravels at the base of the terrace deposit; and
- Site conditions will be better understood utilizing monitoring wells installed at discrete intervals in the uppermost GWBU, rather than wells that extend across multiple saturated zones within the terrace deposit.

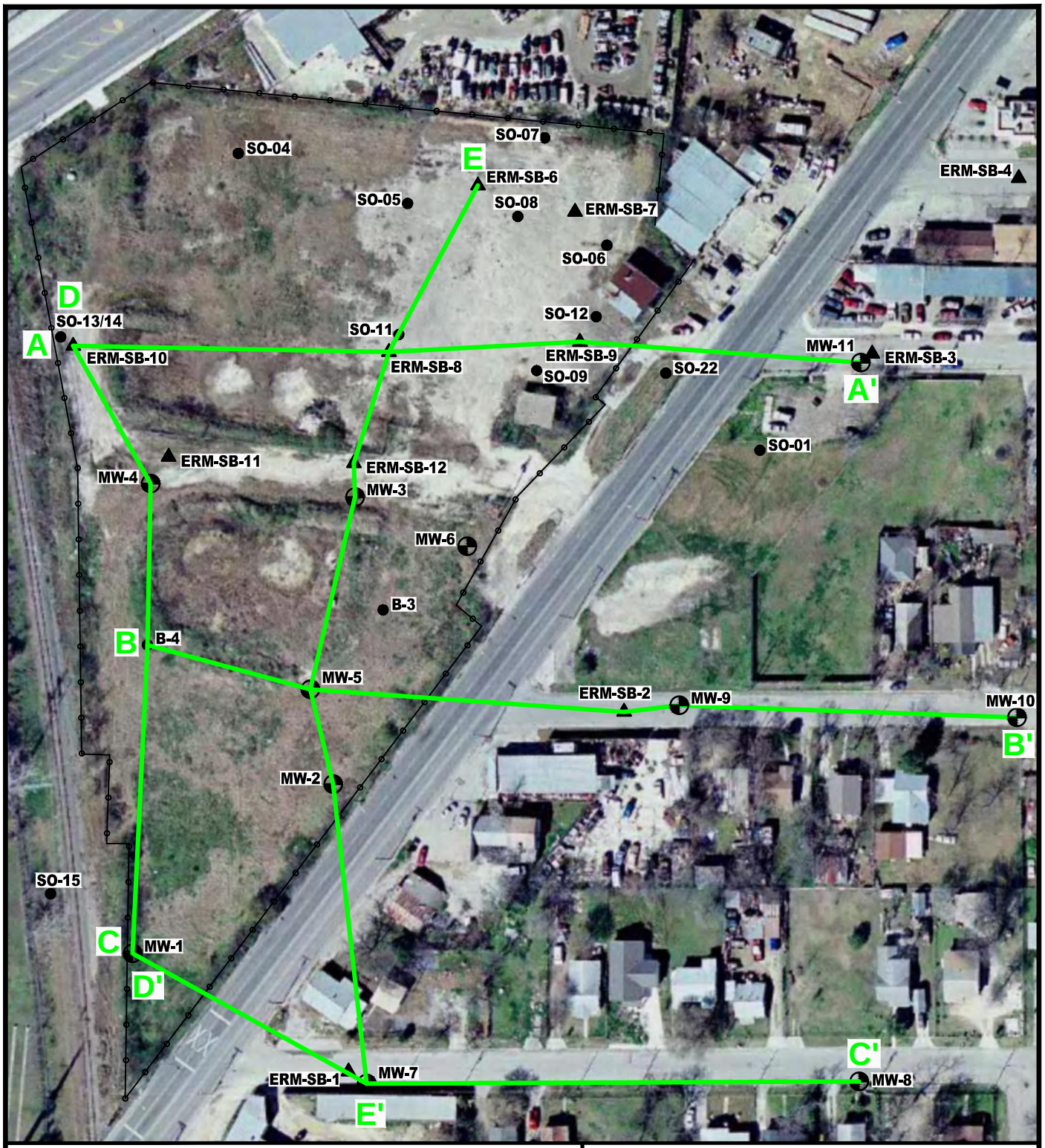
APPROVALS:

Respondents' Project Coordinator: _____ Date: 4/25/11
Eric Pastor
Pastor, Behling & Wheeler, LLC

TCEQ Project Manager: Marilyn Long Date: 4/25/2011
Marilyn Long

EPA Project Manager: Chris Villarreal Date: 4/25/2011
Chris Villarreal

ATTACHMENT A
DRAFT GEOLOGIC CROSS-SECTIONS



EXPLANATION

- Site Boundary Fence Soil
- Boring/Temporary Well
- Groundwater Monitoring Well
- Grab Soil Sample
- A A' Cross Section Location

Note: All locations are approximate.

N

Approx. Scale in Feet

0 60 120

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03. Sample locations from Removal Site Evaluation Reports (E&E, August 1998) and ERM Site Investigation Report (September 2004).

R&H OIL/TROPICANA ENERGY SITE

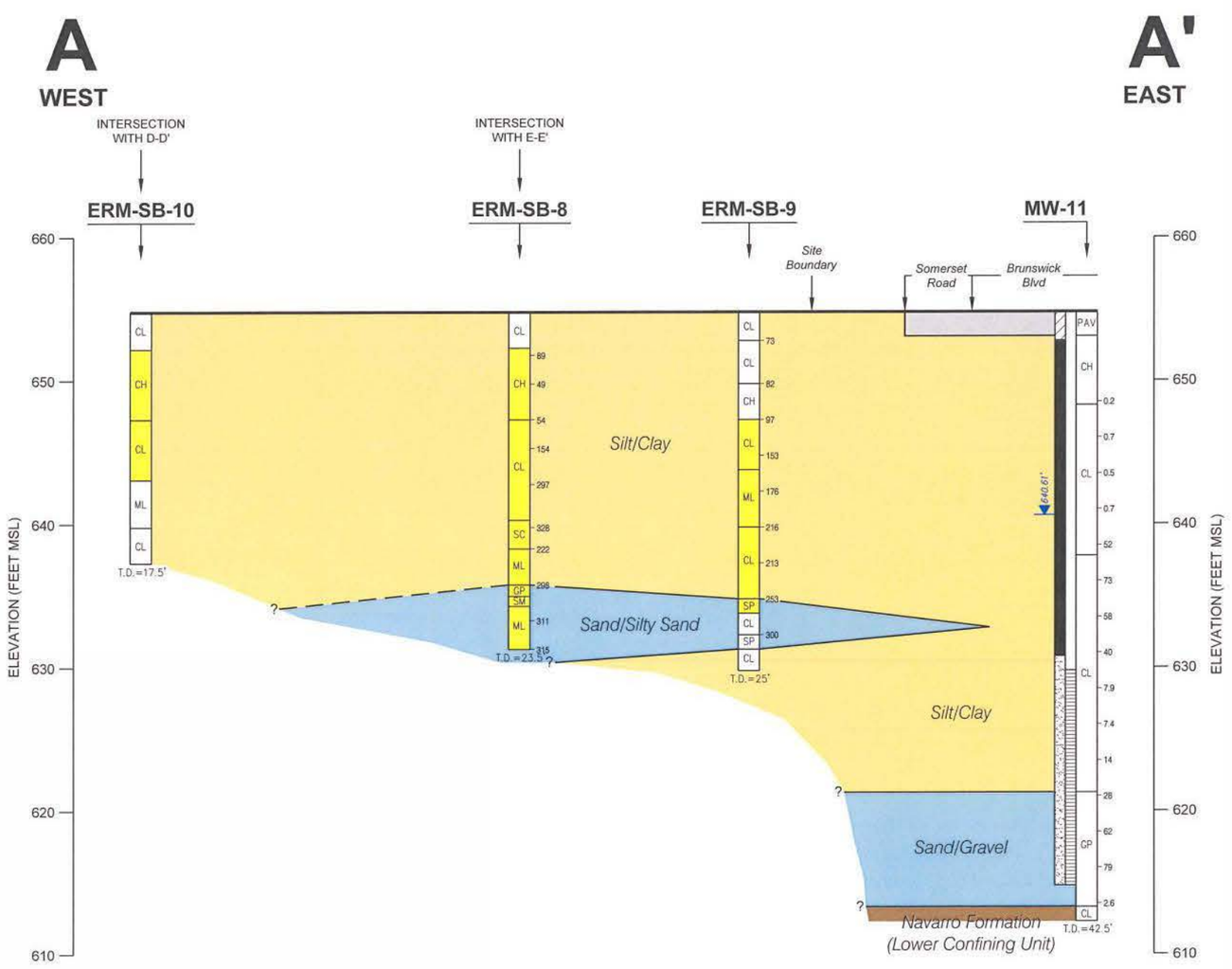
Figure 1

CROSS SECTION LOCATIONS

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: FEB., 2011	CHECKED: EFP	

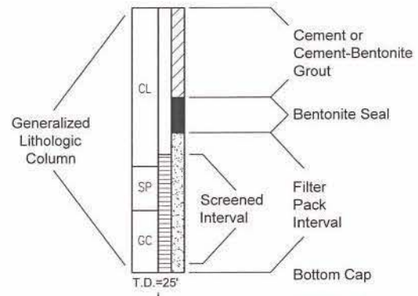
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

DRAFT



EXPLANATION

MONITORING WELL CONSTRUCTION



73 / 82 / 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Water Level Measured 2/1/11

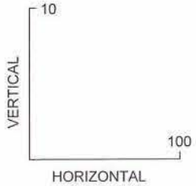
GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GP	Poorly Graded Gravel
SC	Clayey Sand, Plastic Fines (≥15% Fines)
SM	Silty Sand, Non-Plastic Fines (≥15% Fines)
SP	Poorly Graded Sand

Highlighted zones indicate non-aqueous phase liquid (NAPL) observed during drilling

Notes:
1. See Figure 1 for cross section location.
2. Lithologic information for borings ERM-SB-6, ERM-SB-8, ERM-SB-9, ERM-SB-10, and ERM-SB-12 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-1 through MW-6 and B-4 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

SCALE IN FEET



10x Vertical Exaggeration

R&H OIL/TROPICANA ENERGY SITE

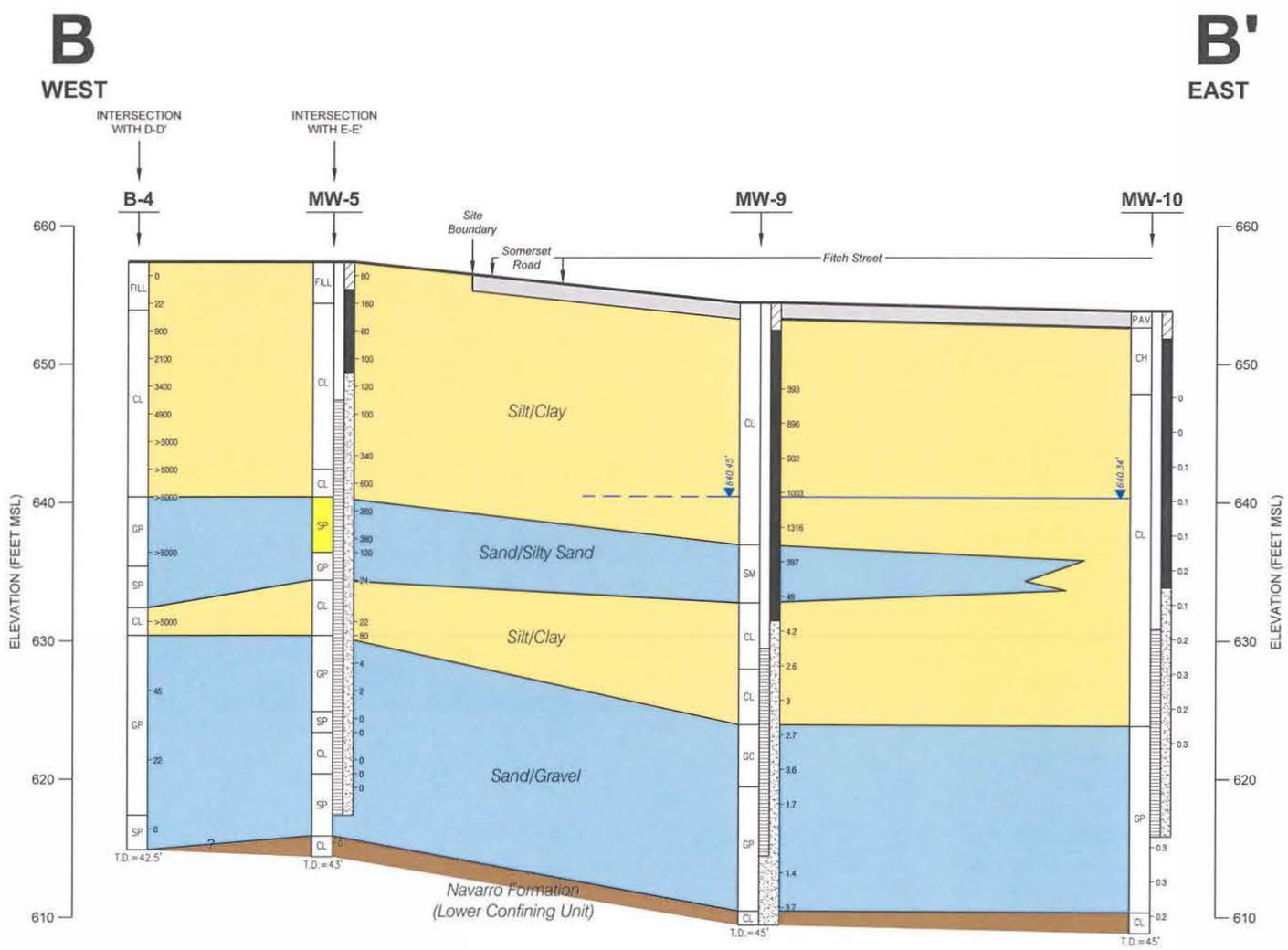
Figure 2

CROSS SECTION A-A'

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: EFP	

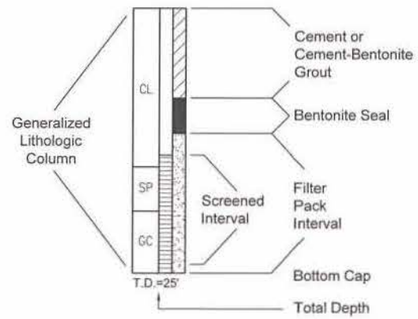
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

DRAFT



EXPLANATION

MONITORING WELL CONSTRUCTION



73
82
97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Water Level Measured 2/1/11

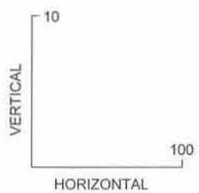
GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GP	Poorly Graded Gravel
SC	Clayey Sand, Plastic Fines (≥15% Fines)
SM	Silty Sand, Non-Plastic Fines (≥15% Fines)
SP	Poorly Graded Sand

Highlighted zones indicate non-aqueous phase liquid (NAPL) observed during drilling

Notes:
1. See Figure 1 for cross section location.
2. Lithologic information for borings ERM-SB-6, ERM-SB-8, ERM-SB-9, ERM-SB-10, and ERM-SB-12 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-1 through MW-6 and B-4 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

SCALE IN FEET



10x Vertical Exaggeration

R&H OIL/TROPICANA ENERGY SITE

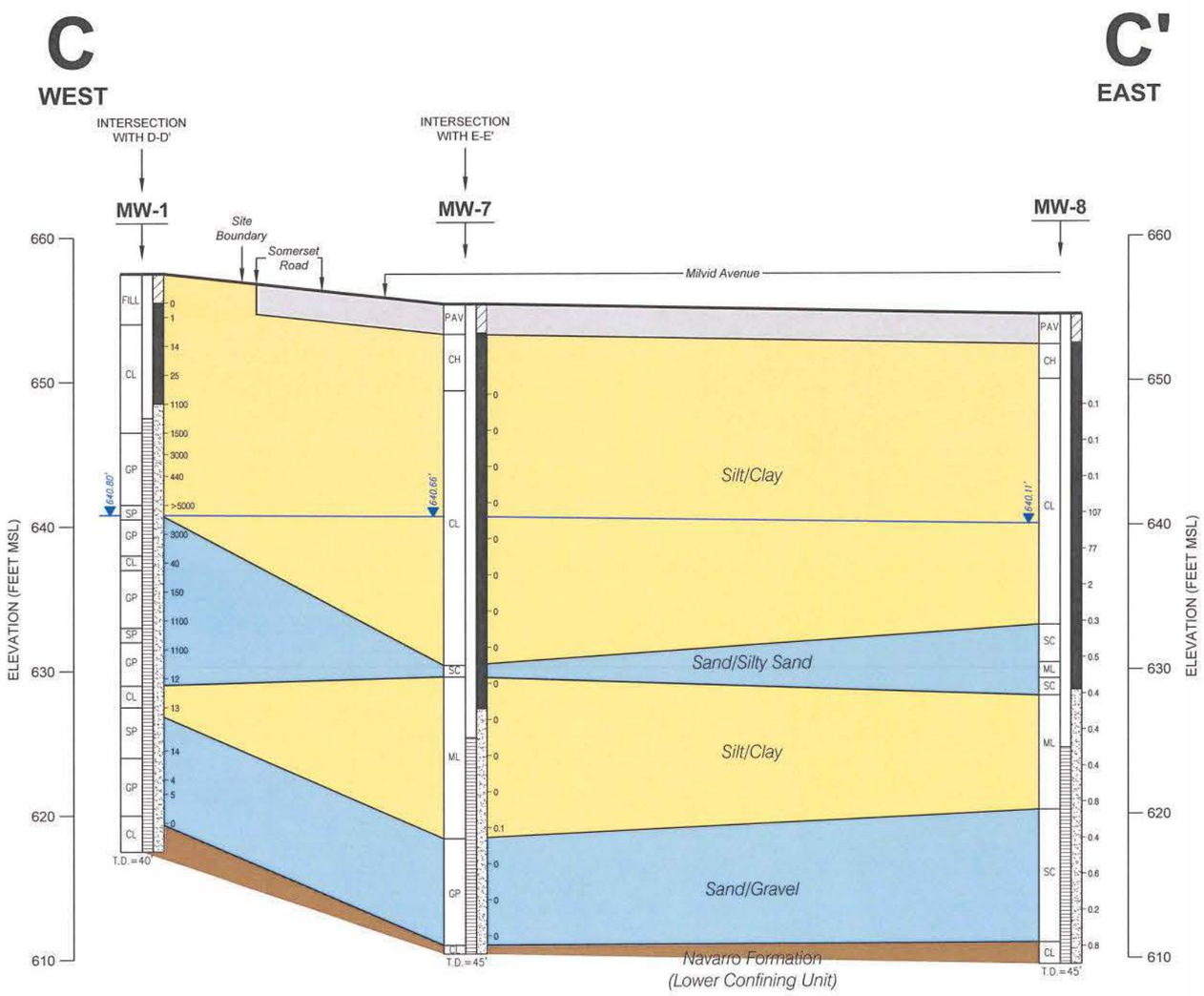
Figure 3

CROSS SECTION B-B'

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: EFP	

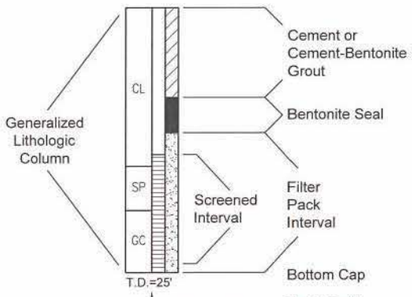
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

DRAFT



EXPLANATION

MONITORING WELL CONSTRUCTION



73, 82, 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Water Level Measured 2/1/11

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GP	Poorly Graded Gravel
SC	Clayey Sand, Plastic Fines (≥15% Fines)
SM	Silty Sand, Non-Plastic Fines (≥15% Fines)
SP	Poorly Graded Sand

Highlighted zones indicate non-aqueous phase liquid (NAPL) observed during drilling

Notes:
1. See Figure 1 for cross section location.
2. Lithologic information for borings ERM-SB-6, ERM-SB-8, ERM-SB-9, ERM-SB-10, and ERM-SB-12 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-1 through MW-6 and B-4 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

SCALE IN FEET

VERTICAL 10

HORIZONTAL 100

10x Vertical Exaggeration

R&H OIL/TROPICANA ENERGY SITE

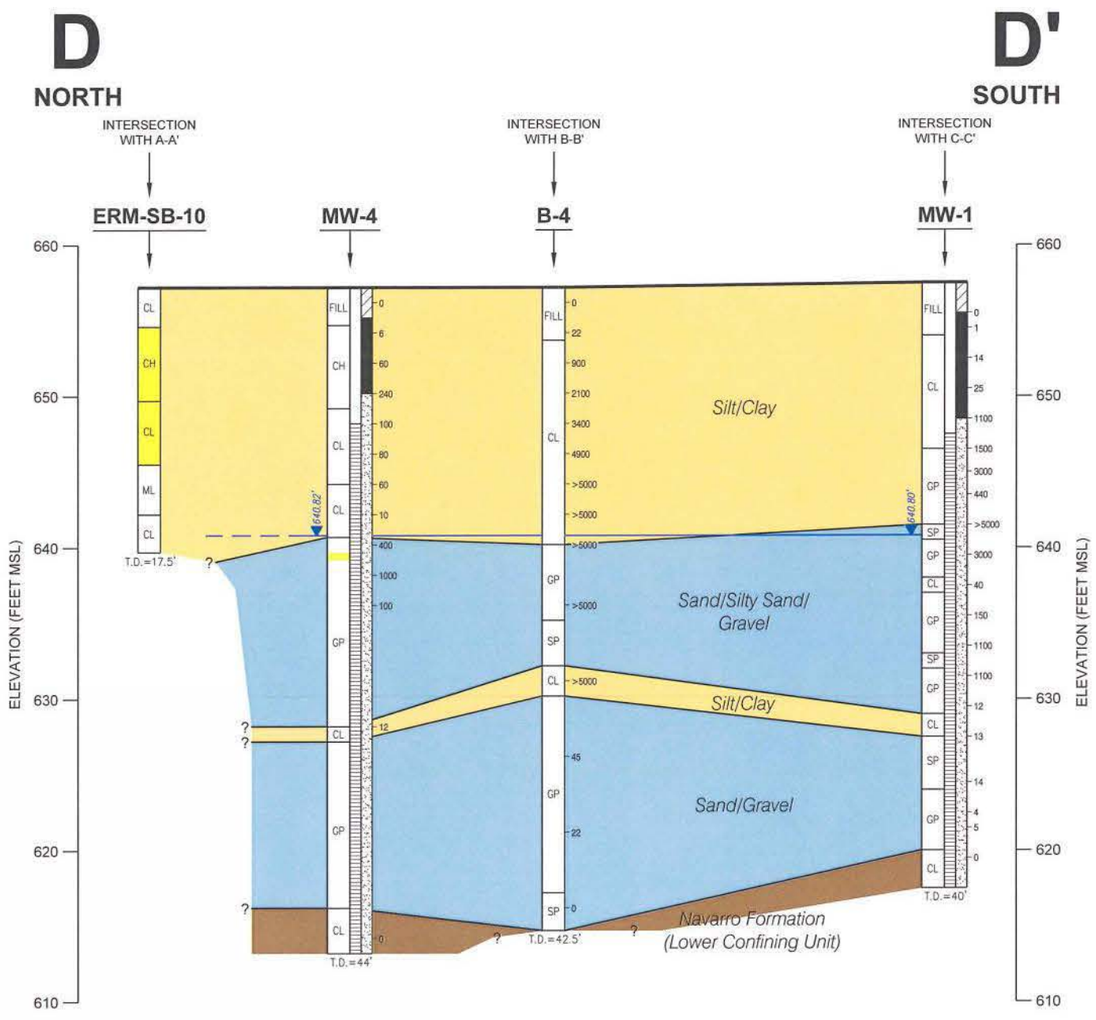
Figure 4

CROSS SECTION C-C'

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: EFP	

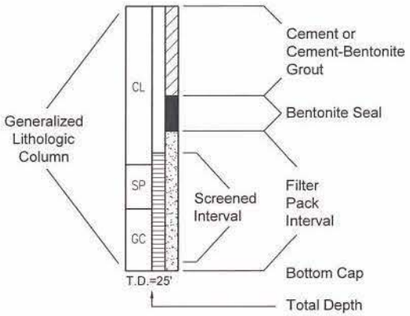
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

DRAFT



EXPLANATION

MONITORING WELL CONSTRUCTION



73, 82, 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Water Level Measured 2/1/11

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GP	Poorly Graded Gravel
SC	Clayey Sand, Plastic Fines (≥15% Fines)
SM	Silty Sand, Non-Plastic Fines (≥15% Fines)
SP	Poorly Graded Sand

Highlighted zones indicate non-aqueous phase liquid (NAPL) observed during drilling

Notes:
1. See Figure 1 for cross section location.
2. Lithologic information for borings ERM-SB-6, ERM-SB-8, ERM-SB-9, ERM-SB-10, and ERM-SB-12 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-1 through MW-6 and B-4 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

SCALE IN FEET

VERTICAL 10

HORIZONTAL 100

10x Vertical Exaggeration

R&H OIL/TROPICANA ENERGY SITE

Figure 5

CROSS SECTION D-D'

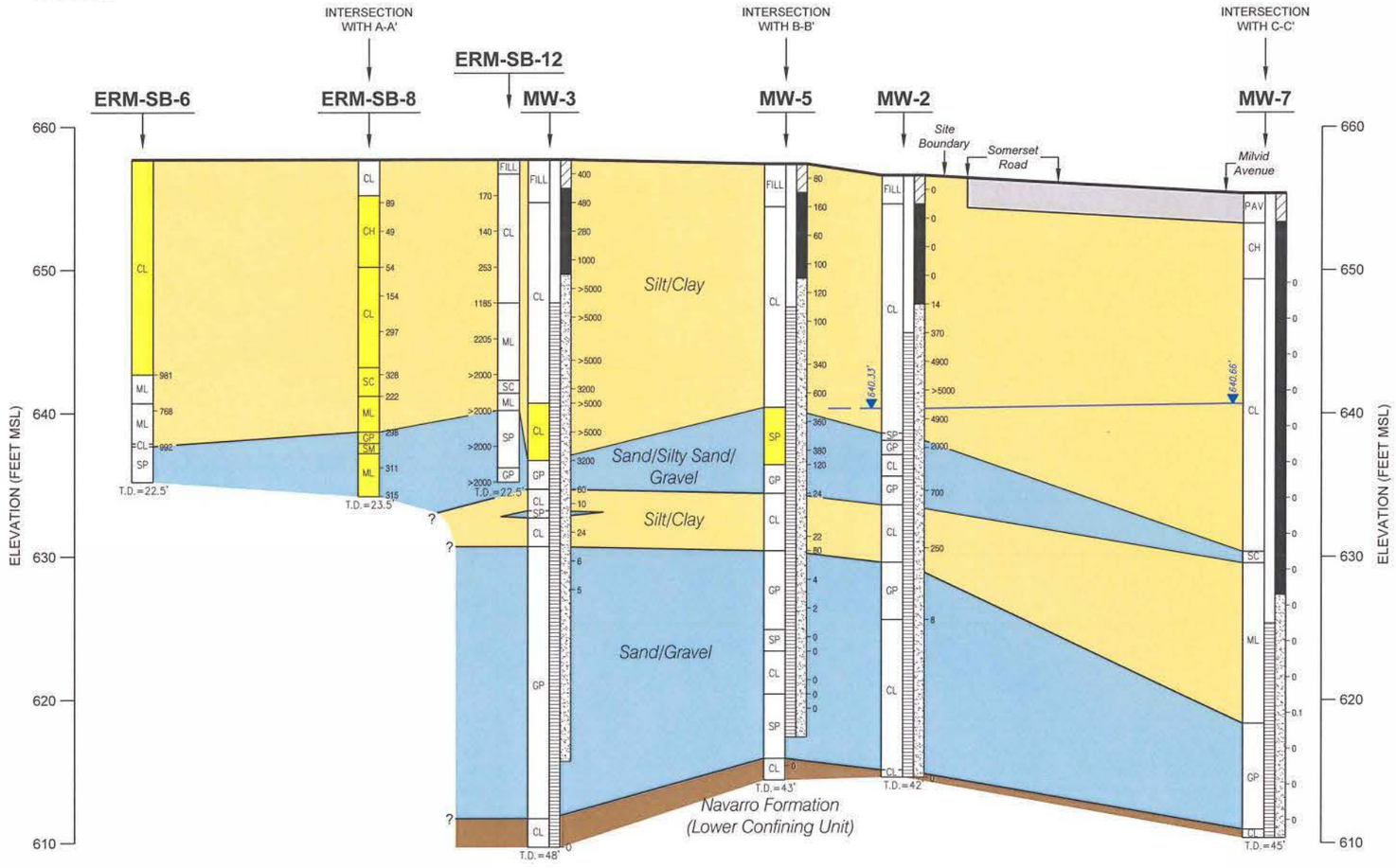
PROJECT: 1651	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

DRAFT

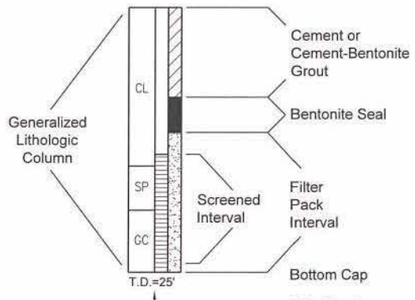
E — NORTH

E' — SOUTH



EXPLANATION

MONITORING WELL CONSTRUCTION



73 / 82 / 97 — Organic Vapor Meter (OVM) soil sample headspace measurement (ppmv)

Water Level Measured 2/1/11

GENERALIZED LITHOLOGIC ABBREVIATIONS

Pav	Pavement
Fill	Fill Material
CH	Fat Clay, High Plasticity
CL	Sandy, or Silty Clay, Lean, Low to Medium Plasticity
ML	Sandy Silt
GC	Clayey Gravel
GP	Poorly Graded Gravel
SC	Clayey Sand, Plastic Fines (≥15% Fines)
SM	Silty Sand, Non-Plastic Fines (≥15% Fines)
SP	Poorly Graded Sand

Highlighted zones indicate non-aqueous phase liquid (NAPL) observed during drilling

SCALE IN FEET

VERTICAL 10 — HORIZONTAL 100

10x Vertical Exaggeration

Notes:
1. See Figure 1 for cross section location.
2. Lithologic information for borings ERM-SB-6, ERM-SB-8, ERM-SB-9, ERM-SB-10, and ERM-SB-12 from Preliminary Site Investigation Summary Report - R&H Oil Company Site, Environmental Resources Management, 2004.
3. Lithologic information for borings MW-1 through MW-6 and B-4 from Phase II Remedial Investigation, Tropicana Energy Company, Inc., Raba-Kistner Consultants, Inc., 1991.

R&H OIL/TROPICANA ENERGY SITE

Figure 6

CROSS SECTION E-E'

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

R&H OIL/TROPICANA ENERGY SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study Work Plan, Sampling and Analysis Plan, Field Sampling Plan (all dated September 24, 2010, as revised by letter dated December 21, 2010)

DATE: March 26, 2012

DESCRIPTION OF REFINEMENT/MODIFICATION:

Two additional monitoring wells will be installed in the shallow groundwater-bearing zone downgradient/east of the Site to characterize the shallow ground water in this area. The monitoring wells will be located on Fitch Street (near existing well MW-9) and Milvid Avenue (near existing well MW-8). Based on the shallow geology observed during the installation of wells MW-8 and MW-9, the proposed wells (MW-21 and MW-22) will be installed to a depth of approximately 23 feet below ground surface with a screen interval of 10 feet to 23 feet below ground surface. Monitoring well installation, construction and sampling will be in accordance with procedures described in the approved Work Plan.

Soil gas sample points will also be installed in the vicinity of wells MW-8 and MW-9. The sample points will be installed and sampled in accordance with procedures described in the approved Work Plan. Soil samples may be collected during monitoring well or soil gas point installation if field conditions warrant.

RATIONALE FOR REFINEMENT/MODIFICATION:

Groundwater data collected during the June and October 2011 groundwater monitoring events indicate that Site COCs are not fully delineated in shallow groundwater to the Extent Evaluation Values (EEVs) at the downgradient Site boundary. Along the downgradient property boundary, the highest concentration of Site COCs in groundwater is in the area immediately adjacent and upgradient of Fitch Street (e.g., MW-17, MW-6 and MW-19). Shallow groundwater concentrations south of this area are below the EEVs at the property boundary (MW-20). Based on the shallow geology observed during installation of the off-site wells, the shallow groundwater-bearing unit does not appear to extend much further beyond well MW-9, with the silty sand layer terminating in a silty clay.

Soil gas samples are proposed to be collected in the vicinity of wells MW-8 and MW-9 to evaluate the potential for vapor intrusion impacts related to the off-site portion of the groundwater plume. Organic vapors were detected in shallow soil headspace samples during the installation of wells MW-8 and MW-9.

APPROVALS:

Respondents' Project Coordinator: _____ Date: 3/27/2012
Eric Pastor
Pastor, Behling & Wheeler, LLC

TCEQ Project Manager: _____ Date: 3/27/2012
Marilyn Long

EPA Project Manager: _____ Date: 3/27/2012
Chris Villarreal

ATTACHMENT A
PROPOSED MONITORING WELL AND SOIL GAS SAMPLE LOCATION MAP

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- NAPL Monitoring Well
- Proposed Monitoring Well Location
- Proposed Soil Gas Sample Point

N

Approx. Scale in Feet

0 60 120

Note: All locations are approximate

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03

R&H OIL/TROPICANA ENERGY SITE

Attachment A

PROPOSED MONITORING WELL AND SOIL GAS SAMPLE LOCATION MAP

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: MAR., 2012	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

R&H OIL/TROPICANA ENERGY SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study Work Plan, Sampling and Analysis Plan, Field Sampling Plan (all dated September 24, 2010, as revised by letter dated December 21, 2010)

DATE: October 17, 2012

DESCRIPTION OF REFINEMENT/MODIFICATION:

Three additional surface soil samples will be collected along the northwest property boundary. Soil samples will be analyzed for the suite of compounds listed on Table 11 of the Approved RI/FS Work Plan.

RATIONALE FOR REFINEMENT/MODIFICATION:

During a conference call conducted between EPA, TCEQ and PBW on October 4th, 2012, concern was expressed regarding the potential for ecological impacts in the adjacent drainage ditch related to (COCs) migrating to the drainage ditch via transport by surface water runoff. To evaluate the likelihood of Site COCs migrating to the ditch from the Site, additional surface soil samples will be collected in this area to evaluate this transport pathway. The proposed locations for the additional samples include one location between existing monitoring wells MW-12 and MW-14, and two locations south of MW-14.

APPROVALS:

Respondents' Project Coordinator: _____ Date: 10/17/12
Eric Pastor
Pastor, Behling & Wheeler, LLC

TCEQ Project Manager: Marilyn Long Date: 10/17/2012
Marilyn Long

EPA Project Manager: Chris Villarreal Date: 10/17/2012
Chris Villarreal

ATTACHMENT A
PROPOSED SOIL SAMPLE LOCATION MAP

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Sample Location
- Proposed Soil Sample Location

DRAFT

N

Approx. Scale in Feet

0 60 120

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03.

R&H OIL/TROPICANA ENERGY SITE

Attachment A

SOIL SAMPLE LOCATION MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: JULY, 2012	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

R&H OIL/TROPICANA ENERGY SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study Work Plan, Sampling and Analysis Plan, Field Sampling Plan (all dated September 24, 2010, as revised by letter dated December 21, 2010)

DATE: April 14, 2014

DESCRIPTION OF REFINEMENT/MODIFICATION:

The PRP group will conduct a Site-wide groundwater monitoring event and coordinate with KAFB to collect split samples at East Kelly AFB wells in the vicinity of the R&H Oil/Tropicana Energy Site.

The attached summary table details the wells to be sampled during this event, the groundwater parameters to be measured, and the analyses to be performed.

RATIONALE FOR REFINEMENT/MODIFICATION:

To evaluate the potential for chlorinated compounds from the East Kelly AFB to be affecting the R&H Oil/Tropicana Energy Site, KAFB has agreed to sample monitoring wells in the vicinity of the Site for BTEX and chlorinated compounds. Since KAFB is conducting this sampling, it would be helpful to collect samples at the Site concurrently to have a more robust data set. Additionally, collection of natural attenuation parameters at KAFB wells upgradient, side gradient or downgradient of the Site will assist with evaluating the efficiency of natural attenuation at the Site and provide for a longer time period of data to evaluate.

ATTACHMENT A
PROPOSED SAMPLING PROGRAM

TABLE 1
SUMMARY OF APRIL 2014 GROUNDWATER SAMPLING
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

East Kelly Air Force Base Wells

Well ID	KAFB COCs	R&H Oil/Tropicana Energy COCs	Notes
SS052MW564	BTEX and chlorinated compounds	VOCs	PBW will split samples with KAFB sample team
SS052MW563		VOCs	PBW will collect groundwater parameters (temp., pH, DO, redox) using its own meter to ensure measurements are consistent with R&H Oil/Tropicana Energy Site wells
SS052MW562		VOCs	
SS052MW097		VOCs	
SS052MW125		VOCs, MNA parameters	
SS052MW184		VOCs, MNA parameters	

R&H Oil/Tropicana Energy Wells

Well ID	COCs	Notes
All wells	VOCs	MNA parameters will be collected at plume centerline wells and two sidegradient wells.
Plume Centerline wells MW-3, MW-6, MW-14, MW19, MW-21 and MW-22	VOCs, MNA parameters	MNA parameters include - Nitrate, Sulfate, Ferrous Iron (field measurement), Manganese, Methane
MW-1 and MW-20	VOCs, MNA parameters	

R&H OIL/TROPICANA ENERGY SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study Work Plan, Sampling and Analysis Plan, Field Sampling Plan (all dated September 24, 2010, as revised by letter dated December 21, 2010)

DATE: January 16, 2014

DESCRIPTION OF REFINEMENT/MODIFICATION:

Several field activities requested by EPA during its review of the Draft Baseline Human Health Risk Assessment (BHHRA) dated July 30, 2013 are included in this Work Plan Refinement Notice:

(1) Certain previously sampled soil locations with elevated levels of Total Petroleum Hydrocarbons (TPH) (NMW-1 0-0.5 ft, and MW-13 3-4 ft) will be re-sampled and analyzed for aliphatic and aromatic TPH fractions using the TX1006 analytical method (see Figure 1 for locations). Soil borings will be advanced using direct-push (Geoprobe) technology and samples will be collected from the previously sampled intervals in accordance with procedures described in the approved Work Plan. The boreholes will be backfilled to the surface with bentonite when sampling is complete. The proposed sample locations were selected based on the TPH concentrations observed in the samples and distribution around the Site. The approximate location of the proposed sampling locations are provided on the attached Figure 1. TPH fractionation data will be evaluated using the Texas Commission on Environmental Quality (TCEQ) guidance – *Development of Human Health PCLs for Total Petroleum Hydrocarbon Mixtures (TRRP-27).*

(2) Two additional soil borings will be advanced at the Site. One boring will be located centrally in the northern portion of the Site and one boring will be advanced on the southern portion of the Site (see Figure 1 for locations). These soil borings will be advanced using direct-push (Geoprobe) technology and samples will be collected and analyzed in accordance with procedures described in the approved Work Plan. The approximate locations of the proposed sample locations are provided on Figure 1. The soil samples collected from these locations will include a duplicate sample and a sample collected for analysis of a matrix spike and matrix spike duplicate, and will be analyzed for the analytical suite described in the approved Work Plan. The samples will be analyzed for TPH, the RCRA 8 metals, volatile organic compounds, and semivolatile organic compounds. Following sampling, the boreholes will be backfilled to the surface with bentonite.

(3) Three additional soil gas samples will be collected at the Site. Three temporary soil gas points will be installed at the Site along the Site perimeter adjacent to Somerset Road (see Figure 2 for locations). These sample points will be installed in accordance with the approved Work Plan, however, these will be installed as temporary sample points (no manway/vault will be installed). These sample points will be sampled and analyzed in accordance with the approved Work Plan. The samples will be analyzed for volatile organic compounds by US EPA Method TO-15 and fixed gasses by US EPA Method 3C.

RATIONALE FOR REFINEMENT/MODIFICATION:

The additional scope of work described in this Work Plan Refinement Notice is intended to address comments presented during EPA's review of the Draft Baseline Human Health Risk Assessment during our October 31, 2013 meeting. Specific rationale for the indicated activities are provided below:

(1) The relative percent fractions of aliphatic and aromatic hydrocarbons are necessary to perform certain risk calculations for TPH. Collection of this data will be used to more accurately characterize risk associated with elevated TPH concentrations previously observed in Site soil data.

(2) Two additional soil sampling locations have been selected to fill in spatial data gaps present in the original sample locations as requested by EPA.

(3) Additional soil gas samples will be collected to provide a more robust data set to supplement current off-site soil gas data. Soil gas data collected along the property boundary/Somerset Road will help to evaluate the potential for off-site migration of soil vapor and potential risk to off-site receptors in close proximity to the Site (worst case conditions). Based on the presence of a vapor source at sample location SG-16, the data from subslab vapor samples collected at the former office building approximately 50 feet away suggest that soil vapor does not travel greater than 50 feet laterally at this Site. Proposed sample location SG-25 will help further evaluate whether significant lateral soil migration is occurring.

APPROVALS:

Respondents' Project Coordinator: _____ Date: _____
Eric Pastor
Pastor, Behling & Wheeler, LLC

TCEQ Project Manager: _____ Date: _____
John Flores, TCEQ

EPA Project Manager: _____ Date: _____
Stephen Tzhone, EPA

ATTACHMENT A
PROPOSED SOIL BORING AND SOIL GAS SAMPLE LOCATION MAP

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Sample Location
- Proposed Soil Sample Location (locations are approximate)
- Proposed TPH Sample Location (locations are approximate)

N

Approx. Scale in Feet

0 60 120

Source:
http://imageserver.sanantonio.gov aerial photograph, 8/19/03.

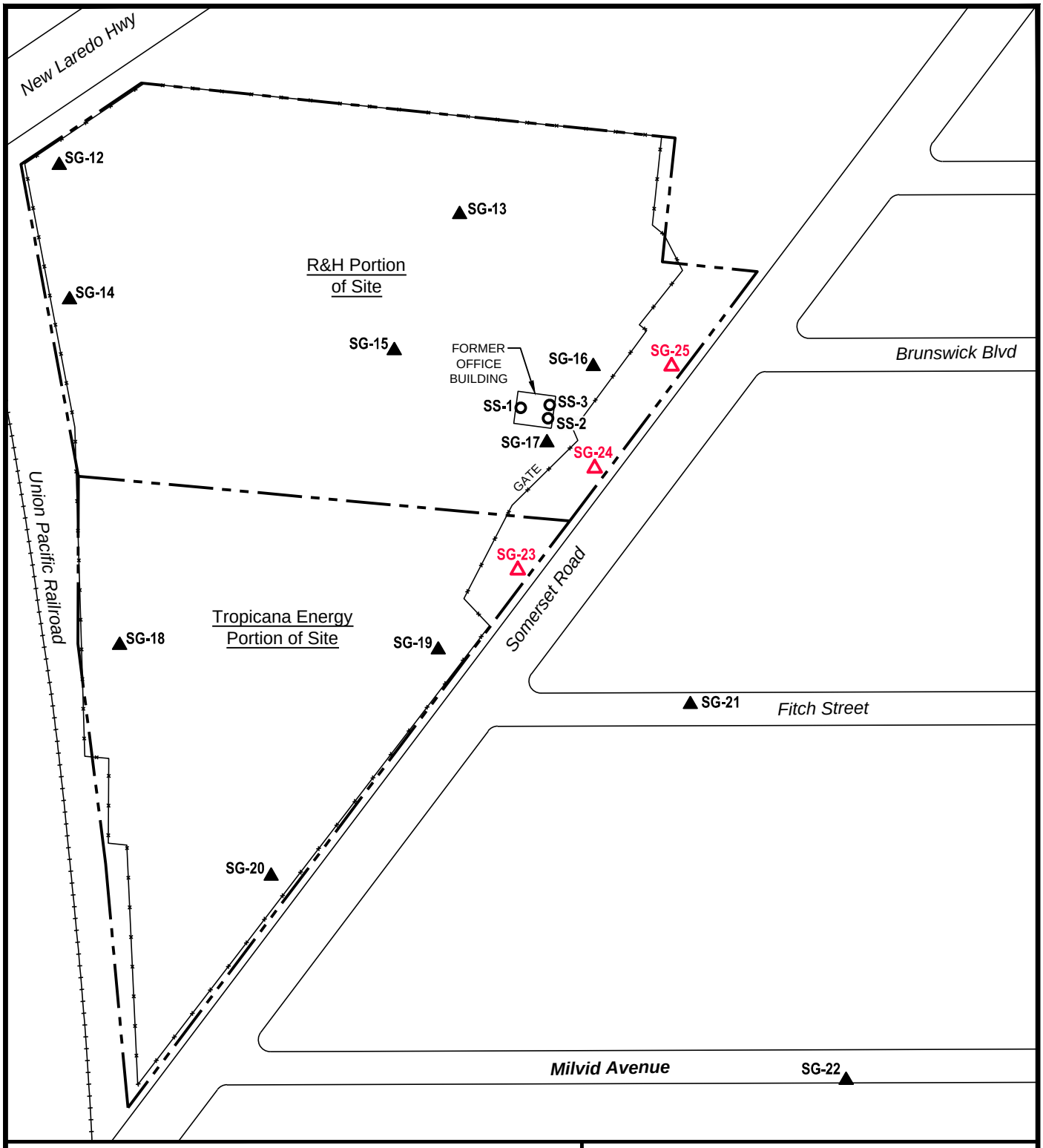
R&H OIL/TROPICANA ENERGY SITE

Figure 1

PROPOSED SOIL SAMPLE LOCATION MAP

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: NOV., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Site Boundary Fence
- Property Boundary
- Soil Gas Sample Location
- Sub Slab Sample Location
- Proposed Soil Gas Sample Location

Notes:
1. Soil gas locations are co-located with well locations MW-12 through MW-20.
2. Soil gas sample points installed at 5-6 feet below ground surface (bgs) except for SG-13 (3.5-4.5 ft bgs) and SG-18 (3-4 ft bgs).

N

Approx. Scale in Feet

0 60 120

R&H OIL/TROPICANA ENERGY SITE

Figure 2

PROPOSED VAPOR SAMPLE LOCATION MAP

PROJECT: 1651	BY: ZGK	REVISIONS
DATE: DEC., 2013	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

JAN 23 2014

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Tim Nickels, Project Scientist
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664

RE: Approval for Work Plan Refinement/Modification Notice
R&H Oil/Tropicana Energy Site, San Antonio, Texas

Dear Mr. Nickels:

This letter provides the approval for the submitted *Work Plan Refinement/Modification Notice,* dated January 16, 2014. Please proceed with implementation of this approved document.

I look forward to working with you on bringing the site Remedial Investigation/Feasibility Study to completion. If there are any questions, please feel free to contact me by telephone at 214.665.8409, or via email at tzhone.stephen@epa.gov.

Sincerely,

Stephen Tzhone
Remedial Project Manager

Enclosure

cc: John Flores, TCEQ

R&H OIL/TROPICANA ENERGY SITE
WORK PLAN REFINEMENT/MODIFICATION NOTICE

REFERENCE DOCUMENTS: Remedial Investigation/Feasibility Study Work Plan, Sampling and Analysis Plan, Field Sampling Plan (all dated September 24, 2010, as revised by letter dated December 21, 2010)

DATE: October 30, 2015

RATIONALE FOR REFINEMENT/MODIFICATION:

As discussed on the conference call conducted with EPA, TCEQ and EPA contractors on July 31, 2015, additional investigation activities were requested to complete the RI and fill remaining data needs. The basis for the additional activities were presented as follows:

1. Elevated constituent of concern (COC) concentrations (benzene at 14 mg/L) were observed in a groundwater sample from monitoring well MW-25, located north of the Site at the former MG Materials property (installed and sampled May 2015). Based on this observation, additional investigation activities to evaluate the source of COCs at MW-25 and extent of the groundwater impacts that may be associated with releases at the R&H Oil/Tropicana Energy Site have been requested.

2. Monitoring well MW-6 was installed by Raba Kistner Consultants Inc. in response to a release at the Site in 1991. This well is one of several that are screened across both the shallow and deep water-bearing zones, with screens from 10 to 40+ feet below ground surface. For consistency with the on-site wells that are only screened in the upper zone and in anticipation of development of a long-term groundwater monitoring-based remedy, an additional well screened in the upper zone is proposed to be installed near MW-6 (designated well MW-30, see attached Figure).

3. Based on the sampling results from wells MW-23 and MW-24 which indicated groundwater impacts on the north side of the Site, the installation of additional wells farther north on Somerset Road, east of the Site was discussed. A well in this area (designated MW-29) is proposed to evaluate the effectiveness of natural attenuation and to evaluate the extent of potentially impacted groundwater in this area. This monitoring well is proposed to be installed on Harlan Avenue at the intersection with Somerset Road. Based on the groundwater gradient observed in the area, a well at this location will provide information about groundwater quality north of the Site.

Per previous discussions with EPA, collection of the additional data described in this WRN should be sufficient to complete the RI/FS and no additional investigation activities are anticipated (except those that may be warranted by new data from the wells proposed in the WRN).

DESCRIPTION OF REFINEMENT/MODIFICATION:

The additional RI investigation activities will be conducted as described below; all soil investigation and monitoring well installation activities are proposed to be conducted during the same mobilization:

The PRP Group has obtained access to 227 New Laredo Highway from the current property owner, Mr. Randall Vail, for one additional investigation event. PBW will conduct a soil and groundwater investigation at the property consisting of the following:

1. Soil investigation – A geoprobe rig will be used to collect soil samples from the vadose zone within the property (where accessible) (see attached Figure 1). The vadose zone is assumed to be present at a depth between 0 and 10 feet below ground surface based on most recent groundwater elevation measurements. Soil lithology will be logged from the soil cores and the core will be screened using an organic vapor meter (OVM) to evaluate the presence of petroleum hydrocarbons. Laboratory analyses of soil samples are not proposed, however, discretionary samples may be collected if warranted based on field observations.
2. Groundwater investigation – based on the findings of the soil investigation, one monitoring well (MW-28) will be installed at the property. The well will be installed during the same mobilization as the geoprobe with the final well location based on visual observations and OVM readings. The attached Figure 1 provides a possible location for the monitoring well, however, the actual location will be dictated by field conditions and observations (and approval by the property owner). The monitoring well will be developed and sampled for volatile organic carbons (VOCs) by EPA Method 8260 in accordance with the FSP after installation.

Two additional upper-zone wells will be installed, one located near current well MW-6 (MW-30) on the Site and one located on Harlan Avenue near the intersection with Somerset Road (MW-29). The well to be installed near MW-6 will be installed to approximately 25 feet below ground surface and will be screened from 10 feet below ground surface to the bottom of the well. The well installed on Harlan Avenue will be installed in the uppermost water-bearing zone encountered during the drilling activities. Following installation, these wells will be developed in accordance with the FSP and sampled for VOCs by EPA Method 8260 in accordance with the FSP.

Newly installed monitoring wells will be developed and sampled as soon as practical after installation. Wells proposed to be sampled as part of this WRN include both wells located at 227 New Laredo Highway (MW-25 and MW-28), the well installed on Harlan Avenue (MW-29), well MW-6 and the new well installed near MW-6 (MW-30). All samples will be analyzed for VOCs by EPA Method 8260. All monitoring well installation, development and sampling activities will be performed in accordance with the approved RI/FS Work Plan and Sampling and Analysis Plan.

ATTACHMENT A

FIGURE 1 SITE MAP - PROPOSED ADDITIONAL INVESTIGATION ACTIVITIES/AREAS

EXPLANATION

- Site Boundary Fence
- Property Boundary
- Groundwater Monitoring Well
- Recovery Well
- Compliance Well
- Proposed Paired Upper Zone Well
- Proposed Off-Site Well
- Proposed MG Materials Well
- Proposed MG Materials Soil Probe Investigation Area

N

Approx. Scale in Feet

0 90 180

Source of photo:
Google Maps accessed March 12, 2014. Imagery date: February 16, 2013.

R&H OIL/TROPICANA ENERGY SITE

Figure 1

SITE MAP

PROJECT: 1651	BY: AJD	REVISIONS
DATE: OCT., 2015	CHECKED: EFP	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

APPENDIX E

SOIL BORING LOGS/WELL CONSTRUCTION DIAGRAMS

LOG OF BORING NO. MW-1
TROPICANA ENERGY COMPANY
SAN ANTONIO, TEXAS

DRILLING METHOD: Hollow Stem Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FORMATION	Monitor Well	FID (ppm)	LABORATORY ANALYSES (ppm) B	T	E	X	TPH	%-200
			SURFACE ELEVATION: 657.50' TOC ELEVATION: 657.07'									
			CLAY, Black with concrete, gravel, and cobbles, Dry	Fill		ND						
			SAND, Silty, Fine, Tan with roots and gravel, Dry			1						
5			CLAY, Silty, Sandy with caliche and gravel, Gray, Dry - hydrocarbon odor from 4' to 37'			14 25 1100						
10			- tan from 10' to 11'			1500						
			GRAVEL, Clayey, Sandy,, Gray with chert fragments - moist at 12' - tan and gray from 13.5' to 15'			3000 440						
15						5000+	16	<2.5	45	8.1	4274	
			SAND, Tan with gravel and cobbles, Moist			3000						
20			GRAVEL, Clayey, Sandy, Tan with cobbles, Moist	Qt		~~40~~						
			CLAY, Tan and Gray with gravel, Dry			150						
			SAND, Clayey, Gravelly, Tan and Gray, Saturated			1100						
25			GRAVEL, Sandy, Gravel with cobbles, Moist - saturated from 21' to 24.5'			~~1100~~ 12						
			Sand with minor gravel, Tan, Medium Moist									
30			GRAVEL, Sandy, Clayey with cobbles, Tan, Saturated			13 14						
			CLAY, Sandy, Silty, Gravelly, Tan and Gray, Moist			4						
35			SAND, Medium, Tan - with clay, sand, and gravel, moist from 32.7' to 33.4'			5 ~~ND~~						
			GRAVEL, Sandy with cobbles, Tan and Gray, Saturated	Kknm			<0.4	<0.4	<0.4	<0.4	<10	
40			CLAY, Gray and Reddish-Brown, Dry - oxidation layer - sand layer at 38.5' - limestone fragments at 38.8'									
45												
50			GROUNDWATER CHEMISTRY RESULTS				<0.3	<0.3	<0.3	<0.3	5	

DEPTH DRILLED:	40.0'	DEPTH TO WATER:	11.81'	PROJ. No.	ASB90-033-01
DATE DRILLED:	10-25-90	DATE MEASURED:	1-31-91	PLATE	5

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT.

LOG OF BORING NO. MW-2
TROPICANA ENERGY COMPANY
SAN ANTONIO, TEXAS

DRILLING METHOD: Hollow Stem Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FORMATION	Monitor Well	FID (ppm)	LABORATORY ANALYSES (ppm) B	T	E	X	TPH	%-200
			SURFACE ELEVATION: 656.60' TOC ELEVATION: 655.96'									
			CLAY, with minor gravel and roots, Gray, Dry - tan from 1' to 2'	Fill		ND						
			CLAY, Gray, Dry - with silt and caliche nodules from 2' to 8.8'			ND ND						
5			- hydrocarbon odor from 8' to 32' - tan and gray, with caliche and sand, green stains, moist from 8.8 to 12'			ND 14 370						
10			CLAY, Silty with some sand, Tan and Gray, Moist			4900 5000+						
15						4900	<0.4	<0.4	6.5	6.0	1800	
			SAND, Clayey with silt, Tan and Gray, Saturated			2000						
20			GRAVEL, Clayey, Sandy, Gray, Saturated									
			CLAY, Silty with sand and gravel, Tan and Gray	Qt		700						
25			GRAVEL, Sandy, Clayey			250						
			CLAY with some sand, Gray and Tan									
30			GRAVEL, Clayey, Sandy			8						
			CLAY, Gravelly, Sandy with chert fragments									
35												
40						ND	<0.4	<0.4	<0.4	<0.4	<10	
			CLAY, Reddish-Brown and Gray with limestone fragments	Kknm								
45												
50			GROUNDWATER CHEMISTRY RESULS				0.95	<0.005	0.033	0.081	5	

DEPTH DRILLED: 42.0' | DEPTH TO WATER: 10.79' | PROJ. No. ASB90-033-01
DATE DRILLED: 10-26-90 | DATE MEASURED: 1-31-91 | PLATE 6

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT.

LOG OF BORING NO. MW-3
TROPICANA ENERGY COMPANY
SAN ANTONIO, TEXAS

DRILLING METHOD: Hollow Stem Auger

LOCATION: See Plate 2

SURFACE ELEVATION: 657.70'
TOC ELEVATION: 657.26'

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FORMATION	Monitor Well	FID (ppm)	LABORATORY ANALYSES (ppm) B	T	E	X	TPH	%-200
			GRAVEL, Sandy, Tan	Fill		400						
			CLAY with gravel, Gray and Black, Dry			480						
5			SAND with gravel, clay, and chert nodules, Dry - hydrocarbon odor from 2' to 27'			280 1000 5000+						
10			CLAY, Silty, Gray, Dry - wood fragments from 2' to 7' - with some caliche nodules from 5' to 11' - green stains at 9'			5000+						
			CLAY, Silty, Massive, Tan and Gray, Dry - with caliche nodules from 11' to 13' - with green stains - mottled from 15' to 17'			5000+ 3200						
15						5000+						
20			CLAY, Silty with sand, Tan, Moist - light oil from 19' to 22.5' - saturated at 19'			5000+	81	880	200	1500	64000	
			GRAVEL with sand and silt, Tan, Saturated	Qt		3200 60						
25			CLAY, Silty with sand, Gray and Tan, Dry			10 24						
			SAND with clay, Tan, Saturated			6						
			CLAY with sand and silt, Tan and Gray, Dry			5						
30			GRAVEL with sand and clay, Tan, Saturated									
			GRAVEL, Clayey, Tan - with some cobbles									
35												
40			- with sand from 40' to 46'									
45												
			CLAY, Gray and Reddish-Brown with limestone fragments	Kkrim		ND	<0.4	<0.4	<0.4	≤0.4	≤10	
50			GROUNDWATER CHEMISTRY RESULTS				2.6	7.3	0.7	6.6	5	

DEPTH DRILLED: 48.0'
DATE DRILLED: 1-14-91

DEPTH TO WATER: 12.04'
DATE MEASURED: 1-31-91

PROJ. No. ASB90-033-01
PLATE 7

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT.

LOG OF BORING NO. MW-4
TROPICANA ENERGY COMPANY
SAN ANTONIO, TEXAS

ATTACHMENT 11
Page 18 of 90

DRILLING METHOD: Hollow Stem Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FORMATION	Monitor Well	FID (ppm)	LABORATORY ANALYSES (ppm) B	T	E	X	TPH	%-200
			SURFACE ELEVATION: 657.20' TOC ELEVATION: 656.71'									
			SAND, Silty, Clayey with gravel, Brown	Fill		ND						
			CLAY with some gravel and caliche nodules, Gray to Light Gray, Moist - hydrocarbon odor from 2' to 22' - with asphalt fragments from 2.3' to 4' - black with leaves and roots from 6' to 8'			6 60 240 100 80	<0.4	2.9	<0.4	18	25000	
			CLAY, Silty, Gray, Dry - with caliche nodules - green stains from 10' to 13'			60 10						
			CLAY with caliche, Gray and Tan, Dry			400						
			GRAVEL with sand, clay, and chert nodules - saturated at 17.5' - light oil from 17.5' to 18'	Qt		1000 100	<0.4	1.3	0.9	12	11000	
			GRAVEL with sand, Gray, Saturated									
			- with clay from 29' to 30'			12						
			CLAY, Gray and Reddish-Brown	Kknm		ND	<0.4	<0.4	<0.4	<0.4	<10	
			GROUNDWATER CHEMISTRY RESULTS				0.7	0.06	0.05	0.23	<1	

DEPTH DRILLED: 44.0' | DEPTH TO WATER: 11.22' | PROJ. No. ASB90-033-01
DATE DRILLED: 1-15-91 | DATE MEASURED: 1-31-91 | PLATE 8

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT.

LOG OF BORING NO. MW-5
TROPICANA ENERGY COMPANY
SAN ANTONIO, TEXAS

DRILLING METHOD: Hollow Stem Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FORMATION	Monitor Well	FID (ppm)	LABORATORY ANALYSES (ppm) B	T	E	X	TPH	%-200
			SURFACE ELEVATION: 657.40' TOC ELEVATION: 656.97'									
			GRAVEL with sand and clay, Tan, Dry	Fill		80						
			CLAY with gravel, Black - hydrocarbon odor from 2' to 29'			160						
5			CLAY with some silt and sand, Gray to Light Gray, Dry - with roots and wood fragments, caliche nodules, and green stains			60 100						
10			- caliche at 11'			120 100 340						
15			CLAY, Sandy, Tan and Gray, Mottled, Dry - gravel at 16.5'			600 360						
20			SAND, Clayey, Tan and Gray, Mottled, Moist with some gravel - light oil from 18' to 19' - saturated at 19'			380	<0.4	15	44	140	460	
			GRAVEL, Clayey, Sandy, Tan, Saturated with chert fragments	Qt		120						
25			CLAY with some sand and gravel, Tan and Gray, Dry			24 22						
30			GRAVEL, Clayey, Sandy, Tan and Gray, Saturated, with chert fragments - with cobbles from 29' to 32.5'			80 4 2						
			SAND with gravel and clay, Tan, Dry			ND ND						
35			CLAY with sand layers, Gray and Tan, Dry			ND ND						
			SAND, Tan and Gray, Dry			ND						
40			CLAY, Gray and Reddish-Brown, Dry	Kknm		ND	<0.4	<0.4	<0.4	<0.4	<10	
45												
50			GROUNDWATER CHEMISTRY RESULTS				2	0.008	0.020	0.030	4	

DEPTH DRILLED: 43.0'
DATE DRILLED: 1-17-91

DEPTH TO WATER: 11.68'
DATE MEASURED: 1-31-91

PROJ. No. ASB90-033-01
PLATE 9

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT.

LOG OF BORING NO. MW-6
TROPICANA ENERGY COMPANY
SAN ANTONIO, TEXAS

DRILLING METHOD: Hollow Stem Auger

LOCATION: See Plate 2

SURFACE ELEVATION: 657.30'
TOC ELEVATION: 656.93'

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FORMATION	Monitor Well	FID (ppm)	LABORATORY ANALYSES (ppm) B	T	E	X	TPH	%-200
			GRAVEL, Clayey, Tan and Brown	Fill		16						
5			CLAY with silt, Gray, Dry - hydrocarbon odor from 3' to 27' - with wood fragments, some caliche nodules, and green stains	Qt		130 260 1300						
10			- caliche from 10.7' to 11.3'			1200 2400						
15			CLAY, Sandy, Tan and Gray, Mottled, Dry - with green stains and caliche nodules - copper wire at 13'			3300 3500						
			SAND, Clayey, Tan and Gray, Mottled, Dry - with caliche nodules and green stains - saturated at 19', light oil from 19' to 23'			3000	15	150	44	300	3600	
20						3600 20						
25			GRAVEL with sand and clay, Saturated - with some cobbles			20 24						
			GRAVEL, Sandy, Tan, Saturated									
30			CLAY with gravel and sand, Tan, Slightly Moist - with chert fragments and green stains			7						
			GRAVEL, Clayey, Tan, Saturated - with chert fragments			2						
35			CLAY with gravel and sand, Tan, Slightly Moist - with iron stains			ND						
40			GRAVEL with sand and cobbles, Tan, Saturated - with chert fragments			ND 2 ND						
45						ND						
			GRAVEL with sand and clay, Tan, Moist - with chert fragments									
50												
			CLAY, Gray and Reddish-Brown, Dry	Kknm		ND	<0.4	0.8	<0.4	<0.4	60	

DEPTH DRILLED: 54.5'
DATE DRILLED: 1-17-91

DEPTH TO WATER: 11.75'
DATE MEASURED: 1-31-91

PROJ. No. ASB90-033-01
PLATE 10

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT.

R&H Oil/Tropicana Energy Superfund Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-7

Completion Date:	1/24/2011	Drilling Method:	HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	8.5
Driller:	James Neal	Total Depth (ft):	45
Driller's License:	4868	Northing:	13682261.71
Logged By:	Christopher Moore, P.G.	Easting:	2115651.16
Sampling Method:	2"x2.5' Split Barrel	Ground Elev. (ft AMSL):	655.35

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				PAV	(0 - 0.4) Asphalt Pavement
					(0.4 - 2.1) Gravel Base Material
		--	--	CH	(2.1 - 6.0) CLAY, CH, gray, moist, firm, trace sand, no odor.
5		0	2.5/2.5		(6.0 - 25.0) SILTY CLAY, CL, light gray, moist, firm, some sand, trace orange staining, no odor.
		0	2.5/2.5		
10		0	2.5/2.5		10.7: sand lens(<0.1'), wet, no odor.
		0	2.3/2.5		13.1-13.7: with gravel, dry, no odor.
15		0	2.5/2.5	CL	
		0	2.4/2.5		Below 17.0: some sand and gravel (limestone and silica gravel).
20		0	2.1/2.5		
		0	2.5/2.5		
25		0	2.5/2.5	SC	(25.0 - 25.8) CLAYEY SAND, SC, with gravel, light gray, wet, firm, some orange staining, no odor.
		0	2.0/2.5		(25.8 - 35.5) SANDY SILT, ML, yellowish brown, moist, firm to hard, trace sand laminae, no odor.
30		0	2.5/2.5	ML	
		0	2.1/2.5		
35		0.1	2.2/2.5		(35.5 - 37.0) SANDY SILT, ML, with gravel, yellowish brown, moist, hard, no odor.
		0	0.5/2.5		(37.0 - 44.4) SILTY/SANDY GRAVEL, GP, wet, firm, subrounded chert gravel, no odor.
40		0	0.5/2.5	GP	
		0	1.0/2.5		
45				CL	(44.4 - 45.0) SILTY CLAY, CL, gray, moist, firm to hard, no odor.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST
7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 4.5 feet drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 655.13

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 28.0) Bentonite Chips
(28.0 - 45.0) 12/20 Silica Sand

Well Materials
(0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 45.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Superfund Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-8

Completion Date:	1/25/2011	Drilling Method:	HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	8.5
Driller:	James Neal	Total Depth (ft):	45
Driller's License:	4868	Northing:	13682263.46
Logged By:	Christopher Moore, P.G.	Easting:	2116065.57
Sampling Method:	2"x2.5' Split Barrel	Ground Elev. (ft AMSL):	654.59

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				PAV	(0 - 0.4) Asphalt Pavement
		--	--		(0.4 - 2.1) Gravel Base Material
				CH	(2.1 - 4.5) CLAY, CH, gray, moist, firm, trace sand, no odor.
5		0.1	2.0/2.5		(4.5 - 13.5) SILTY CLAY, CL, light gray, moist, firm, some sand, trace orange staining, no odor.
		0.1	2.1/2.5		
10		0.1	1.8/2.5		12.0-13.5: with sand, slight hydrocarbon odor.
		106.5	2.5/2.5	CL	
15		76.7	2.5/2.5		(13.5 - 21.5) SANDY CLAY, CL, mottled light gray and yellowish brown, trace possibly wet sand lenses (<0.1'), hydrocarbon odor.
		2.1	2.5/2.5		
20		0.3	2.5/2.5		
		0.5	2.5/2.5	SC	(21.5 - 24.1) CLAYEY SAND, SC, light gray, wet, soft, some gravel, some orange staining, slight hydrocarbon odor.
25		0.4	2.5/2.5	ML / SC	(24.1 - 25.2) SANDY SILT, ML, mottled light gray and yellowish brown, moist, firm, trace laminated sand lenses (<0.1'), no odor. (25.2 - 26.4) CLAYEY SAND, SC, with gravel, light gray, wet, soft, some orange staining, slight hydrocarbon odor.
		0.4	2.5/2.5		(26.4 - 34.3) SANDY SILT, ML, mottled light gray and yellowish brown, trace laminated sand lenses (<0.1'), no odor. 27.8-28.0: gravelly lens, wet. 30.5-31.7: gravelly, moist to wet. 33.3-33.7: sandy, wet.
30		0.4	2.5/2.5	ML	
		0.8	2.1/2.5		
35		0.4	2.2/2.5		(34.3 - 43.5) CLAYEY SAND, SC, with gravel, brownish yellow, wet, soft to firm, some clay laminae (<0.1'), no odor.
		0.6	2.2/2.5	SC	
40		0.2	1.2/2.5		
		0.8	1.5/2.5	CL	(43.5 - 45.0) CLAY, CH, yellowish brown, firm to hard, trace gravel, no odor.
45					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

4/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 5 feet drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 654.42

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Bentonite Chips
(26.0 - 45.0) 12/20 Silica Sand

Well Materials
(0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 45.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Superfund Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-9

Completion Date:	1/25/2011	Drilling Method:	HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	8.5
Driller:	James Neal	Total Depth (ft):	45
Driller's License:	4868	Northing:	13682579.94
Logged By:	Christopher Moore, P.G.	Easting:	2115914.28
Sampling Method:	2"x2.5' Split Barrel	Ground Elev. (ft AMSL):	654.47

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	--	PAV.	(0 - 0.3) Asphalt Pavement
					(0.3 - 1.3) Gravel Base Material
				CH	(1.3 - 8.0) CLAY, CH, gray, moist, firm, trace sand, slight hyrodcarbon odor.
5		392.7	2.1/2.5		
		895.5	2.0/2.5	CL	(8.0 - 17.5) SILTY CLAY, CL, light gray, moist, firm, some sand, trace orange staining, hyrodcarbon odor. 10-15: trace sand laminae. 15.0-17.5: trace white to greenish gray silt laminae/lenses.
10		902.1	2.5/2.5		
		1003	2.5/2.5		
15		1316	2.5/2.5		
		397.2	2.5/2.5	SM	(17.5 - 21.7) SILTY SAND, SM, light yellowish brown, moist to wet, soft to firm, some wet lenses (<0.1'), slight hyrodcarbon odor. 20.0-21.7: with gravel, wet.
20		49.1	2.5/2.5		
		4.2	2.5/2.5	CL	(21.7 - 26.5) SILTY CLAY, CL, moist, firm to hard, mottled yellowish brown and light gray, trace sand, no odor.
25		2.6	2.0/2.5		
		3.0	1.5/2.5		(26.5 - 30.5) GRAVELLY CLAY, CL, with sand, yellowish brown, moist, firm to hard, no odor. 27.5-30.0: possible saturated lenses (sample moist).
30		2.7	2.0/2.5	GC	(30.5 - 35.0) CLAYEY GRAVEL, GC, with sand, yellowish brown, wet firm, no odor.
		3.6	0.8/2.5		
35		1.7	0.7/2.5	GP	(35.0 - 44.0) GRAVEL, GP, with sand, yellowish brown, wet, soft, no odor.
		--	0/2.5		
40		1.4	2.0/2.5		
		3.7	1.5/2.5		
45				CL	(44.0 - 45.0) SILTY CLAY, CL, gray, moist, firm to hard, no odor

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 5 feet drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 654.17

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 23.0) Bentonite Chips
(23.0 - 45.0) 12/20 Silica Sand

Well Materials
(0 - 25.0) Casing, 2" Sch 40 FJT PVC
(25.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Superfund Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-10

Completion Date:	1/26/2011	Drilling Method:	HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	8.5
Driller:	James Neal	Total Depth (ft):	45
Driller's License:	4868	Northing:	13682569.73
Logged By:	Christopher Moore, P.G.	Easting:	2116198.47
Sampling Method:	2"x2.5' Split Barrel	Ground Elev. (ft AMSL):	653.86

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	--	PAV	(0 - 0.3) Asphalt Pavement
					(0.3 - 1.2) Gravel Base Material
				CH	(1.2 - 6.0) CLAY, CH, gray, moist, firm, trace sand, slight hyrodcarbon odor.
5		0	2.5/2.5		(6.0 - 30.0) SILTY CLAY, CL, light gray, moist, firm, some sand, trace orange staining, hyrodcarbon odor. 11.0-16.0: trace thin sand laminae (<0.1'), moist to wet. 17.0-20.0: trace 0.5" to 1.0" gravel.
		0	2.5/2.5		
10		0.1	2.5/2.5		
		0.1	2.5/2.5		
15		0.1	2.5/2.5		
		0.2	2.1/2.5	CL	
20		0.1	2.5/2.5		
		0.2	2.2/2.5		
25		0.3	2.5/2.5		
		0.2	2.5/2.5		
30		0.3	2.0/2.5		(30.0 - 43.5) GRAVEL, GP, with sand and silt, yellowish brown, wet, soft, no odor.
		--	0/2.5		
35		--	0/2.5	GP	
		0.3	0.5/25		
40		0.3	0.5/25		
		0.2	2.0/2.5	CL	(43.5 - 45) SILTY CLAY, CL, gray, moist, firm to hard, no odor.
45					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/12

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 5 feet drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 653.57

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 20.0) Bentonite Chips
(20.0 - 45.0) 12/20 Silica Sand

Well Materials
(0 - 23.0) Casing, 2" Sch 40 FJT PVC
(23.0 - 38.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Superfund Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-11

Completion Date:	1/26/2011	Drilling Method:	HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	8.5
Driller:	James Neal	Total Depth (ft):	42.5
Driller's License:	4868	Northing:	13682868.35
Logged By:	Christopher Moore, P.G.	Easting:	2116067.04
Sampling Method:	2"x2.5' Split Barrel	Ground Elev. (ft AMSL):	654.78

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	--	PAV	(0 - 0.3) Asphalt Pavement (0.3 - 1.7) Gravel Base Material
				CH	(1.7 - 6.5) CLAY, CH, gray, moist, firm, trace sand, slight hydrocarbon odor.
5		0.2	2.5/2.5		
		0.7	2.5/2.5		(6.5 - 17.0) SILTY CLAY, CL, light gray, moist, firm, some sand, trace orange staining, some thin white silt laminae (<0.1'), no odor.
10		0.5	2.5/2.5		
		0.7	2.5/2.5		
15		51.6	2.5/2.5		
		72.9	2.5/2.5		(17.0 - 33.5) SANDY CLAY, CL, light gray, moist, firm, some thin sand and gravel laminae (<0.1'), slight hyrodcarbon odor. 17.0-19.0: with sand laminae (<0.1'), wet.
20		58.0	2.5/2.5	CL	
		40.0	2.1/2.5		22.0: thin gravel laminae (<0.1'), wet.
25		7.9	2.5/2.5		
		7.4	2.5/2.5		28.0-31.0: with gravel, moist.
30		14.3	2.5/2.5		
		28.3	1.3/2.5		(33.5 - 41.5) GRAVEL, GP, with sand and silt, yellowish brown, wet, soft, no odor. 33.0-36.0: slightly cemented.
35		62.4	0.5/2.5	GP	
		78.7	0.5/2.5		
40		2.6	2.1/2.5	CL	(41.5 - 42.5) SILTY CLAY, CL, gray, moist, firm to hard, no odor.
45					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST
7/15/15

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 5 feet drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 654.55

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 24.0) Bentonite Chips
(24.0 - 42.5) 12/20 Silica Sand

Well Materials
(0 - 25.0) Casing, 2" Sch 40 FJT PVC
(25.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

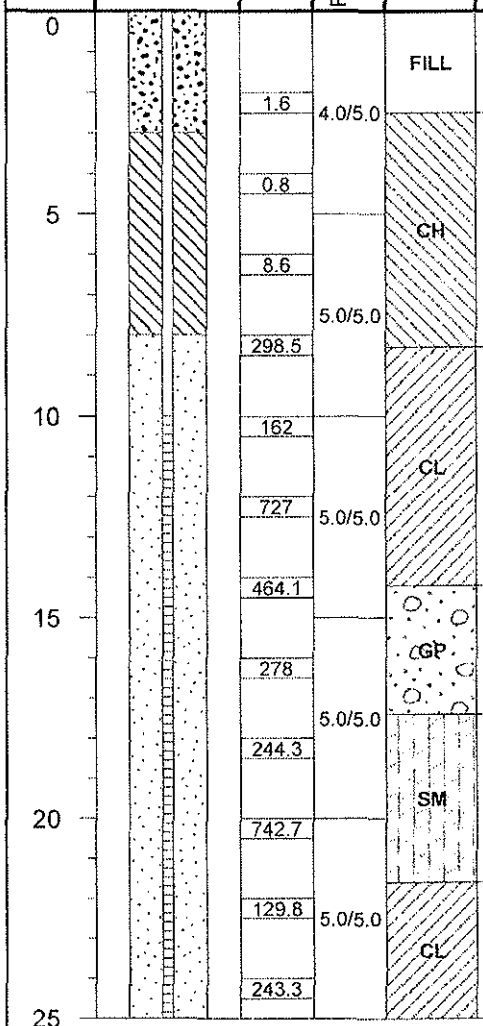
R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-12

Completion Date:	5/23/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13683030.594
Logged By:	Christopher Moore, P.G.	Easting:	2115395.667
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	657.2



Lithologic Description

(0 - 2.5) FILL, silty clay with gravel, brown, dry, firm, carbonate and silicate gravel, wood fragments.

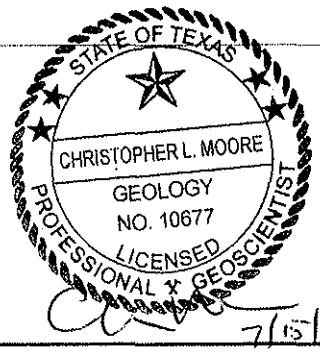
(2.5 - 8.3) CLAY, CH, dark gray, moist, firm to hard, trace sand size carbonate nodules.

(8.3 - 14.2) SILTY CLAY, CL, gray, moist, firm, some sand size carbonate nodules, hydrocarbon odor.

(14.2 - 17.4) GRAVEL, GP, light gray, with clay, moist, firm to hard, silicate gravel, hydrocarbon odor.

(17.4 - 21.6) SILTY SAND, SM, light grayish brown, moist, soft to firm, fine to coarse sand, trace gravel, hydrocarbon odor.

(21.6 - 25.0) SILTY CLAY, CL, light gray, moist, firm to hard, trace sand size carbonate nodules, hydrocarbon odor (decreasing with depth).



7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 659.9

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-13

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682992.482
Logged By:	Christopher Moore, P.G.	Easting:	2115729.857
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	659.7

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				FILL	(0 - 2.6) FILL, silty clay with gravel, brown, dry, firm.
		0.8	3.5/5.0	CL	(2.6 - 3.9) SILTY CLAY, CL, black, dry to moist, firm to hard, oil impregnated/free oil (viscous, oil odor), possible fill.
5		9.8		SM	(3.9 - 6.9) SILTY SAND, SM, black, wet, very soft/flowing, fine to coarse sand, free oil (viscous, oil odor).
		9.7	5.0/5.0		(6.9 - 7.8) SILTY SAND, SM, gray, moist, very soft, few shell fragments, hydrocarbon odor.
		2.8			(7.8 - 10.2) SILTY CLAY, CL, mottled gray to grayish brown, moist, soft to firm, hydrocarbon odor. 8.9-9.0: sand lens.
10		585.4			(10.2 - 14.8) SILTY CLAY, CL, light gray, moist, firm, with sand size carbonate nodules, oil sheen.
		958.9	5.0/5.0		
		117.4		CL	(14.8 - 22.6) SANDY CLAY, CL, mottled light brownish gray and light gray, moist, firm, hydrocarbon odor.
15		603			
		102.2	5.0/5.0		
20		795.2			
		512.7	4.5/5.0		
		558		SC/GC	(22.6 - 25.0) CLAYEY SAND/GRAVEL, SC/GC, pale brown, moist, firm, oil impregnated.
25					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 662.65

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

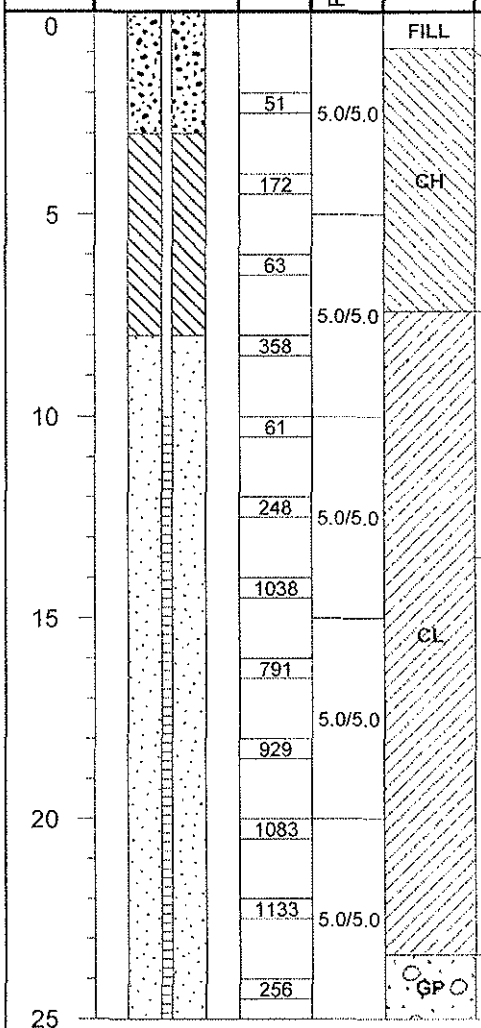
R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-14

Completion Date:	5/23/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682920.741
Logged By:	Christopher Moore, P.G.	Easting:	2115401.134
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	657.1



Lithologic Description

(0 - 0.9) FILL, silty clay with gravel and sand, dark gray, dry, soft to firm, hydrocarbon odor.

(0.9 - 7.4) CLAY, CH, dark gray, moist, firm to hard, trace sand size carbonate nodules.

(7.4 - 13.5) SILTY CLAY, CL, gray, moist, firm, some sand size carbonate nodules, hydrocarbon odor.

(13.5 - 23.4) SANDY CLAY, CL, mottled light brownish gray and light gray, trace (~1 per foot) sandier seams (~1cm), brownish discoloration (possible oil sheen).

(23.4 - 25.0) GRAVEL, GP, brown, with silt/clay, moist, firm to hard, hydrocarbon odor.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/5/15

TOC Elevation (ft AMSL): 660.17

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-15

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682877.977
Logged By:	Christopher Moore, P.G.	Easting:	2115674.764
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	657.2

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				FILL	(0 - 1.4) FILL, gravel with silt, grayish brown, dry, soft. 0.8-1.4: thick, oily material-free oil.
		230.3	4.5/5.0		(1.4 - 7.2) CLAY, CH, dark gray, moist, soft to firm. 1.8-2.2:oil impregnated 2.2-7.2: oil sheen.
		62.7		CH	
5		104.4			
			5.0/5.0		(7.2 - 14.5) SILTY CLAY, CL, gray, moist, firm, trace sand size carbonate nodules, hydrocarbon odor. Below 11.2: with sand.
		387.6			
10		126.6			
		516.5	5.0/5.0	CL	
		779.4			
15					(14.5 - 17.3) SANDY CLAY, CL, gray, moist, firm, oil sheen.
		614.7			
			5.0/5.0		(17.3 - 20.2) CLAYEY SAND/GRAVEL, SC/GC, grayish brown, moist, firm, silicate gravel, hydrocarbon odor.
		245.8		SC/GC	
20		19.3		SP	(20.2 - 20.3) SAND, SP, light grayish brown, wet, soft, hydrocarbon odor.
					(20.3 - 24.0) SANDY CLAY, CL, mottled light grayish brown and greenish gray, moist, firm to hard, hydrocarbon odor.
		120.6	5.0/5.0	CL	
		196.6		GC	(24.0 - 25.0) CLAYEY GRAVEL, GC, greenish gray, moist, firm to hard, hydrocarbon odor.
25					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 659.94

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-16

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682858.045
Logged By:	Christopher Moore, P.G.	Easting:	2115849.201
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	656.4

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				FILL	(0 - 1.8) FILL, gravel with silt, grayish brown, dry, soft.
		0.5	4.0/5.0		(1.8 - 8.5) CLAY, CH, dark gray, moist, firm, trace sand size carbonate nodules, hydrocarbon odor.
5		47.3		CH	
		50.2	5.0/5.0		
		198.4			(8.5 - 11.0) SILTY CLAY, CL, gray, moist, firm, with sand size carbonate nodules, hydrocarbon odor.
10		262			
		92	5.0/5.0	CL	(11.0 - 18.2) SANDY CLAY, CL, mottled gray and brownish gray, moist, firm, some sand size carbonate nodules, hydrocarbon odor.
		399.4			
15		244.1	5.0/5.0		
		384.6		SP/SM	(18.2 - 18.5) SAND/SILTY SAND, SP/SM, gray, wet, soft, hydrocarbon odor.
		512.7		GC	(18.5 - 23.0) CLAYEY GRAVEL, GC, light brownish gray, moist, firm, oil sheen.
20		217.2	4.0/5.0		
		524.5		SM/GM	(23.0 - 25.0) SILTY SAND/GRAVEL, SM/GM, light brownish gray, moist, firm, hydrocarbon odor (oil sheen observed smeared on outside of sample from above).
25					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 659.2

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-17

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682787.708
Logged By:	Christopher Moore, P.G.	Easting:	2115802.304
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	656.6

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		10.5	4.5/5.0	FILL	(0 - 3.0) FILL, gravel with silt, dark grayish brown, dry, firm.
5		1.9 7.1 7.3	5.0/5.0	CH	(3.0 - 8.8) CLAY, CH, dark gray, moist, firm, trace sand size carbonate nodules. Below 7.5: hydrocarbon odor.
10		4.6 33.6 98.8	5.0/5.0	CL	(8.8 - 13.5) SILTY CLAY, CL, gray, moist, firm, with sand size carbonate nodules, hydrocarbon odor.
15		906.6 989.5	5.0/5.0		(13.5 - 18.2) SANDY CLAY, CL, mottled gray and brownish gray, moist, firm to hard, banded yellowish brown staining, hydrocarbon odor. 16.6-16.7: oil impregnated sand lens. 17.0-17.1: oil impregnated sand lens. 17.4-17.5: oil impregnated sand lens.
20		735.6		GC	(18.2 - 21.4) CLAYEY GRAVEL, GC, mottled gray and grayish brown, moist to wet, firm to hard, silicate gravel, hydrocarbon odor.
25		1092 32.7	5.0/5.0	CL	(21.4 - 25.0) SILTY CLAY, CL, mottled grayish brown and greenish gray, moist, firm to hard, hydrocarbon odor to 22.4. Below 22.4: gray.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

TOC Elevation (ft AMSL): 659.23

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-18

Completion Date:	5/23/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682629.75
Logged By:	Christopher Moore, P.G.	Easting:	2115443.358
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	657.7

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		0.2	4.0/5.0	FILL	(0 - 3.4) FILL, gravel with silt, dark grayish brown, dry, soft to firm, some glass and brick fragments.
		0.4			
5		410	5.0/5.0	CH	(3.4 - 10.5) CLAY, CH, dark gray, moist, firm, trace sand size carbonate nodules. Below 6.0: oil sheen.
		185			
10		517	5.0/5.0	CL	(10.5 - 20.5) SILTY CLAY, CL, gray, moist, firm, some sand size carbonate nodules, oil sheen. 16.5-17.1: carbonate gravel lens. 17.1-18.3: with sand.
		815			
15		643	5.0/5.0		
		910			
20		370	4.0/5.0	GC	(20.5 - 21.2) CLAYEY GRAVEL, GC, pale brown, wet, soft to firm, oil sheen in sandy lens.
				CL	(21.2 - 23.0) SILTY CLAY, CL, gray, moist, firm, some sand size carbonate nodules, hydrocarbon odor.
25				GP	(23.0 - 25.0) GRAVEL, GP, brown, with silt, moist, hard, silicate gravel, hydrocarbon odor.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 660.6

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-19

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682622.457
Logged By:	Christopher Moore, P.G.	Easting:	2115715.595
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	655.5

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				FILL	(0 - 1.9) FILL, gravel with silt, dark grayish brown, dry, firm.
		2.8	4.0/5.0		(1.9 - 9.0) CLAY, CH, dark gray, dry, firm, trace sand size carbonate nodules. Below 4.0: moist. Below 7.5: hydrocarbon odor.
		4.3			
5				CH	
		5.1	5.0/5.0		
		61.9			
10					(9.0 - 15.2) SILTY CLAY, CL, gray, moist, firm, with sand size carbonate nodules, hydrocarbon odor. 11.0-12.5: siltier, clayey silt?
		15			
		71.1	5.0/5.0	CL	
		17.4			
15					(15.2 - 18.0) SANDY CLAY, CL, mottled light gray and light brownish gray, moist, firm, oil sheen.
		990.5	5.0/5.0		
		345.2			(18.0 - 21.5) CLAYEY GRAVEL, GC, moist to wet, firm, hydrocarbon odor, thin wet lenses at 19.5 with oil sheen. 20.1-20.4: sandy clay. 20.6-21.0: sandy clay. 21.0-21.5:wet.
20				GC	
		726.1			
		25.5	4.0/5.0		(21.5 - 25.0) SILTY CLAY, CL, mottle pale brown and light gray, moist, firm, slight hydrocarbon odor.
		4.3		CL	
25					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/6/15

TOC Elevation (ft AMSL): 658.37

Notes:
This boring log should not be used separately from the original report.

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

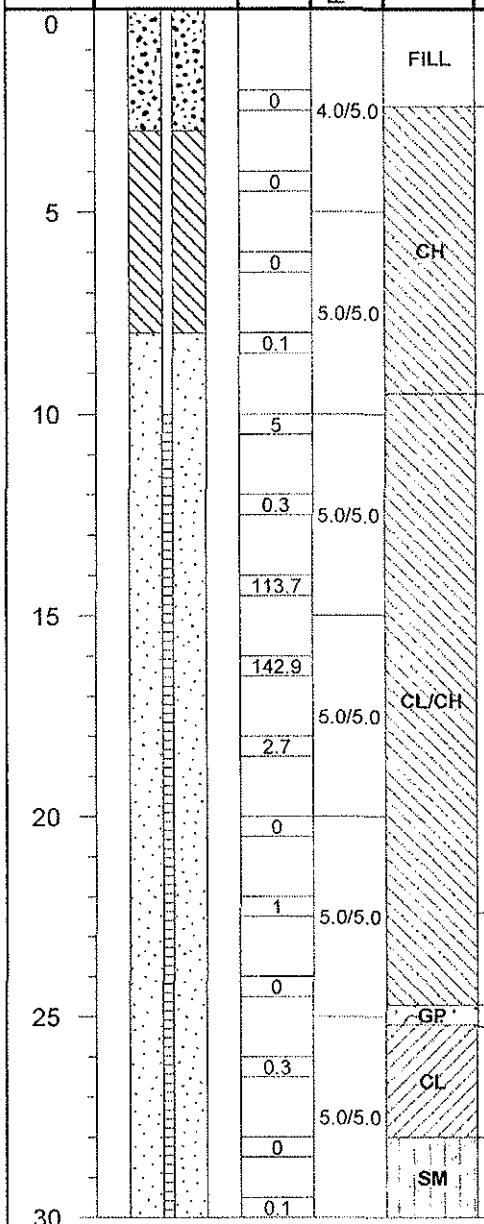
R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-20

Completion Date:	5/23/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	30
Driller's License:	54776M	Northing:	13682428.923
Logged By:	Christopher Moore, P.G.	Easting:	2115579.383
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	656.5



Lithologic Description
(0 - 2.4) FILL, gravel with silt, dark grayish brown, dry, firm.
(2.4 - 9.5) CLAY, CH, dark gray, dry to moist, firm to hard, trace sand size carbonate nodules.
(9.5 - 22.4) SILTY CLAY, CL/CH, pale brown, moist, firm to hard, trace sand size carbonate nodules. 11.5-20.0: hydrocarbon odor. 14.0: mottled greenish gray. 18.5: increased carbonate nodules. 19.5-19.8:silicate gravel lens, moist. 21.0-21.1:silicate gravel lens, moist.
(22.4 - 24.7) SILTY CLAY, CL, mottled yellowish brown and light gray, with very fine grained sand, moist, soft to firm.
(24.7 - 25.2) GRAVEL, GP, moist, hard.
(25.2 - 28.0) SANDY CLAY, CL, brownish yellow, moist, soft to firm, very fine grained sand.
(28.0 - 30.0) SILTY SAND, SM, brownish yellow, moist to wet, soft to firm, very fine grained sand, driller reports water in borehole.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 659.38

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 30.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 30.0) Screen, 2" Sch 40 FJT PVC.
0.01 slot

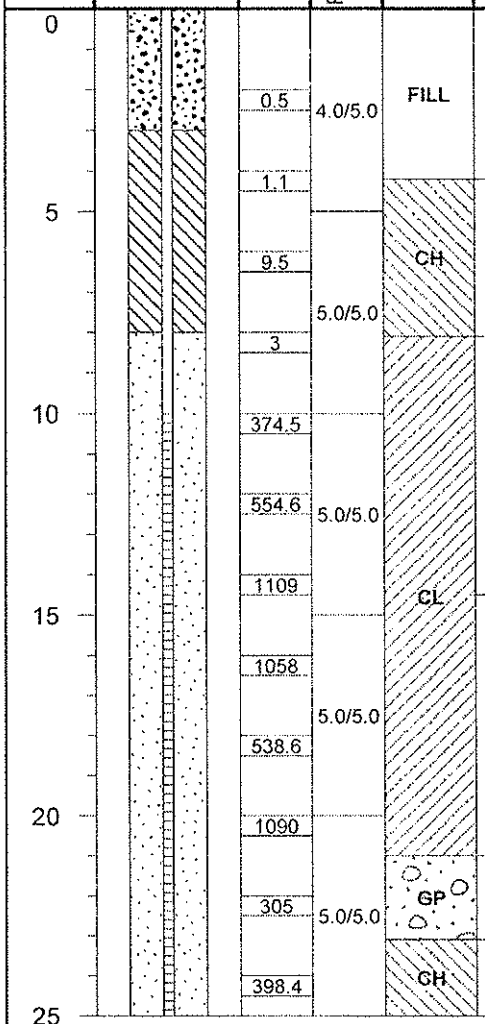
R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: NMW-1

Completion Date:	5/23/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13683027.829
Logged By:	Christopher Moore, P.G.	Easting:	2115604.439
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	659.2



Lithologic Description

(0 - 4.2) FILL, silty clay with gravel, dark gray, dry, soft to firm, carbonate and silicate gravel.

(4.2 - 8.1) CLAY, CH, dark gray, moist, firm, trace sand size carbonate nodules, hydrocarbon odor. 6.2-8.1: oil sheen.

(8.1 - 14.5) SILTY CLAY, CL, gray, moist, firm, some sand size carbonate nodules, oil sheen.

(14.5 - 21.0) SILTY/SANDY CLAY, CL, brownish yellow and gray, moist, firm, very fine grained sand, trace thin sandy laminae (<1 cm), oil impregnated. 19.0-21.0: sandier.

(21.0 - 23.1) GRAVEL, GP, light brownish gray, with clay, moist, firm to hard, silicate gravel, hydrocarbon odor.

(23.1 - 25.0) CLAY, CH, light gray, moist, firm to hard, hydrocarbon odor.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 662.3

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: NMW-2

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	30
Driller's License:	54776M	Northing:	13683013.239
Logged By:	Christopher Moore, P.G.	Easting:	2115822.355
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	657.8

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				FILL	(0 - 1.8) FILL, silty clay with gravel, dark gray, dry, soft to firm, carbonate and silicate gravel, wood fragments.
		0.7	4.5/5.0	CH	(1.8 - 4.5) CLAY, CH, dark gray, moist, soft to firm, few very dark gray silt laminae, oil sheen.
		2.3			
5		15.8	5.0/5.0	CL	(4.5 - 11.8) SILTY CLAY, CL, light gray, with sand, moist, firm, hydrocarbon odor.
		0.8			
10		321.2			
		588.1	5.0/5.0		(11.8 - 18.5) SANDY CLAY, CL, gray, moist, soft to firm, trace sand size carbonate nodules, oil sheen.
		314.9			
15		54.6	5.0/5.0		
		25.9			
20		604.7			(18.5 - 26.3) SILTY CLAY, CL, mottled gray and brown, moist, firm to hard, some sand size carbonate nodules, oil sheen.
		11.5	5.0/5.0		
		83.1			
25		20.6		ML/CL	(26.3 - 27.8) SANDY SILT/CLAY, ML/CL, gray. moist to wet, soft, hydrocarbon odor.
		0.9	5.0/5.0	SC/GC	(27.8 - 30.0) CLAYEY SAND/GRAVEL, SC/GC, mottled light gray and light brown, moist, firm to hard.
30		1.3			

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED PROFESSIONAL GEOSCIENTIST

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 660.61

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: NMW-3

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682838.279
Logged By:	Christopher Moore, P.G.	Easting:	2115529.386
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	657.5

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		5.2	4.5/5.0	FILL	(0 - 3.4) FILL, silty clay with gravel, dark gray, dry, soft to firm, carbonate and silicate gravel.
		1.3		CH	(3.4 - 8.8) CLAY, CH, dark gray, moist, firm, trace sand size carbonate nodules, hydrocarbon odor.
5		162.2	5.0/5.0		
		118.7		CL	(8.8 - 10.5) SILTY CLAY, CL, gray, moist, firm to hard, with sand size carbonate nodules, hydrocarbon odor.
10		489.3		ML/CL	(10.5 - 11.2) SANDY SILT/CLAY, ML/CL, mottled light gray and light grayish brown, moist, firm, very fine grained sand, hydrocarbon odor.
		951	5.0/5.0	CL	(11.2 - 21.1) SANDY CLAY, CL mottled ight gray and light grayish brown, moist, firm, oil sheen, 11.2-11.3: sand seam, free oil, 11.7-11.9: sand seam, free oil.
		579			
15		964			
		999.3	5.0/5.0		
		1039			
20		730	5.0/5.0	SC/GC	(21.1 - 24.2) CLAYEY SAND/GRAVEL, SC/GC, grayish brown, moist, firm to hard, hydrocarbon odor.
		567.5		CL	(24.2 - 25.0) SILTY CLAY, CL, gray, moist, firm to hard, hydrocarbon odor.
25					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/5/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 660.63

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

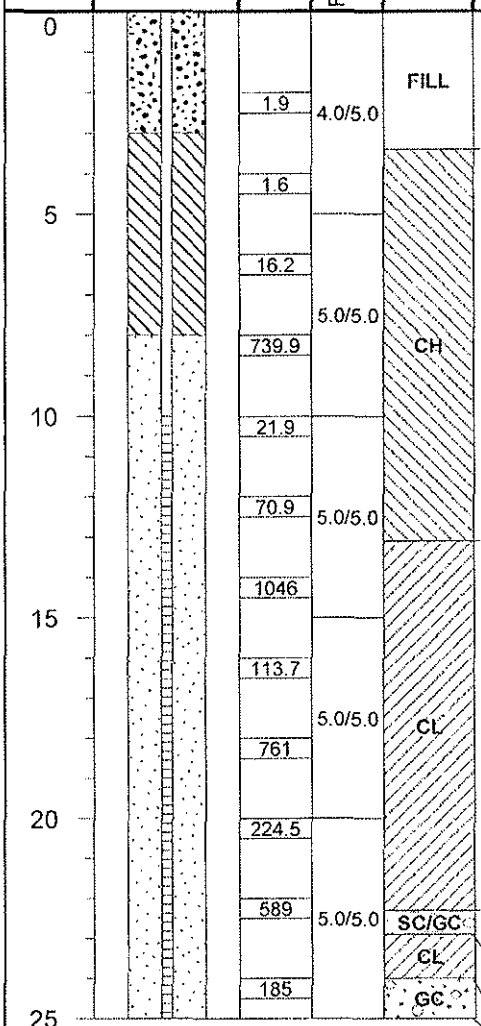
R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: NMW-4

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682716.579
Logged By:	Christopher Moore, P.G.	Easting:	2115580.311
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	658.0



Lithologic Description

(0 - 3.4) FILL, silty clay with gravel, grayish brown, dry, firm, carbonate and silicate gravel.

(3.4 - 13.1) CLAY, CH, very dark gray, moist, firm, trace sand size carbonate nodules, hydrocarbon odor. Below 5.9: oil sheen.

(13.1 - 22.3) SILTY CLAY, CL, light gray to light greenish gray, moist, firm, hydrocarbon odor. 16.0-18.5: oil sheen.

(22.3 - 22.9) CLAYEY SAND/GRAVEL, SC/GC, grayish brown, wet, soft, hydrocarbon odor.

(22.9 - 24.0) SILTY CLAY, CL, gray, moist, firm, with yellowish brown staining, hydrocarbon odor.

(24.0 - 25.0) CLAYEY GRAVEL, GC, gray, moist, firm.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 660.99

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: NMW-5

Completion Date:	5/24/2011	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	7.5
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	54776M	Northing:	13682566.721
Logged By:	Christopher Moore, P.G.	Easting:	2115533.008
Sampling Method:	5'x2.5' Barrel	Ground Elev. (ft AMSL):	657.7

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0.6	4.0/5.0	FILL	(0 - 4.3) FILL, silty clay with gravel, grayish brown, dry, firm, carbonate and silicate gravel, wood fragments.
5	0.5			
	1.2	5.0/5.0	CH	(4.3 - 12.0) CLAY, CH, dark gray, moist, firm, trace sand size carbonate nodules. Below 7.6: hydrocarbon odor.
	5.1			
10	1.4			
	45.9	5.0/5.0	CL	(12.0 - 21.1) SILTY CLAY, CL, gray, moist, firm, with sand size carbonate nodules, hydrocarbon odor. Below 12.5: infrequent oil sheen.
	33.4			
15	5.0	5.0/5.0		
	32.6			
20	107.6		GP	(21.1 - 21.9) GRAVEL, GP, grayish brown, with sand, moist, firm, oil sheen.
	51.7	5.0/5.0	SP	(21.9 - 24.0) SAND, SP, light brownish gray, wet, soft, hydrocarbon odor.
	172.3			(24.0 - 25.0) CLAYEY GRAVEL, GC, light brownish gray, moist, firm-hard.
25				

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

7/15/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 660.45

Annular Materials
(0.0 - 3.0) Concrete
(3.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-21

Completion Date:	5/7/2012	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	23
Driller's License:	54776M	Northing:	13682580.3
Logged By:	Tim Nickels	Easting:	2115923.15
Sampling Method:	5' x 2.5" Barrel	Ground Elev. (ft AMSL):	654.56

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				PAV	(0 - 0.3) Asphalt pavement
				FILL	(0.3 - 1.5) Road base/crushed limestone
		23.9	5.0/5.0	CH	(1.5 - 7.5) CLAY, CH dark gray, stiff, dry from 1.5'-5', moist from 5'-7.5'.
5		78.9			
			5.0/5.0		(7.5 - 10) SILTY CLAY, CL, light gray and white, dry, loose, friable, slight hydrocarbon odor.
		833			
10					(10 - 17.5) SANDY CLAY, CL, brown, hydrocarbon odor increasing at 15'. Sand/gravel layers 1" thick at 15.5'; 16', 16.5', dry, decreasing hydrocarbon odor.
		3651	5.0/5.0	CL	
		1196			
15					
		1861			
			5.0/5.0		(17.5 - 22) SILTY SAND, SM, brown, moist/wet, no odor. 20'-21' saturated sand. 21'-22' silty sand, wet.
		23.8		SM	
20					
			3.0/3.0		
				CL	(22 - 23) CLAY, CL, brown, firm, dry.

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
9/26/16

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

TOC Elevation (ft AMSL): 654.19

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 6.0) Bentonite Chips
(6.0 - 23.0) 12/20 Silica Sand

Well Materials
(0 - 8.0) Casing, 2" Sch 40 FJT PVC
(8.0 - 23.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site

San Antonio, TX

PBW Project No. 1651

Log of Boring: MW-22

Completion Date:	5/7/2012	Drilling Method:	Geoprobe/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	27
Driller's License:	54776M	Northing:	13682263.39
Logged By:	Tim Nickels	Easting:	2116053.79
Sampling Method:	5' x 2.5" Barrel	Ground Elev. (ft AMSL):	654.53

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				PAV	(0 - 0.4) Asphalt pavement
				FILL	(0.4 - 1.5) Road base/fill
			5.0/5.0	CH	(1.5 - 5) CLAY, CH light and dark gray, dry, firm, trace sand.
		0			
5					(5 - 15) SANDY CLAY, CL, light gray, firm, dry, no odor. 1" gravel/chert pieces from 5'-7.5'.
			2.0/5.0		
			2.0/2.0		
		0.2			
10					
		0.1			
			5.0/5.0	CL	
		0.4			
15					(15 - 20) SILTY CLAY, CL, brown, moist, firm, slight hydrocarbon odor. 18'-19': soft, moist, without odor.
		35.4			
			5.0/5.0		
		12.1			
20					(20 - 25) CLAYEY SAND, SC, firm, dry gravel lenses (may have fallen from above). 22'-24': soft, moist to wet.
			2.0/5.0	SC	

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

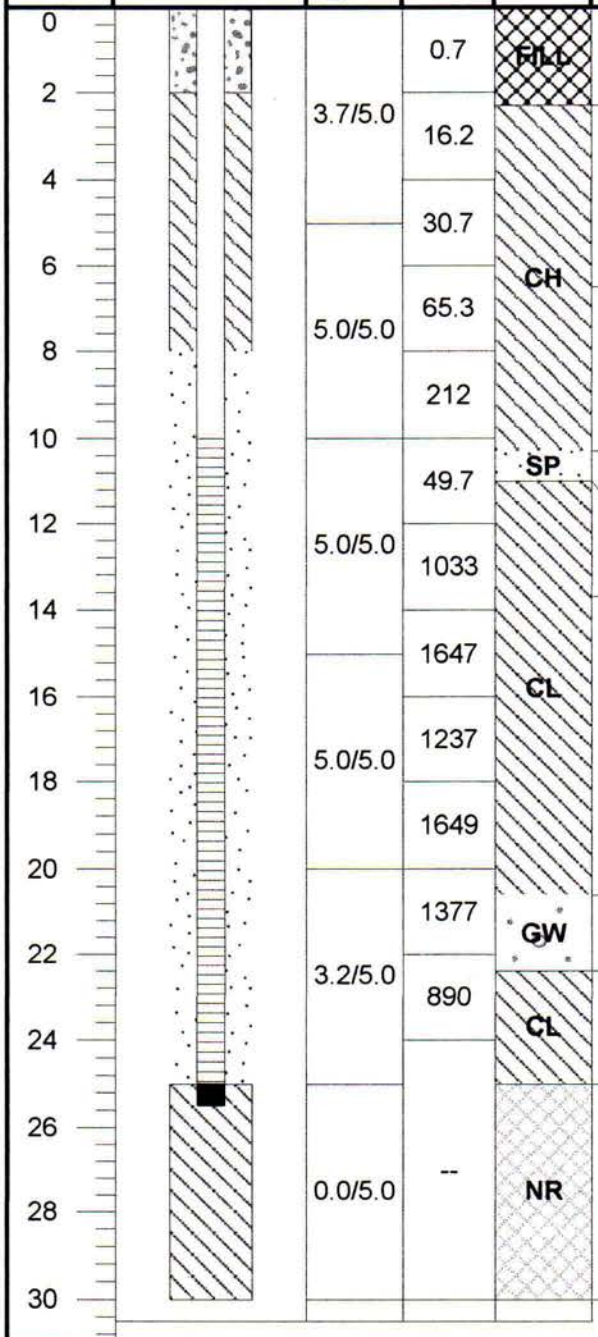
TOC Elevation (ft AMSL): 654.07

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

R&H Oil/Tropicana Energy Site	Log of Boring: MW-23

San Antonio, TX	Completion Date:	4/28/2015	Drilling Method:	6" Solid Flight Auger
	Drilling Company:	Vortex	Borehole Diameter (in.):	6
	Driller:	Robert Joiner	Total Depth (ft):	25.5
PBW Project No. 1651	Driller's License:	TX54476M	TOC Elevation(ft AMSL):	662.615
	Logged By:	Tim Jennings, P.G.	Northing:	13683058.962
	Sampling Method:	5' x 2" Core Barrel	Easting:	2115753.25



Depth (ft)	Recovery (ft/ft)	PID	USCS	Lithologic Description
0		0.7	FILL	(0 - 2.3) Sand, Gravel and Clay FILL.
2	3.7/5.0	16.2		(2.3 - 6.5) Sandy CLAY, dark gray to black, locally black stains, moist, soft, strong odor. 5.0-6.5: 5% carbonate gravel.
4		30.7		
6	5.0/5.0	65.3	CH	(6.5 - 10.3) Silty CLAY, dark gray, moist, firm, trace fine carbonate fragments, moderate hydrocarbon odor.
8		212		
10		49.7	SP	(10.3 - 11) Clayey SAND, dark brown, wet, <30% high plasticity clay in sand, strong odor.
12	5.0/5.0	1033		(11 - 13.7) Sandy CLAY, light gray, moist, firm, fine sand in medium plasticity clay, moderate hydrocarbon odor.
14		1647	CL	(13.7 - 20.6) Sandy CLAY, light brown to light gray, moist, firm to soft, moderate to strong hydrocarbon odor. 13.7-15.0: chalky white gravel. 18.7-20.6: slight hydrocarbon sheen
16		1237		
18	5.0/5.0	1649		
20		1377	GW	(20.6 - 22.4) Sandy Clayey GRAVEL, brown, fine to coarse gravel (carbonaceous), fine to medium sand, wet, firm, low plasticity clay.
22	3.2/5.0	890	CL	(22.4 - 25) CLAY, brown with gray mottling, very stiff, moderate plasticity clay with few carbonate fragments locally, slight hydrocarbon odor.
24				
26	0.0/5.0	--	NR	(25 - 30) No Recovery.
28				
30				

STATE OF TEXAS
TIMOTHY P. JENNINGS
GEOLOGY
LIC. NO. 1842
LICENSED
PROFESSIONAL GEOSCIENTIST

2/19/2016

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

This boring log should not be used separately from the original report.
Hole was plugged with bentonite chips from 25-30'.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(25.0 - 25.5) End Cap

R&H Oil/Tropicana Energy Site

Log of Boring: MW-24

San Antonio, TX

PBW Project No. 1651

Completion Date:	4/28/2015	Drilling Method:	6" Solid Flight Auger
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	30.5
Driller's License:	TX54476M	TOC Elevation(ft AMSL):	662.139
Logged By:	Tim Jennings, P.G.	Northing:	13683077.001
Sampling Method:	5' x 2" Core Barrel	Easting:	2115557.133

Depth (ft)	Well Materials	Recovery (ft/ft)	PID	USCS	Lithologic Description
0					
2		3.6/5.0	1.2	FILL	(0 - 3.6) Sand, Gravel, Clay FILL, brown and gray.
4			2.5		
6		3.5/5.0	--		(3.6 - 15) Silty CLAY, dark gray, moist, firm, no odor.
8			161.3		
10			294.2		
12		2.0/5.0	--		
14			390.5		
16		5.0/5.0	--	CL	(15 - 20.6) CLAY & Silty CLAY, brown with gray mottling locally, chalky carbonate locally, moist, firm to stiff, moderate hydrocarbon odor, slight black hydrocarbon stain at 19.3'.
18			580.2		
20			956.3		
22		5.0/5.0	642.9		(20.6 - 27) Silty Sandy CLAY, gray with brown mottling, moist, firm, chalky carbonate material locally and few silica gravel fragments, moderate to heavy hydrocarbon odor increasing with depth.
24			1124		
26			751.2		
28		3.5/5.0	1982		
30			1057	GW	(27 - 28.5) Sandy GRAVEL, light brown, fine to coarse gravel, angular carbonate gravel with rounded silica gravel locally, moist to wet, hard, strong hydrocarbon odor .
			--	NR	(28.5 - 30) No Recovery.

STATE OF TEXAS
TIMOTHY P. JENNINGS
GEOLOGY
LIC. NO. 1842
LICENSED
PROFESSIONAL GEOSCIENTIST
5/12/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 30.5) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 30.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(30.0 - 30.5) End Cap

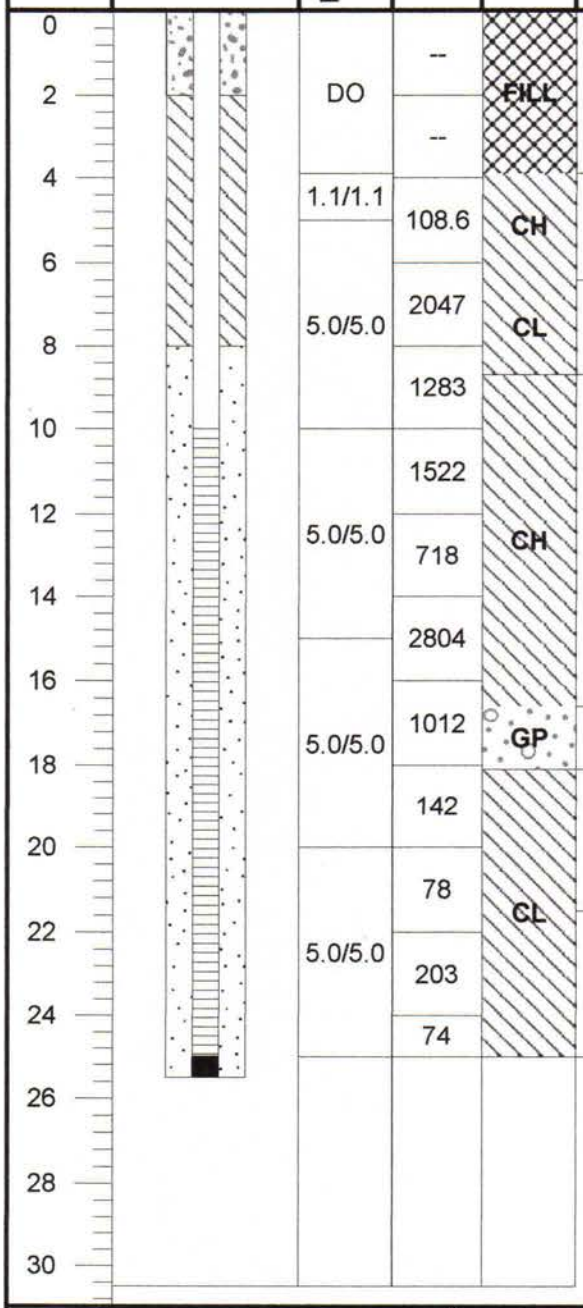
R&H Oil/Tropicana Energy Site

Log of Boring: MW-25

San Antonio, TX

PBW Project No. 1651

Completion Date:	4/27/2015	Drilling Method:	6" Solid Flight Auger
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	25.5
Driller's License:	TX54476M	TOC Elevation(ft AMSL):	656.878
Logged By:	Tim Jennings, P.G.	Northing:	13683203.479
Sampling Method:	5' x 2" Core Barrel	Easting:	2115353.955



Depth (ft)	Recovery (ft/ft)	PID	USCS	Lithologic Description
0	DO	--	FILL	(0 - 3.9) Silty Clay and Gravel FILL, light gray .
2		--		
4	1.1/1.1	108.6	CH	(3.9 - 6.4) Silty CLAY, dark gray, trace (<5%) very fine carbonate fragments, moist, slight to moderate hydrocarbon odor .
6	5.0/5.0	2047	CL	(6.4 - 8.7) Gravelly Sandy CLAY, brown, fine to coarse carbonate gravel and sand, moist to dry, slight hydrocarbon odor.
8		1283	CH	(8.7 - 16.6) Sandy CLAY, brown with gray mottling, fine ot medium sand interbeds locally, moist, firm to soft, moderate hydrocarbon odor.
10	5.0/5.0	1522		
12		718		
14		2804		
16	5.0/5.0	1012	GP	(16.6 - 18.1) Sandy Clayey GRAVEL, brown, fine to medium gravel, moist to wet 16.9-17.2.
18		142	CH	(18.1 - 21.5) CLAY, brown with gray mottling, firm to stiff, slight hydrocarbon odor. Water in the borehole above clay at 18.1.
20	5.0/5.0	78		
22		203	CL	(21.5 - 25) Sandy CLAY, light gray, wet, firm, low plasticity sandy clay with thin sandy interbeds locally.
24		74		
26				
28				
30				

STATE OF TEXAS
TIMOTHY P. JENNINGS
GEOLOGY
LIC. NO. 1842
LICENSED
PROFESSIONAL GEOSCIENTIST
6/12/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 3.9 feet drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 25.5) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(25.0 - 25.5) End Cap

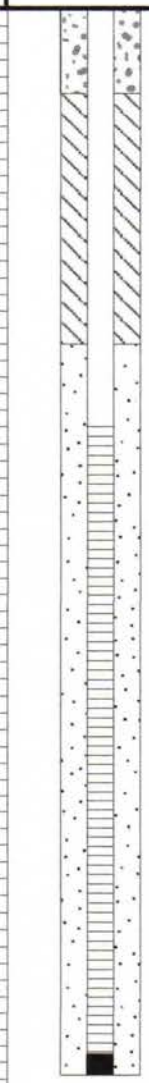
R&H Oil/Tropicana Energy Site

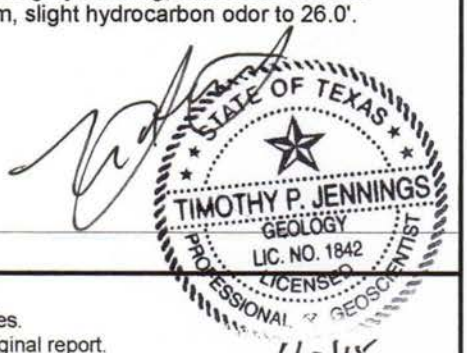
Log of Boring: MW-26

San Antonio, TX

PBW Project No. 1651

Completion Date:	4/27/2015	Drilling Method:	6" Solid Flight Auger
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	25.5
Driller's License:	TX54476M	TOC Elevation(ft AMSL):	657.699
Logged By:	Tim Jennings, P.G.	Northing:	13682810.249
Sampling Method:	5' x 2" Core Barrel	Easting:	2115275.935

Depth (ft)	Well Materials	Recovery (ft/ft)	PID	USCS	Lithologic Description
0		DO	--	FILL	(0 - 4) Clay and Gravel FILL.
2			--		
4		1.0/1.0	11.3	CH	(4 - 9.6) Silty CLAY, dark gray, color grades to light grayish green below 7.0', few small carbonate fragments, moist, firm, no odor 4.0-6.0, slight to moderate hydrocarbon odor below 6.0'.
6		5.0/5.0	12.2		
			72.4		
8			95.4		
10		5.0/5.0	29.3	CL	(9.6 - 13.3) Silty Sandy CLAY, gray to brown, chalky carbonate fragments locally, moist, firm, moderate hydrocarbon odor.
12			1076		(13.3 - 22.6) Sandy CLAY, grayish brown, moist clay with very fine sand, friable, moderate hydrocarbon odor.
14			3452		
16		5.0/5.0	3616		
18			4282		
20		5.0/5.0	297		
22			239	GP	(22.6 - 23.4) Gravel, light brown with gray mottling, fine to coarse gravel, dry to moist, slight hydrocarbon odor.
24			79	CL	(23.4 - 30) Silty Sandy CLAY, brown with gray mottling, carbonate nodules locally, silica gravel at 28', dry, very firm, slight hydrocarbon odor to 26.0'.
26		5.0/5.0	193		
28			10.1		
30					



6/12/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 4 feet drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 25.5) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(25.0 - 25.5) End Cap

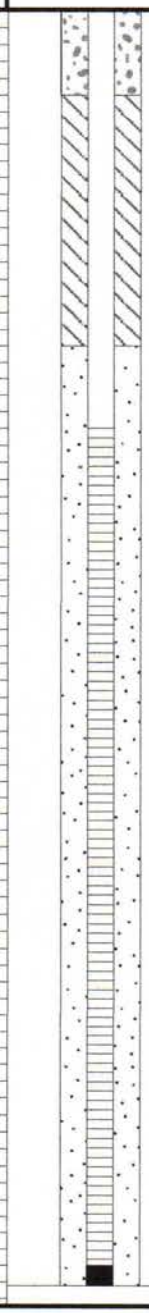
R&H Oil/Tropicana Energy Site

Log of Boring: MW-27

San Antonio, TX

PBW Project No. 1651

Completion Date:	4/27/2015	Drilling Method:	6" Solid Flight Auger
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	30.5
Driller's License:	TX54476M	TOC Elevation(ft AMSL):	658.386
Logged By:	Tim Jennings, P.G.	Northing:	13682448.26
Sampling Method:	5' x 2" Core Barrel	Easting:	2115339.006

Depth (ft)	Well Materials	Recovery (ft/ft)	PID	USCS	Lithologic Description
0		4.3/5.0	1.0	CH	(0 - 5.3) Silty CLAY, dark gray, moist, firm, few fine carbonate fragments, abundant grass roots.
2			0.3		
4			1.3		
6		5.0/5.0	0.9		(5.3 - 9.4) Sandy Gravelly CLAY, brown to light brown, 30-40% fine sand and fine cabonate and silica gravel, abundant chalky carbonate fragments below 9.4', moist to dry, firm to stiff, no odor.
8			0.3		
10		5.0/5.0	6.9		(9.4 - 13.7) Silty Sandy CLAY, light brown, abundant chalky carbonate, locally wet to moist, moderate to heavy hydrocarbon odor increasing with depth. 13.0-13.7: Possible hydrocarbon staining locally.
12			96.6		
14		5.0/5.0	7.4		(13.7 - 19.5) Sandy CLAY, brown with gray mottling, abundant carbonate fragments locally, moist, stiff, moderate hydrocarbon odor.
16			114.7	CL	
18			8.3		
20		5.0/5.0	1.1		(19.5 - 29.2) Sandy CLAY, brown with gray mottling, 30-40% fine sand, moist to wet, firm, no odor. 25.0-27.0: Very wet in sandy zone.
22			0.7		
24		5.0/5.0	0.5		
26			0.8		
28			3.4		
30				GW	(29.2 - 30) Clayey GRAVEL, brown, wet, moderate plasticity clay in fine to coarse carbonate gravel, no odor.

STATE OF TEXAS
TIMOTHY P. JENNINGS
GEOLOGY
LIC. NO. 1842
LICENSED
PROFESSIONAL GEOSCIENTIST

6/12/15

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:

This boring log should not be used separately from the original report.

Annular Materials

(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 30.5) 12/20 Silica Sand

Well Materials

(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 30.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(30.0 - 30.5) End Cap

R&H Oil/Tropicana Energy Site

Log of Boring: MW-28

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/7/2015	Drilling Method:	DPT/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	30
Driller's License:	TX54776M	Northing:	13683495.94
Logged By:	C. Kakolewski	Easting:	2115282.811
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	658.383
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	658.076

Depth (ft)	Well Materials	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0		5.0/5.0	27.8	FILL	(0 - 0.2) FILL - Asphalt Pavement (0.2 - 0.5) FILL - Gravel Base Material
			71.7	CH	(0.5 - 7.1) CLAY, CH, dark gray to dark brown, moist, firm to soft, high to medium plasticity, very faint hydrocarbon odor.
5			58.1		
		5.0/5.0	26.3	GC	(7.1 - 10) Clayey GRAVEL, GC, tan, trace orange brown staining, slightly moist, soft, low to medium plasticity, fine to coarse carbonate gravel, rounded, calcareous precipitate throughout, trace fine to very fine sand, no odor.
			18.8		
10		5.0/5.0	99.7	CL	(10 - 14.2) Silty CLAY, CL, mottled tan and gray, trace orange brown staining, moist to slightly moist, hard, low plasticity, hydrocarbon odor at 10.5', sand with clay lens at 12.4' to 12.6', moist, calcareous precipitate throughout.
			340		
			736	CH	(14.2 - 15) CLAY, CH, light brown, light gray mottling, moist to slightly moist, hard to very hard, high to medium plasticity, hydrocarbon odor.
15		5.0/5.0	386	CL	(15 - 17) Silty CLAY, CL, light brown, moist, hard, medium plasticity, moderate very fine sand, hydrocarbon odor.
			192		(17 - 25) Silty CLAY, CL, gray, orange brown staining, slightly moist to dry, hard, trace carbonate nodules and gravel, hydrocarborn odor, no odor between 20.0' to 22.0', calcareous precipitate throughout, hydrocarbon odor between 22.0 to 23.2'.
20			10.3		
		5.0/5.0	191		
25			10.4		
		2.5/2.5	13.3	ML	(25 - 29.8) Clayey SILT, ML, tan/tan gray, trace orange brown staining, moist to slightly moist, firm to hard, very low to no plasticity, trace very fine sand.
		2.5/2.5	6		
30				GP	(29.8 - 30) GRAVEL with some clay, GP, orange brown, saturated, loose/soft, low to no plasticity, coarse chert gravel, rounded, some gravel >1.0", trace fine sand, rounded.

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 30.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 30.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(30.0 - 30.5) End Cap

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

R&H Oil/Tropicana Energy Site

Log of Boring: MW-29

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/8/2015	Drilling Method:	DPT/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	30
Driller's License:	TX54776M	Northing:	13683019.721
Logged By:	C. Kakolewski	Easting:	2116181.208
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	655.344
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	655.079

Depth (ft)	Well Materials	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0				FILL	(0 - 0.3) FILL - Asphalt Pavement
		NR	--		(0.3 - 2.5) FILL - Gravel Base Material
				CH	(2.5 - 5) CLAY, CH, brown to dark brown, gray mottling, moist, firm, high plasticity.
5			0.2		
		5.0/5.0	0.2		
			0		
10			0.1	CL	(5 - 18.1) Silty CLAY, CL, brown tan, trace orange brown staining, slightly moist, firm to hard, medium to low plasticity, trace calcareous precipitate, occasional medium to fine carbonate gravel, rounded, color becomes orange brown with gray mottling at 10.0'.
		5.0/5.0	0.4		
15			0.5		
		5.0/5.0	14.4		
			1	GC	(18.1 - 21.2) Clayey, sandy, silty, GRAVEL, GC, brown, wet, saturated at 19.5', loose, low to no plasticity, fine to very coarse chert gravel <1.0", rounded.
20			17.9		(21.2 - 23) GRAVELLY CLAY, CL, silty, moderate very fine to fine sand, gray brown, wet, firm to soft, high to medium plasticity, coarse to medium chert gravel, rounded.
		5.0/5.0		CL	
			4.6		(23 - 25) Silty CLAY, CL, with very fine sand, brown, moist to wet, medium to high plasticity, very slight hydrocarbon odor near 23.0'.
25					

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
4/21/16

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: Top 5.0' drilled out (DO) with a Jet-Vac to clear for utilities.
This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(25.0 - 25.5) End Cap

R&H Oil/Tropicana Energy Site

Log of Boring: MW-30

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/8/2015	Drilling Method:	DPT/HSA
Drilling Company:	Vortex	Borehole Diameter (in.):	6
Driller:	Robert Joiner	Total Depth (ft):	30
Driller's License:	TX54776M	Northing:	13682734.671
Logged By:	C. Kakolewski	Easting:	2115744.085
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	657.209
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	660.198

Depth (ft)	Well Materials	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0		3.0/5.0	2	FILL	(0 - 2.4) FILL - Gravel Base Material, hydrocarbon odor.
			175		
5		3.0/5.0	--	CH	(2.4 - 10) CLAY, CH, dark gray to dark brown, slightly moist, firm to soft, high plasticity, hydrocarbon odor.
			518		
10		5.0/5.0	1124	ML	(10 - 13.3) Clayey SILT, ML, mottled brown and gray, dry to slightly moist, soft to firm, no to low plasticity, calcareous precipitate throughout, hydrocarbon odor.
			1035		
15		5.0/5.0	1035	CL	(13.3 - 21) Silty CLAY, CL, trace very fine sand, gray, trace green staining, slightly moist to moist, firm to soft, low to medium plasticity, hydrocarbon odor.
			994		
			1012		
20		5.0/5.0	1046		(21 - 24) Gravelly, silty, sandy, CLAY, CL, light brown, mottled gray and tan, saturated at 21.0', soft, becomes hard at 25.0', high plasticity, sand lens from 23.5' to 24.0', very fine, loose, rounded, moderately sorted, hydrocarbon odor.
			1050		
25				CH	(24 - 25) CLAY, CL, mottled light brown and orange brown, slightly moist, very hard, high plasticity, trace to moderate fine gravel <0.5", rounded, hydrocarbon odor.

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
This boring log should not be used separately from the original report.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 8.0) Bentonite Chips
(8.0 - 25.0) 12/20 Silica Sand

Well Materials
(0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot
(25.0 - 25.5) End Cap

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

R&H Oil/Tropicana Energy Site

Log of Boring: SB-4

San Antonio, TX

PBW Project No. 1651

Completion Date:	2/20/2014	Drilling Method:	DPT
Drilling Company:	Vortex Drilling Inc.	Borehole Diameter (in.):	2
Driller:	Robert Joiner	Total Depth (ft):	20
Driller's License:	TX54776M	Northing:	--
Logged By:	Tim Nickels	Easting:	--
Sampling Method:	2" Core Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0		1.18	FILL	(0 - 2) FILL, silty clay, brown, dry, no odor.
	5.0/5.0	76.5		(2 - 15) SILTY CLAY, CL, dark gray, moist, firm. 4: soft lens with slight hydrocarbon odor. 8 - 10: light gray, softens with depth, oil impregnated, increasing odor with depth. 10 - 11: light gray, more silt, less stiff than above, strong hydrocarbon odor, carbonate nodules. 11 - 15: light gray, firm, becoming more sandy with depth.
5		134		
	5.0/5.0	142		
		383		
10		540	CL	
	5.0/5.0	607		
15		1046		(15 - 20) SANDY CLAY, CL, strong hydrocarbon odor, sand seams at 16 and 18, carbonate nodules/gravel at 19.5.
	5.0/5.0	1079		
		493		
20				

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Boring plugged with bentonite/cement upon completion.
This boring log should not be used seperately from original report.

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

R&H Oil/Tropicana Energy Site	Log of Boring: SB-5

San Antonio, TX	Completion Date:	2/20/2014	Drilling Method:	DPT
	Drilling Company:	Vortex Drilling Inc.	Borehole Diameter (in.):	2
	Driller:	Robert Joiner	Total Depth (ft):	20
PBW Project No. 1651	Driller's License:	TX54776M	Northing:	--
	Logged By:	Tim Nickels	Easting:	--
	Sampling Method:	2" Core Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0		55.3	FILL	(0 - 2) FILL, silty clay with gravel, light brown, dry, no odor.
	5.0/5.0	154		(2 - 10) SILTY CLAY, CL, dry, hard/firm, with carbonate seam at 4, hydrocarbon odor below 7.
5		53.1		
	5.0/5.0	69.3		
		141		
10		356	CL	(10 - 19.5) SANDY/SILTY CLAY, CL, gray. 10 - 12: with carbonate nodules. 12 - 20: SILTY CLAY, light gray with dark mottling, slight hydrocarbon odor. 15 - 16: SANDY CLAY. 17: with sand seam. 18: with moist sand seam with carbonate nodules/chert.
	5.0/5.0	1039		
15		978		
	5.0/5.0	453		
		1098		
20			SM	(19.5 - 20) SILTY SAND, SM.

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
4/22/16

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Boring plugged with bentonite/cement upon completion.
This boring log should not be used seperately from original report.

R&H Oil/Tropicana Energy Site | Log of Boring: SB-6

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/7/2015	Drilling Method:	DPT
Drilling Company:	Vortex	Borehole Diameter (in.):	2.25
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	TX54776M	Northing:	--
Logged By:	C. Kakolewski	Easting:	--
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	--
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	--

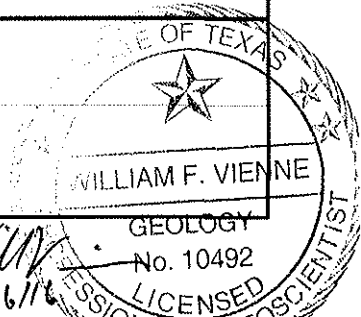
Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0			FILL	(0 - 0.5) FILL - Asphalt Pavement
		1.6		(0.5 - 1.2) FILL - Gravel Base Material
	3.5/5.0	0.4		(1.2 - 5) CLAY, CH, brown gray, moist, firm to soft, high plasticity, trace moderate to coarse gravel, caliche at top, no odor.
5		0.3	CH	
		1		(5 - 7) CLAY, CH, brown gray, dark gray mottling, moist, firm, high to medium plasticity.
	5.0/5.0	0.4		(7 - 10) CLAY, CH, tan to brown, slightly moist, firm to hard, moderate plasticity, calcareous precipitate, trace medium to fine gravel.
10		0.5		
	5.0/5.0	0.3		(10 - 15) Silty CLAY, CL, tan to light brown, slightly moist, hard, low to moderate plasticity, orange stain/mottling, silty calcareous precipitate, trace dark brown stain at 14.8'.
15		0.5		
		0.7	CL	(15 - 19) Silty CLAY, CL, tan, slightly moist, hard, low to moderate plasticity, orange brown stain/mottling, silty white calcareous precipitate, trace nodules.
	4.7/5.0	0.4		
20		0.4		(19 - 24) Silty CLAY, CL, light brown, dry to slightly moist, hard, low to moderate plasticity, orange stain and tan mottling locally.
	5.0/5.0	0.9		
25			GC	(24 - 25) GRAVEL, GC, rounded chert, silt content increases from 24.0' to 25.0' with very fine to fine sand, moisture increases with depth.

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: Boring plugged with bentonite/cement upon completion.
This boring log should not be used separately from the original report.

Annular Materials | Well Materials



4/26/16

R&H Oil/Tropicana Energy Site

Log of Boring: SB-7

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/7/2015	Drilling Method:	DPT
Drilling Company:	Vortex	Borehole Diameter (in.):	2.25
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	TX54776M	Northing:	--
Logged By:	C. Kakolewski	Easting:	--
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	--
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0	5.0/5.0	0.1	FILL	(0 - 0.2) FILL - Asphalt Pavement (0.2 - 0.6) FILL - gravel, sand, silt, dark brown, coarse grained, trace dark red brown stain.
		0.3	CH	(0.6 - 4) CLAY, CH, dark brown, moist, firm, high plasticity.
5	5.0/5.0	0.2		(4 - 8.2) CLAY, CL, dark brown, moist, hard, medium plasticity, dark brown and orange/brown mottling, silty white calcareous precipitate throughout.
		0.3		
		0.4		(8.2 - 10.1) Gravelly CLAY, CL, brown to tan brown, slightly moist, firm to soft, low plasticity, gray stain, white silty calcareous precipitate.
10	5.0/5.0	0.3		
		0.7		
15	5.0/5.0	0.6	CL	
		0.2		(10.1 - 25) CLAY, CL, light gray to tan, slightly moist to dry, hard, medium plasticity, orange/brown mottling, white silty calcareous precipitate with nodules between 14.0' and 15.0', orange/brown mottling increases 17.0'-25.0', carbonaceous content increases 17.0'-25.0'.
		0.6		
20	5.0/5.0	0.6		
		0.5		
25				

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: Boring plugged with bentonite/cement upon completion.
This boring log should not be used separately from the original report.

Annular Materials

Well Materials

R&H Oil/Tropicana Energy Site

Log of Boring: SB-8

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/7/2015	Drilling Method:	DPT
Drilling Company:	Vortex	Borehole Diameter (in.):	2.25
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	TX54776M	Northing:	--
Logged By:	C. Kakolewski	Easting:	--
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	--
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0	5.0/5.0	2.5	FILL	(0 - 0.2) FILL - Asphalt Pavement (0.2 - 0.4) FILL - Gravel Base Material (0.4 - 0.9) CLAY, CH, light gray, orange/brown mottling, trace calcareous precipitate.
		1.7	CH	
5		3.9		(0.9 - 6.3) CLAY, CH, dark gray to gray, trace yellow brown staining.
	5.0/5.0	2.6		
		3.7		(6.3 - 9.9) CLAY, CL, gray to tan gray, white silty calcareous precipitate with trace fine carbonaceous gravel between 6.6' and 7.0'.
10	5.0/5.0	0.5		
		0.2		
15		0	CL	
	5.0/5.0	0		(9.9 - 25) Silty CLAY, CL, gray to tan gray, slightly moist, hard, low to moderate plasticity, light brown mottling, decrease in carbonaceous content 9.9'-14.0', local tan mottling after 12.0', carbonaceous nodules 14.6' to 15.1'.
		0.2		
20	5.0/5.0	0.1		
		0.4		
25				

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

Notes: Boring plugged with bentonite/cement upon completion.
This boring log should not be used separately from the original report.

Annular Materials

Well Materials

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

R&H Oil/Tropicana Energy Site

Log of Boring: SB-9

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/7/2015	Drilling Method:	DPT
Drilling Company:	Vortex	Borehole Diameter (in.):	2.25
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	TX54776M	Northing:	--
Logged By:	C. Kakolewski	Easting:	--
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	--
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0	5.0/5.0	38.8	FILL	(0 - 0.2) FILL - Asphalt Pavement (0.2 - 0.4) CLAY, CH, gray, moist to slightly moist, hard, high plasticity, trace orange/brown staining, trace calcareous precipitate.
		52.5	CH	
5		34.1		(0.4 - 6.9) CLAY, CH, dark gray, moist, hard, high plasticity, rare calcareous precipitate.
	5.0/5.0	23.8	GC	(6.9 - 9) Clayey GRAVEL, GC, gray/brown, slightly moist, firm to hard, low plasticity, fine to medium grain, rounded, slight hydrocarbon odor 8.0' to 10.0'.
		44.7		
10	5.0/5.0	291	CL	(9 - 19.4) Silty CLAY, CL, gray/brown, slightly moist, hard, low plasticity, trace very fine sand, trace fine to coarse gravel to 11.0', hydrocarbon odor 10.0' to 18.9', color becomes brown after 11.0', calcareous precipitate throughout, orange/brown to brown mottling 14.3' to 19.4'.
		594		
15		346		
	5.0/5.0	231		
		94.1		
20	5.0/5.0	166	CH	(19.4 - 20) CLAY, CH, gray, slightly moist, very hard, moderate plasticity, brown mottling, hydrocarbon odor decreases from 18.9' to 20.0'.
		182	CL	(20 - 25) CLAY, CL, gray, dry to slightly moist, hard, low plasticity, brown mottling, hydrocarbon odor 19.0' to 25.0', calcareous precipitate to 21.5'.
25				

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: Boring plugged with bentonite/cement upon completion.
This boring log should not be used separately from the original report.

Annular Materials

Well Materials

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

R&H Oil/Tropicana Energy Site

Log of Boring: SB-10

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/7/2015	Drilling Method:	DPT
Drilling Company:	Vortex	Borehole Diameter (in.):	2.25
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	TX54776M	Northing:	--
Logged By:	C. Kakolewski	Easting:	--
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	--
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0			FILL	(0 - 0.2) FILL - Asphalt Pavement
		4.7		(0.2 - 1.2) FILL - Gravel Base Material
	5.0/5.0	4.2	CH	(1.2 - 6.4) CLAY, CH, dark brown, moist, firm, high plasticity, tan mottling between 6.0' to 6.4'.
5		0.6		
	5.0/5.0	0.6		
		0.3		
10		0	CL	(6.4 - 18) Silty CLAY, CL, brown, moist to slightly moist, firm becoming hard with depth, medium to low plasticity, trace fine carbonate gravel, rounded, calcareous precipitate throughout, dry to slightly moist at 7.0', becomes gray to gray brown with brown mottling at 10.5'.
	5.0/5.0	0		
15		0		
	5.0/5.0	0.3		
		0	CH	(18 - 19.9) CLAY, CH, gray, orange brown mottling, slightly moist, very hard, medium plasticity, trace calcareous precipitate and carbonate nodules.
20		0		
	5.0/5.0	0	CL	(19.9 - 25) Silty CLAY, CL, tan gray, orange brown mottling, slightly moist to dry, hard to very hard, low to medium plasticity.
25				

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: Boring plugged with bentonite/cement upon completion.
This boring log should not be used separately from the original report.

Annular Materials

Well Materials

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

4/26/16

R&H Oil/Tropicana Energy Site | Log of Boring: SB-11

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/7/2015	Drilling Method:	DPT
Drilling Company:	Vortex	Borehole Diameter (in.):	2.25
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	TX54776M	Northing:	--
Logged By:	C. Kakolewski	Easting:	--
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	--
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0	5.0/5.0	0.2	FILL	(0 - 0.2) FILL- Asphalt Pavement (0.2 - 0.6) FILL - Gravel Base Material
		0.2	CH	(0.6 - 6.3) CLAY, CH, dark brown, moist, hard to firm, high plasticity, trace calcareous precipitate between 5.8'-6.3'.
5		0.8		
	5.0/5.0	0.7		(6.3 - 9.7) Silty CLAY, CL, gray brown, gray mottling, slightly moist, firm to soft, low plasticity, calcareous precipitate throughout, fine white carbonate nodules at 8.0'.
		0.4		
10	5.0/5.0	42.8	CL	
		81.8		
15	5.0/5.0	120		(9.7 - 24.2) Silty CLAY, CL, light gray, tan brown mottling, slightly moist, ~~hard~~, low plasticity, calcareous precipitate throughout, carbonate gravel locally, subrounded to rounded, hydrocarbon odor at 9.9', trace orange brown staining after 9.9', staining increases with depth, color becomes orange brown and gray at 15.3', trace very fine sand between 16.0' to 18.3', hydrocarbon odor begins to decrease at approximately 23.0'.
		178		
		258		
20	5.0/5.0	229		
		66.2	GC	(24.2 - 25) Clayey GRAVEL, GC, tan gray, orange brown staining, moist to slightly moist, firm to soft, medium to high plasticity, coarse chert gravel, rounded, very slight hydrocarbon odor.
25				

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST
4/26/16

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: Boring plugged with bentonite/cement upon completion.
This boring log should not be used separately from the original report.

Annular Materials | Well Materials

R&H Oil/Tropicana Energy Site

Log of Boring: SB-12

San Antonio, TX

PBW Project No. 1651

Completion Date:	12/8/2015	Drilling Method:	DPT
Drilling Company:	Vortex	Borehole Diameter (in.):	2.25
Driller:	Robert Joiner	Total Depth (ft):	25
Driller's License:	TX54776M	Northing:	--
Logged By:	C. Kakolewski	Easting:	--
Field Supervisor:	T. Nickels	Ground Elev. (ft AMSL):	--
Sampling Method:	Macro Core MC 5 2.25"	TOC Elev. (ft AMSL):	--

Depth (ft)	Recovery (ft/ft)	PID (ppm-v)	USCS	Lithologic Description
0			FILL	(0 - 0.3) FILL - Asphalt Pavement
		0.4		(0.3 - 1.2) FILL - Gravel Base Material
	5.0/5.0	0.6	CH	(1.2 - 6) CLAY, CH, dark brown, moist, soft to firm, hard, trace roots upper 1.0', becomes more gray near 6.0'.
5		2.2		
	5.0/5.0	2.4		(6 - 11.1) Gravelly CLAY, CL, brown/tan brown, slightly moist, firm, low to no plasticity, coarse to medium gravel, rounded, rare 2.0" coarse gravel, gravel content decreases between 8.9' to 10.4', silty very fine sand lens between 10.0' to 10.4'.
		1.9		
10		2.7		
	5.0/5.0	4.6		(11.1 - 16.4) Silty CLAY, CL, mottled tan, brown, and gray, moist to slightly moist, firm to hard, medium to low plasticity, very fine sand locally, trace calcareous precipitate and very fine carbonate nodules, very fine silty sand with trace clay lens between 11.8' to 12.0', very slight hydrocarbon odor at approximately 12.0'.
15		15.4	CL	
	5.0/5.0	37.7		
		169		
20		83.6		(16.4 - 25) Silty CLAY, CL, gray, orange brown staining, slightly moist, very hard to hard, low plasticity, calcareous precipitate throughout, trace medium to coarse carbonate gravel, very slight hydrocarbon odor.
	5.0/5.0	23.3		
25				

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes: Boring plugged with bentonite/cement upon completion.
This boring log should not be used separately from the original report.

Annular Materials

Well Materials

STATE OF TEXAS
WILLIAM F. VIENNE
GEOLOGY
No. 10492
LICENSED
PROFESSIONAL GEOSCIENTIST

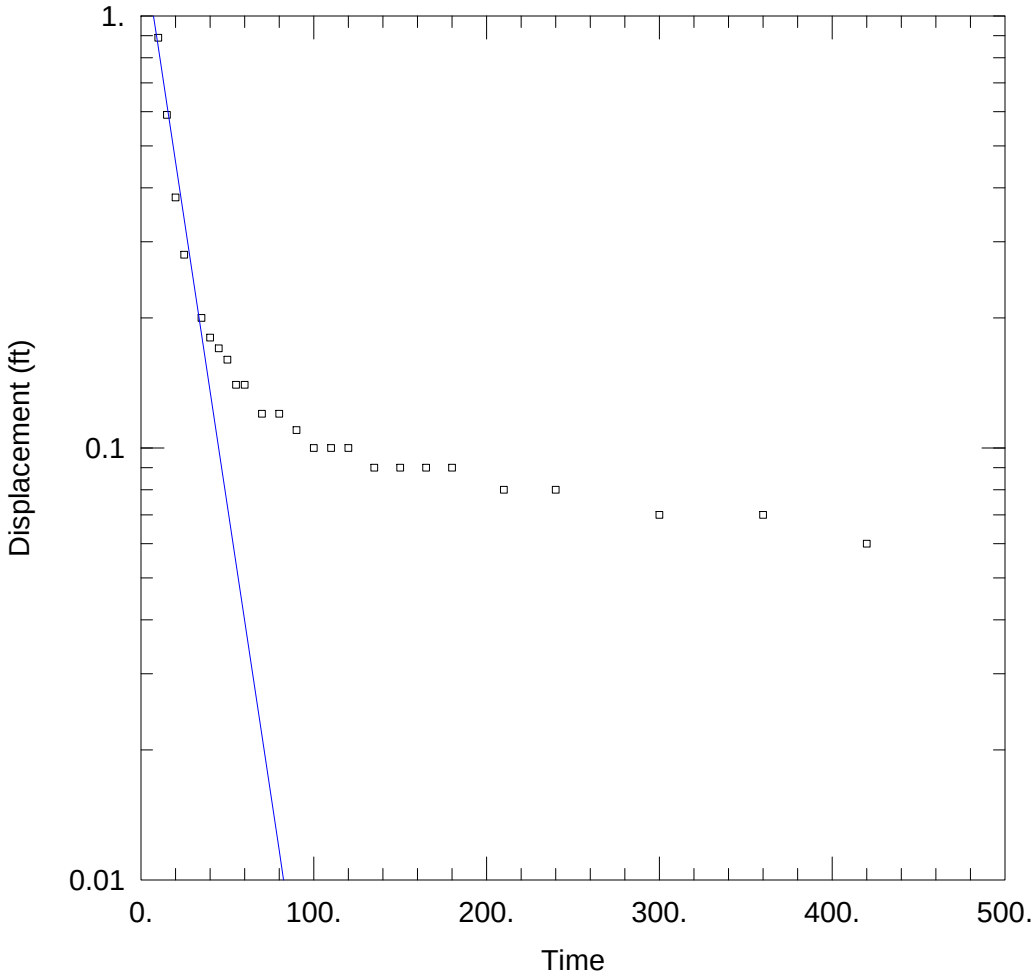
4/26/16

APPENDIX F

HYDRAULIC TESTING DATA

APPENDIX F-1

JULY 2011 SLUG TESTS



MW-12 SLUG OUT, TEST 1

Data Set: J:\...\MW-12 Slug Out Test 1.aqt
Date: 04/14/16 Time: 14:38:22

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Well: MW-12
Test Date: 7/25/11

AQUIFER DATA

Saturated Thickness: 6. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-12)

Initial Displacement: 2.78 ft
Total Well Penetration Depth: 6. ft
Casing Radius: 0.08 ft
Static Water Column Height: 6. ft
Screen Length: 6. ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.008292 cm/sec
y0 = 1.561 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 July 25 2011_slug tests\MW-1
Title: MW-12 Slug Out, Test 1
Date: 04/14/16
Time: 14:38:38

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Date: 7/25/11
Test Well: MW-12

AQUIFER DATA

Saturated Thickness: 6. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-12

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.78 ft
Static Water Column Height: 6. ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 6. ft
Total Well Penetration Depth: 6. ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 25

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
10.	0.89	100.	0.1
15.	0.59	110.	0.1
20.	0.38	120.	0.1
25.	0.28	135.	0.09
35.	0.2	150.	0.09
40.	0.18	165.	0.09
45.	0.17	180.	0.09
50.	0.16	210.	0.08
55.	0.14	240.	0.08
60.	0.14	300.	0.07
70.	0.12	360.	0.07
80.	0.12	420.	0.06
90.	0.11		

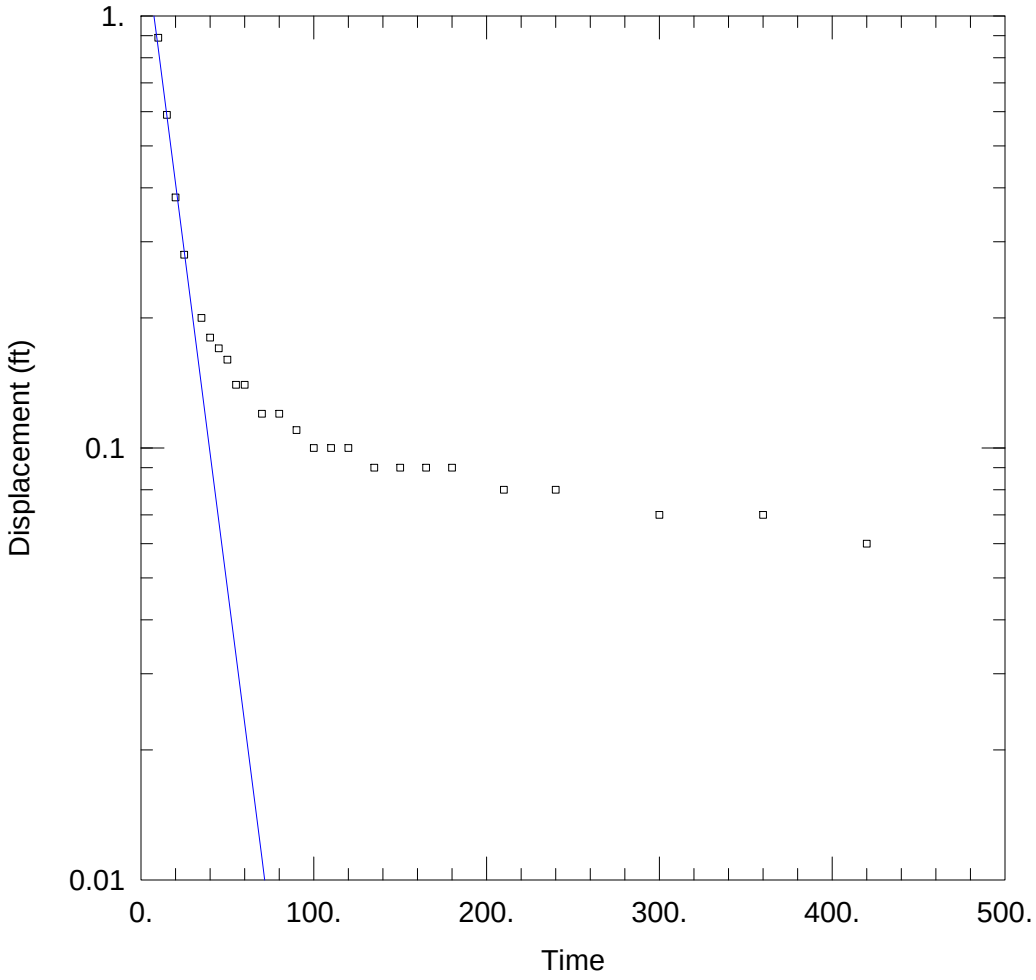
SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.193

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.008292	cm/sec
y0	1.561	ft



MW-12 SLUG OUT, TEST 2

Data Set: J:\...\MW-12 Slug Out Test 2.aqt
Date: 04/14/16 Time: 14:43:38

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Well: MW-12
Test Date: 7/25/11

AQUIFER DATA

Saturated Thickness: 6. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-12)

Initial Displacement: 2.78 ft
Total Well Penetration Depth: 6. ft
Casing Radius: 0.08 ft
Static Water Column Height: 6. ft
Screen Length: 6. ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.009749 cm/sec
y0 = 1.724 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 July 25 2011_slug tests\MW-1
Title: MW-12 Slug Out, Test 2
Date: 04/14/16
Time: 14:43:25

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Date: 7/25/11
Test Well: MW-12

AQUIFER DATA

Saturated Thickness: 6. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-12

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.78 ft
Static Water Column Height: 6. ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 6. ft
Total Well Penetration Depth: 6. ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 25

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
10.	0.89	100.	0.1
15.	0.59	110.	0.1
20.	0.38	120.	0.1
25.	0.28	135.	0.09
35.	0.2	150.	0.09
40.	0.18	165.	0.09
45.	0.17	180.	0.09
50.	0.16	210.	0.08
55.	0.14	240.	0.08
60.	0.14	300.	0.07
70.	0.12	360.	0.07
80.	0.12	420.	0.06
90.	0.11		

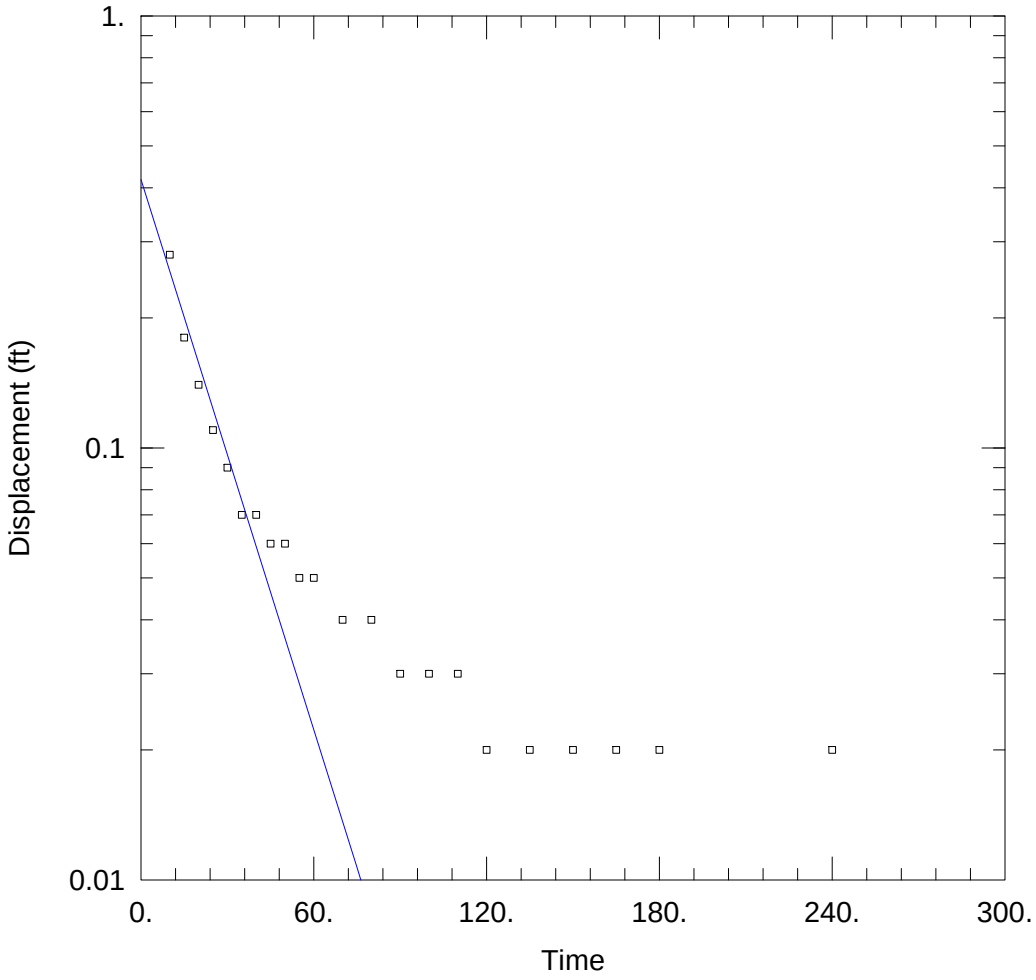
SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.193

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.009749	cm/sec



MW-17 SLUG OUT, 2-FT SLUG

Data Set: J:\...\MW-17 Slug Out 2ft Slug.aqt
Date: 04/14/16 Time: 14:39:16

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Well: MW-17
Test Date: 7/25/11

AQUIFER DATA

Saturated Thickness: 5. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-17)

Initial Displacement: 1.22 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.08 ft
Static Water Column Height: 5. ft
Screen Length: 5. ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.007388 cm/sec
y0 = 0.4182 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 July 25 2011_slug tests\MW-1
Title: MW-17 Slug Out, 2-ft Slug
Date: 04/14/16
Time: 14:39:36

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Date: 7/25/11
Test Well: MW-17

AQUIFER DATA

Saturated Thickness: 5. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-17

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.22 ft
Static Water Column Height: 5. ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 5. ft
Total Well Penetration Depth: 5. ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 22

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
10.	0.28	70.	0.04
15.	0.18	80.	0.04
20.	0.14	90.	0.03
25.	0.11	100.	0.03
30.	0.09	110.	0.03
35.	0.07	120.	0.02
40.	0.07	135.	0.02
45.	0.06	150.	0.02
50.	0.06	165.	0.02
55.	0.05	180.	0.02
60.	0.05	240.	0.02

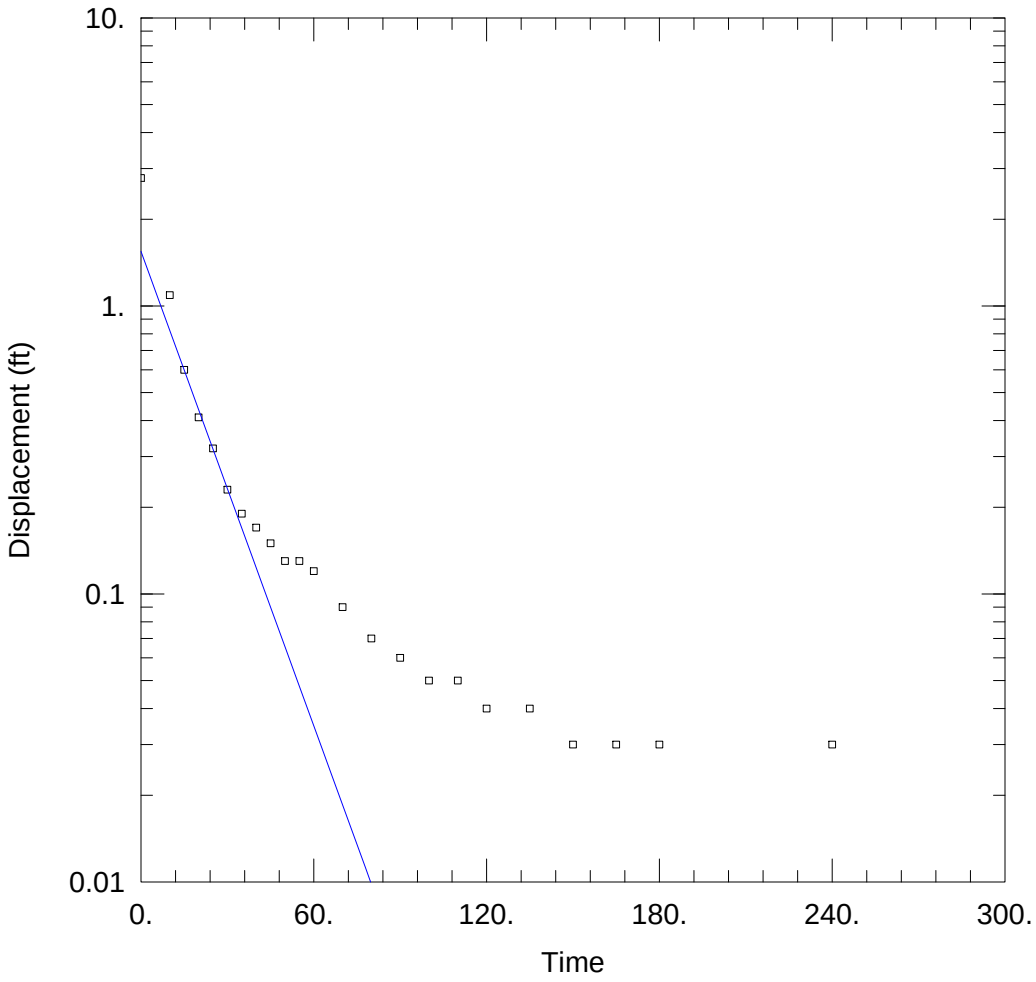
SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.037

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.007388	cm/sec
y0	0.4182	ft



MW-17 SLUG OUT, 5-FT SLUG

Data Set: J:\...\MW-17 Slug Out 5ft Slug.aqt
Date: 04/14/16 Time: 14:47:00

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Well: MW-17
Test Date: 7/25/11

AQUIFER DATA

Saturated Thickness: 5. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-17)

Initial Displacement: 2.78 ft
Total Well Penetration Depth: 5. ft
Casing Radius: 0.08 ft
Static Water Column Height: 5. ft
Screen Length: 5. ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.009553 cm/sec
y0 = 1.545 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 July 25 2011_slug tests\MW-1
Title: MW-17 Slug Out, 5-ft Slug
Date: 04/14/16
Time: 14:47:22

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Date: 7/25/11
Test Well: MW-17

AQUIFER DATA

Saturated Thickness: 5. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-17

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.78 ft
Static Water Column Height: 5. ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 5. ft
Total Well Penetration Depth: 5. ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 22

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
10.	1.09	70.	0.09
15.	0.6	80.	0.07
20.	0.41	90.	0.06
25.	0.32	100.	0.05
30.	0.23	110.	0.05
35.	0.19	120.	0.04
40.	0.17	135.	0.04
45.	0.15	150.	0.03
50.	0.13	165.	0.03
55.	0.13	180.	0.03
60.	0.12	240.	0.03

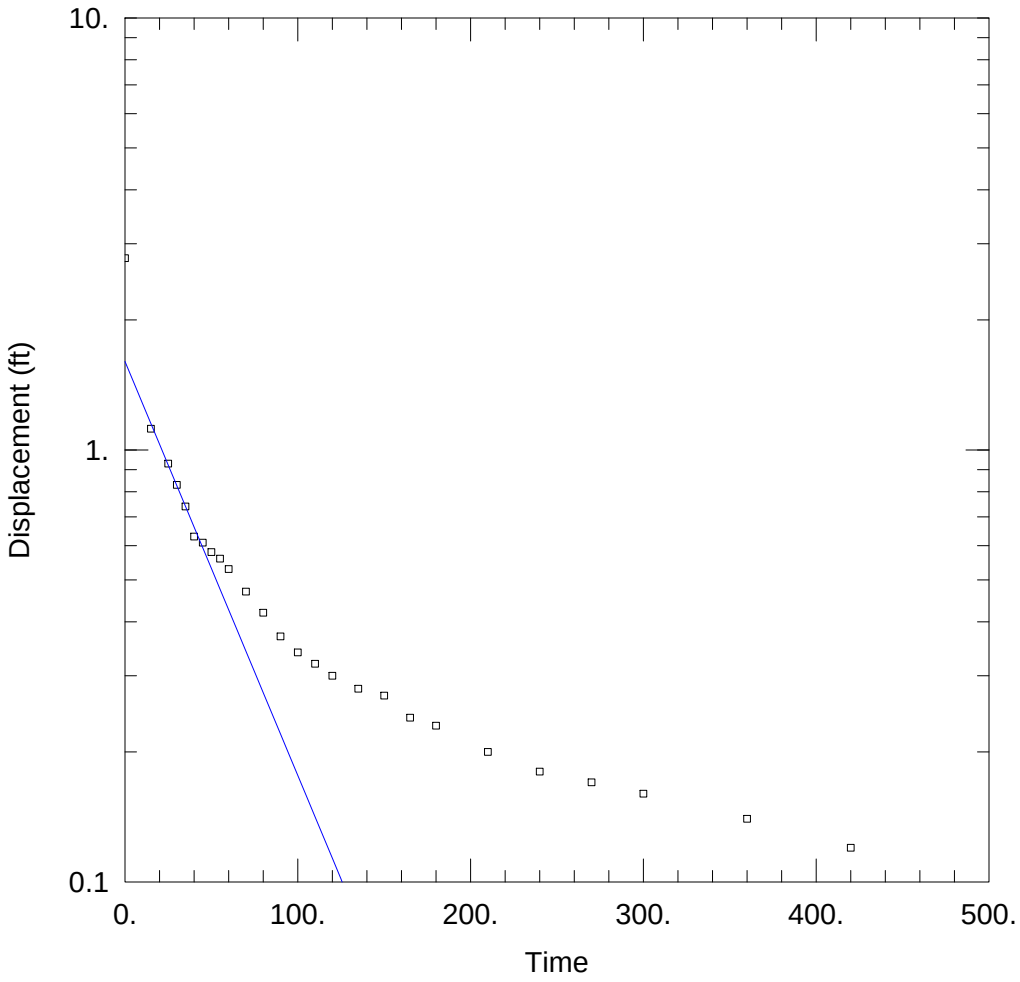
SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.037

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.009553	cm/sec
y0	1.545	ft



MW-20 SLUG OUT

Data Set: J:\...\MW-20 Slug Out.aqt
Date: 04/14/16 Time: 15:06:49

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Well: MW-20
Test Date: 7/25/11

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-20)

Initial Displacement: 2.78 ft
Total Well Penetration Depth: 10.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 10.5 ft
Screen Length: 10.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002083 cm/sec y0 = 1.602 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 July 25 2011_slug tests\MW-2
Title: MW-20 Slug Out
Date: 04/14/16
Time: 14:41:31

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil/Tropicana Energy Site
Project: 1651
Location: San Antonio, TX
Test Date: 7/25/11
Test Well: MW-20

AQUIFER DATA

Saturated Thickness: 10.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-20

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.78 ft
Static Water Column Height: 10.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 10.5 ft
Total Well Penetration Depth: 10.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 25

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
15.	1.12	110.	0.32
25.	0.93	120.	0.3
30.	0.83	135.	0.28
35.	0.74	150.	0.27
40.	0.63	165.	0.24
45.	0.61	180.	0.23
50.	0.58	210.	0.2
55.	0.56	240.	0.18
60.	0.53	270.	0.17
70.	0.47	300.	0.16
80.	0.42	360.	0.14
90.	0.37	420.	0.12
100.	0.34		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.673

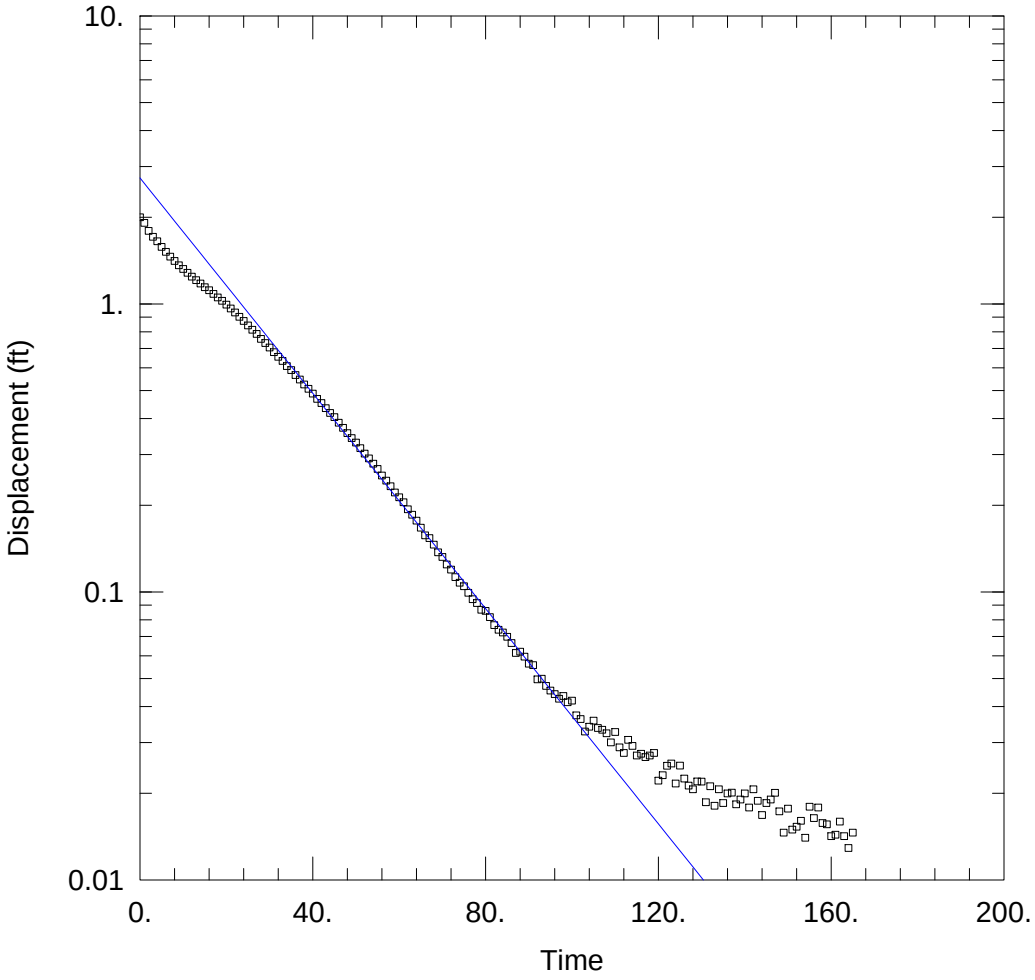
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002083	cm/sec

APPENDIX F-2

DECEMBER 2011 SLUG TESTS



MW-16 SLUG TEST 1

Data Set: J:\...\MW-16_test1.aqt
Date: 04/14/16 Time: 14:50:31

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Well: MW-16
Test Date: 12/13/2011

AQUIFER DATA

Saturated Thickness: 4.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-16)

Initial Displacement: 2. ft
Total Well Penetration Depth: 4.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 4.5 ft
Screen Length: 4.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.006912 cm/sec y0 = 2.737 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 December 2011_Slug Tests\A
Title: MW-16 Slug Test 1
Date: 04/14/16
Time: 14:51:03

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Date: 12/13/2011
Test Well: MW-16

AQUIFER DATA

Saturated Thickness: 4.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-16

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2. ft
Static Water Column Height: 4.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 4.5 ft
Total Well Penetration Depth: 4.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 165

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	1.911	84.	0.07235
2.	1.794	85.	0.06981
3.	1.709	86.	0.06649
4.	1.65	87.	0.0614
5.	1.578	88.	0.06204
6.	1.516	89.	0.05961
7.	1.46	90.	0.05636
8.	1.409	91.	0.05569
9.	1.362	92.	0.04969
10.	1.322	93.	0.04993
11.	1.283	94.	0.04714
12.	1.244	95.	0.04545
13.	1.209	96.	0.04418
14.	1.177	97.	0.04259
15.	1.144	98.	0.04354
16.	1.115	99.	0.04142
17.	1.083	100.	0.04195
18.	1.054	101.	0.03729
19.	1.025	102.	0.0362
20.	0.9938	103.	0.03274
21.	0.9636	104.	0.03404
22.	0.9336	105.	0.03574
23.	0.9017	106.	0.03369
24.	0.8725	107.	0.03324
25.	0.8423	108.	0.03228
26.	0.8136	109.	0.03002

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
27.	0.7867	110.	0.03263
28.	0.7566	111.	0.02885
29.	0.7311	112.	0.02758
30.	0.706	113.	0.03065
31.	0.6797	114.	0.02921
32.	0.6548	115.	0.02705
33.	0.6339	116.	0.02741
34.	0.6086	117.	0.0267
35.	0.5888	118.	0.02705
36.	0.5663	119.	0.02758
37.	0.5462	120.	0.02211
38.	0.5253	121.	0.0231
39.	0.5071	122.	0.02491
40.	0.4883	123.	0.02537
41.	0.468	124.	0.02162
42.	0.4529	125.	0.02494
43.	0.4345	126.	0.0225
44.	0.4183	127.	0.02127
45.	0.4045	128.	0.02063
46.	0.3868	129.	0.02197
47.	0.3713	130.	0.02194
48.	0.3558	131.	0.01862
49.	0.3422	132.	0.02116
50.	0.3302	133.	0.01809
51.	0.3157	134.	0.02064
52.	0.3021	135.	0.01848
53.	0.2909	136.	0.01996
54.	0.2787	137.	0.0201
55.	0.2672	138.	0.0183
56.	0.2537	139.	0.01901
57.	0.2435	140.	0.01997
58.	0.2327	141.	0.01784
59.	0.2214	142.	0.02063
60.	0.2132	143.	0.01883
61.	0.2048	144.	0.01679
62.	0.1937	145.	0.01848
63.	0.1854	146.	0.01901
64.	0.1768	147.	0.02007
65.	0.167	148.	0.01731
66.	0.1573	149.	0.0146
67.	0.1537	150.	0.01767
68.	0.1459	151.	0.01495
69.	0.1372	152.	0.0153
70.	0.1322	153.	0.01604
71.	0.1246	154.	0.014
72.	0.1195	155.	0.01795
73.	0.1125	156.	0.0164
74.	0.1077	157.	0.01785
75.	0.1046	158.	0.01576
76.	0.09925	159.	0.01559
77.	0.09438	160.	0.01418
78.	0.09145	161.	0.01435
79.	0.08675	162.	0.01594
80.	0.08591	163.	0.01418
81.	0.08178	164.	0.01291
82.	0.07673	165.	0.0146
83.	0.07387		

SOLUTION

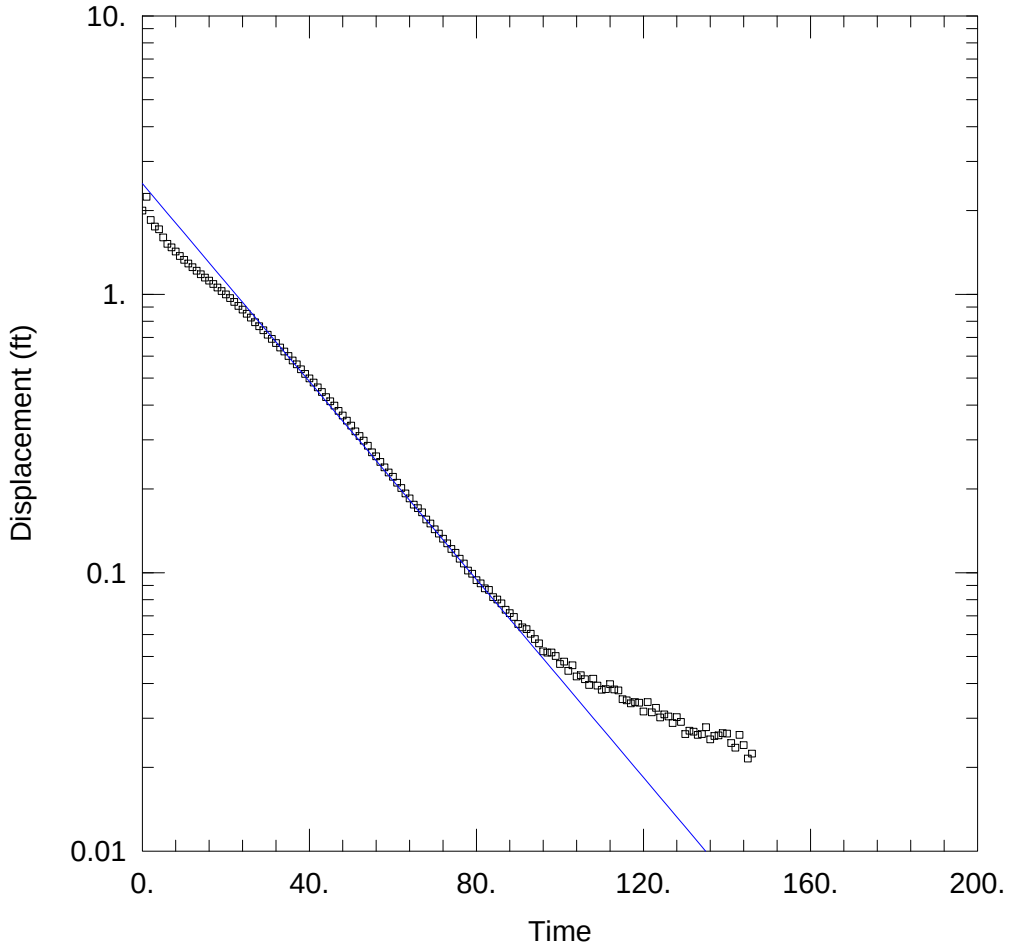
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.949

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.006912	cm/sec
y0	2.737	ft

$T = K*b = 0.9481$ cm²/sec



MW-16 SLUG TEST 2

Data Set: J:\...\MW-16_test2.aqt
Date: 04/14/16 Time: 14:51:23

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Well: MW-16
Test Date: 12/13/2011

AQUIFER DATA

Saturated Thickness: 4.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-16)

Initial Displacement: 2. ft
Total Well Penetration Depth: 4.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 4.5 ft
Screen Length: 4.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.006575 cm/sec
y0 = 2.5 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 December 2011_Slug Tes
Title: MW-16 Slug Test 2
Date: 04/14/16
Time: 14:51:36

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Date: 12/13/2011
Test Well: MW-16

AQUIFER DATA

Saturated Thickness: 4.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-16

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2. ft
Static Water Column Height: 4.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 4.5 ft
Total Well Penetration Depth: 4.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 146

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	2.241	74.	0.1218
2.	1.85	75.	0.1179
3.	1.751	76.	0.1122
4.	1.712	77.	0.108
5.	1.602	78.	0.1018
6.	1.518	79.	0.09916
7.	1.475	80.	0.09404
8.	1.424	81.	0.0916
9.	1.373	82.	0.08786
10.	1.33	83.	0.08677
11.	1.291	84.	0.08175
12.	1.251	85.	0.08013
13.	1.215	86.	0.07762
14.	1.181	87.	0.0736
15.	1.149	88.	0.07155
16.	1.119	89.	0.06936
17.	1.088	90.	0.06541
18.	1.058	91.	0.06361
19.	1.028	92.	0.06273
20.	0.9995	93.	0.06039
21.	0.9695	94.	0.05778
22.	0.9392	95.	0.05577
23.	0.9091	96.	0.05217
24.	0.8813	97.	0.05163
25.	0.8517	98.	0.05171
26.	0.8244	99.	0.05019
27.	0.7938	100.	0.04698

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
28.	0.7677	101.	0.04793
29.	0.7426	102.	0.04443
30.	0.7157	103.	0.04652
31.	0.6915	104.	0.04239
32.	0.6683	105.	0.04285
33.	0.6442	106.	0.04147
34.	0.6234	107.	0.03953
35.	0.6005	108.	0.04164
36.	0.5783	109.	0.03932
37.	0.5603	110.	0.03798
38.	0.538	111.	0.03818
39.	0.5179	112.	0.03978
40.	0.499	113.	0.03808
41.	0.4819	114.	0.0378
42.	0.4634	115.	0.03511
43.	0.4457	116.	0.03483
44.	0.4276	117.	0.03395
45.	0.4129	118.	0.0343
46.	0.3983	119.	0.03412
47.	0.3815	120.	0.03172
48.	0.367	121.	0.0343
49.	0.3516	122.	0.03151
50.	0.3377	123.	0.03271
51.	0.322	124.	0.03021
52.	0.3097	125.	0.03098
53.	0.2981	126.	0.03045
54.	0.2858	127.	0.02886
55.	0.2707	128.	0.03028
56.	0.2619	129.	0.02911
57.	0.2501	130.	0.02632
58.	0.2389	131.	0.02706
59.	0.2291	132.	0.02685
60.	0.2212	133.	0.02615
61.	0.2106	134.	0.02632
62.	0.2014	135.	0.02787
63.	0.1926	136.	0.0252
64.	0.185	137.	0.0259
65.	0.1757	138.	0.02604
66.	0.1706	139.	0.02654
67.	0.1648	140.	0.02643
68.	0.1554	141.	0.02446
69.	0.1502	142.	0.02354
70.	0.1432	143.	0.02615
71.	0.1382	144.	0.02403
72.	0.1326	145.	0.02149
73.	0.1275	146.	0.0224

SOLUTION

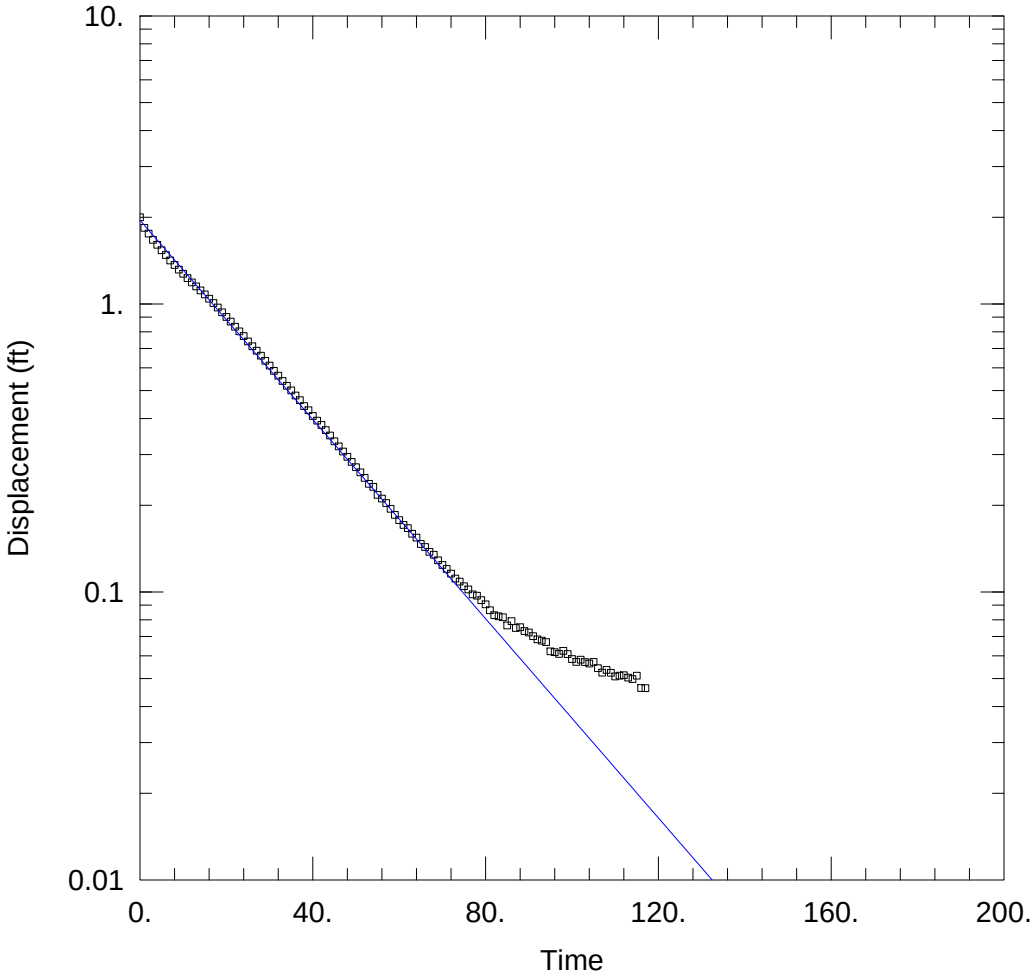
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.949

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.006575	cm/sec
y0	2.5	ft

$T = K*b = 0.9018$ cm²/sec



MW-16 SLUG TEST 3

Data Set: J:\...\MW-16_test3.aqt
Date: 04/14/16 Time: 14:51:55

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Well: MW-16
Test Date: 12/13/2011

AQUIFER DATA

Saturated Thickness: 4.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-16)

Initial Displacement: 2. ft
Total Well Penetration Depth: 4.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 4.5 ft
Screen Length: 4.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.006396 cm/sec y0 = 1.953 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 December 2011_Slug Tests\A
Title: MW-16 Slug Test 3
Date: 04/14/16
Time: 14:52:13

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Date: 12/13/2011
Test Well: MW-16

AQUIFER DATA

Saturated Thickness: 4.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-16

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2. ft
Static Water Column Height: 4.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 4.5 ft
Total Well Penetration Depth: 4.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 117

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	1.838	60.	0.1776
2.	1.756	61.	0.1708
3.	1.669	62.	0.1665
4.	1.605	63.	0.1592
5.	1.537	64.	0.1543
6.	1.478	65.	0.1467
7.	1.415	66.	0.1431
8.	1.366	67.	0.1378
9.	1.316	68.	0.1347
10.	1.272	69.	0.1288
11.	1.23	70.	0.1241
12.	1.188	71.	0.1201
13.	1.151	72.	0.1157
14.	1.114	73.	0.1113
15.	1.079	74.	0.1086
16.	1.042	75.	0.1046
17.	1.006	76.	0.102
18.	0.9712	77.	0.09808
19.	0.9348	78.	0.09702
20.	0.9007	79.	0.09359
21.	0.8683	80.	0.09056
22.	0.8335	81.	0.08643
23.	0.8027	82.	0.083
24.	0.7737	83.	0.08229
25.	0.7413	84.	0.08166
26.	0.7134	85.	0.07647
27.	0.6875	86.	0.07915

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
28.	0.6609	87.	0.07492
29.	0.6347	88.	0.07541
30.	0.6108	89.	0.07312
31.	0.5851	90.	0.07227
32.	0.5631	91.	0.07019
33.	0.5404	92.	0.06846
34.	0.52	93.	0.06775
35.	0.5006	94.	0.06694
36.	0.4807	95.	0.06221
37.	0.4632	96.	0.06179
38.	0.4421	97.	0.06094
39.	0.4276	98.	0.06238
40.	0.4079	99.	0.06087
41.	0.3933	100.	0.05846
42.	0.38	101.	0.05716
43.	0.3647	102.	0.05818
44.	0.3493	103.	0.05709
45.	0.3333	104.	0.05645
46.	0.3199	105.	0.05716
47.	0.3074	106.	0.05433
48.	0.2945	107.	0.05243
49.	0.2827	108.	0.05359
50.	0.2712	109.	0.05236
51.	0.2601	110.	0.05084
52.	0.2487	111.	0.05119
53.	0.2371	112.	0.05137
54.	0.2315	113.	0.05038
55.	0.2172	114.	0.04985
56.	0.2109	115.	0.05116
57.	0.2034	116.	0.04636
58.	0.1942	117.	0.04633
59.	0.1851		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.949

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.006396	cm/sec
y0	1.953	ft

$T = K*b = 0.8773$ cm²/sec

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
94.	0.3664	189.	0.1983
95.	0.362		

SOLUTION

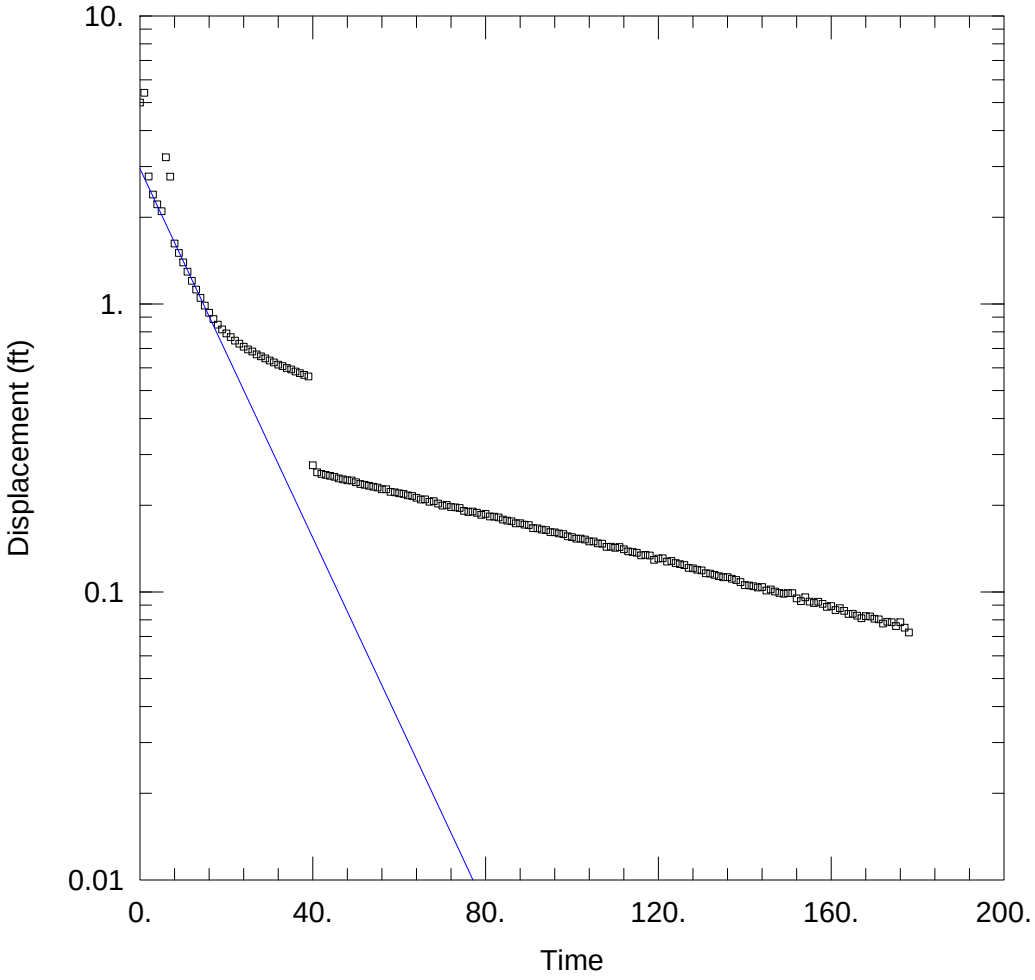
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.597

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00707	cm/sec
y0	2.794	ft

$T = K*b = 2.069$ cm²/sec



MW-20 TEST 1

Data Set: J:\...\MW-20_test1.aqt
Date: 04/14/16 Time: 15:44:48

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Well: MW-20
Test Date: 12/13/2011

AQUIFER DATA

Saturated Thickness: 9.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-20)

Initial Displacement: 5. ft
Total Well Penetration Depth: 9.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 9.5 ft
Screen Length: 9.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007454 cm/sec y0 = 2.946 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 December 2011_Slug Tests\A
Title: MW-20 Test 1
Date: 04/14/16
Time: 15:45:09

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Date: 12/13/2011
Test Well: MW-20

AQUIFER DATA

Saturated Thickness: 9.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-20

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 5. ft
Static Water Column Height: 9.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 9.5 ft
Total Well Penetration Depth: 9.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 178

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	5.41	90.	0.1705
2.	2.771	91.	0.1665
3.	2.398	92.	0.1663
4.	2.217	93.	0.1646
5.	2.098	94.	0.1639
6.	3.228	95.	0.1613
7.	2.765	96.	0.161
8.	1.621	97.	0.1597
9.	1.504	98.	0.1587
10.	1.394	99.	0.156
11.	1.294	100.	0.155
12.	1.203	101.	0.1531
13.	1.122	102.	0.1533
14.	1.049	103.	0.1521
15.	0.9862	104.	0.1497
16.	0.9312	105.	0.1498
17.	0.8859	106.	0.1474
18.	0.8478	107.	0.147
19.	0.8158	108.	0.1434
20.	0.7901	109.	0.1436
21.	0.7664	110.	0.1423
22.	0.7458	111.	0.1431
23.	0.7276	112.	0.1407
24.	0.7101	113.	0.1383
25.	0.695	114.	0.1376
26.	0.6834	115.	0.1368
27.	0.6682	116.	0.134

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
28.	0.6574	117.	0.1345
29.	0.6472	118.	0.1337
30.	0.6365	119.	0.1293
31.	0.6266	120.	0.1306
32.	0.6152	121.	0.1309
33.	0.6087	122.	0.1274
34.	0.5992	123.	0.1281
35.	0.5926	124.	0.1259
36.	0.5824	125.	0.1249
37.	0.5751	126.	0.1239
38.	0.567	127.	0.1212
39.	0.5595	128.	0.1208
40.	0.2754	129.	0.1194
41.	0.2601	130.	0.1188
42.	0.257	131.	0.116
43.	0.2549	132.	0.1158
44.	0.2531	133.	0.1146
45.	0.2511	134.	0.1135
46.	0.2478	135.	0.1124
47.	0.246	136.	0.1125
48.	0.2442	137.	0.1112
49.	0.2437	138.	0.11
50.	0.2404	139.	0.1082
51.	0.2371	140.	0.1056
52.	0.2355	141.	0.1053
53.	0.2336	142.	0.1047
54.	0.2319	143.	0.1036
55.	0.2303	144.	0.104
56.	0.2271	145.	0.1011
57.	0.2273	146.	0.102
58.	0.2226	147.	0.1003
59.	0.2217	148.	0.0992
60.	0.2201	149.	0.0986
61.	0.219	150.	0.099
62.	0.2164	151.	0.0991
63.	0.2152	152.	0.095
64.	0.2123	153.	0.0929
65.	0.2094	154.	0.0958
66.	0.2095	155.	0.0926
67.	0.2055	156.	0.0915
68.	0.2066	157.	0.0924
69.	0.2027	158.	0.0909
70.	0.1993	159.	0.0887
71.	0.2005	160.	0.0893
72.	0.1971	161.	0.0865
73.	0.1967	162.	0.0878
74.	0.1956	163.	0.0859
75.	0.1911	164.	0.0839
76.	0.1895	165.	0.084
77.	0.1903	166.	0.0827
78.	0.1882	167.	0.081
79.	0.1852	168.	0.0824
80.	0.1866	169.	0.0822
81.	0.1829	170.	0.0807
82.	0.1825	171.	0.0803
83.	0.1813	172.	0.0777
84.	0.1783	173.	0.0788
85.	0.1769	174.	0.0785
86.	0.1759	175.	0.0761
87.	0.1731	176.	0.0785
88.	0.1733	177.	0.0751
89.	0.1713	178.	0.0723

SOLUTION

Slug Test

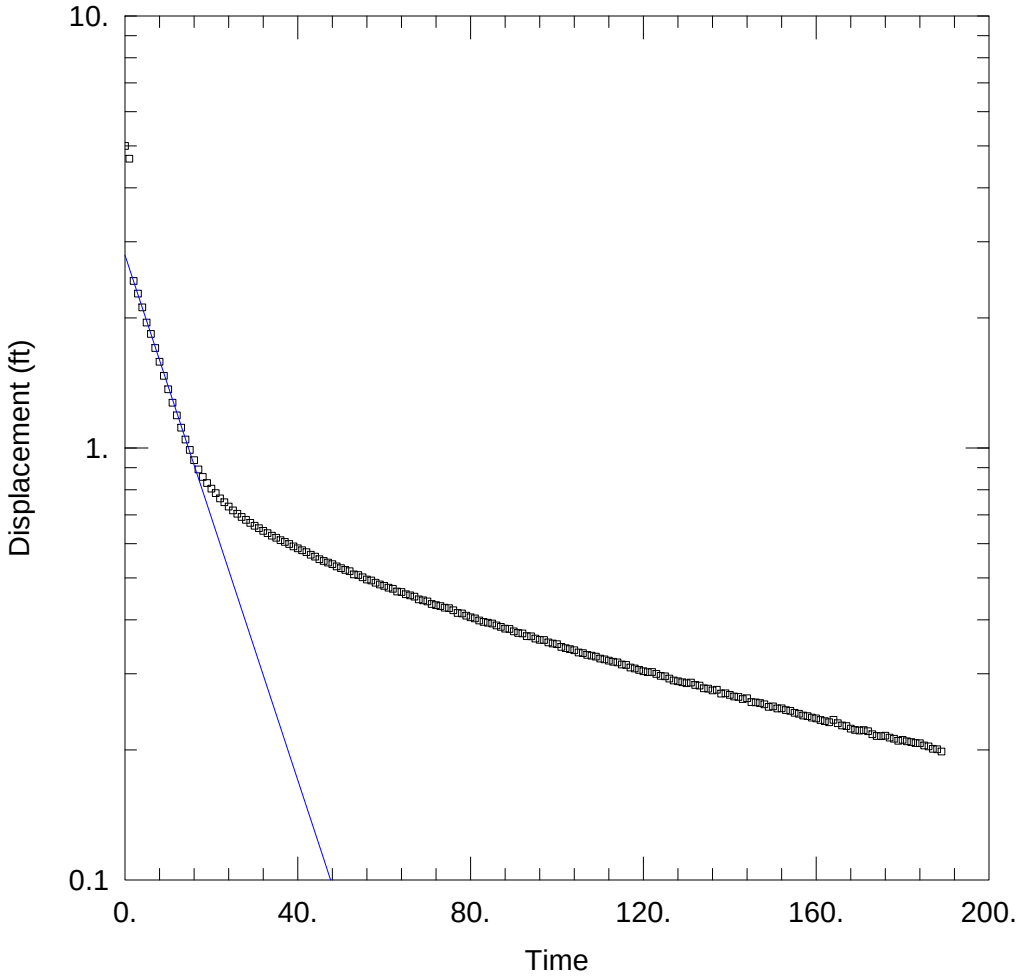
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.589

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.007454	cm/sec
y0	2.946	ft

$T = K*b = 2.158$ cm²/sec



MW-20 TEST 2

Data Set: J:\...\MW-20_test2.aqt
Date: 04/14/16 Time: 15:46:03

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Well: MW-20
Test Date: 12/13/2011

AQUIFER DATA

Saturated Thickness: 9.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-20)

Initial Displacement: 5. ft
Total Well Penetration Depth: 9.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 9.5 ft
Screen Length: 9.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.00707 cm/sec y0 = 2.794 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 December 2011_Slug Tests\A
Title: MW-20 Test 2
Date: 04/14/16
Time: 15:46:19

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Date: 12/13/2011
Test Well: MW-20

AQUIFER DATA

Saturated Thickness: 9.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-20

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 5. ft
Static Water Column Height: 9.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 9.5 ft
Total Well Penetration Depth: 9.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 189

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	4.673	96.	0.3596
2.	2.436	97.	0.3592
3.	2.276	98.	0.3546
4.	2.115	99.	0.3527
5.	1.95	100.	0.3514
6.	1.836	101.	0.3462
7.	1.703	102.	0.3438
8.	1.582	103.	0.3421
9.	1.469	104.	0.3401
10.	1.367	105.	0.336
11.	1.273	106.	0.3349
12.	1.19	107.	0.3318
13.	1.114	108.	0.3304
14.	1.046	109.	0.3287
15.	0.9891	110.	0.3254
16.	0.937	111.	0.324
17.	0.8915	112.	0.3219
18.	0.8567	113.	0.3198
19.	0.8292	114.	0.3188
20.	0.8048	115.	0.3152
21.	0.7856	116.	0.3144
22.	0.764	117.	0.3102
23.	0.7484	118.	0.3087
24.	0.7315	119.	0.3062
25.	0.7166	120.	0.3043
26.	0.7043	121.	0.3027
27.	0.6924	122.	0.3028

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
28.	0.6814	123.	0.2999
29.	0.6704	124.	0.2967
30.	0.6603	125.	0.296
31.	0.6522	126.	0.2926
32.	0.6425	127.	0.2895
33.	0.6348	128.	0.2884
34.	0.6266	129.	0.2867
35.	0.6193	130.	0.2853
36.	0.6115	131.	0.2862
37.	0.6058	132.	0.2827
38.	0.5992	133.	0.2818
39.	0.5917	134.	0.2777
40.	0.5856	135.	0.2772
41.	0.5796	136.	0.2745
42.	0.5737	137.	0.2755
43.	0.5661	138.	0.27
44.	0.56	139.	0.2705
45.	0.5528	140.	0.2681
46.	0.5475	141.	0.2658
47.	0.5429	142.	0.2651
48.	0.5382	143.	0.2623
49.	0.5319	144.	0.2634
50.	0.5269	145.	0.258
51.	0.5219	146.	0.2575
52.	0.5185	147.	0.2568
53.	0.5097	148.	0.2549
54.	0.5078	149.	0.2515
55.	0.5017	150.	0.2521
56.	0.4957	151.	0.2493
57.	0.4932	152.	0.2495
58.	0.4873	153.	0.2472
59.	0.4829	154.	0.2463
60.	0.4792	155.	0.2438
61.	0.4749	156.	0.2425
62.	0.472	157.	0.2401
63.	0.4651	158.	0.2393
64.	0.464	159.	0.2375
65.	0.4586	160.	0.2365
66.	0.4556	161.	0.2345
67.	0.4526	162.	0.2331
68.	0.4462	163.	0.2317
69.	0.444	164.	0.2347
70.	0.4411	165.	0.2306
71.	0.4354	166.	0.2279
72.	0.4327	167.	0.2271
73.	0.4306	168.	0.2239
74.	0.4269	169.	0.2224
75.	0.4258	170.	0.2217
76.	0.4208	171.	0.2222
77.	0.4149	172.	0.221
78.	0.4139	173.	0.2174
79.	0.4089	174.	0.2154
80.	0.4054	175.	0.2151
81.	0.4031	176.	0.2157
82.	0.3985	177.	0.2135
83.	0.3957	178.	0.2123
84.	0.394	179.	0.21
85.	0.3922	180.	0.2109
86.	0.3881	181.	0.2093
87.	0.3852	182.	0.2084
88.	0.3817	183.	0.2075
89.	0.381	184.	0.2072
90.	0.3762	185.	0.2048
91.	0.3731	186.	0.2038
92.	0.3721	187.	0.2011
93.	0.3668	188.	0.2007

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
94.	0.3664	189.	0.1983
95.	0.362		

SOLUTION

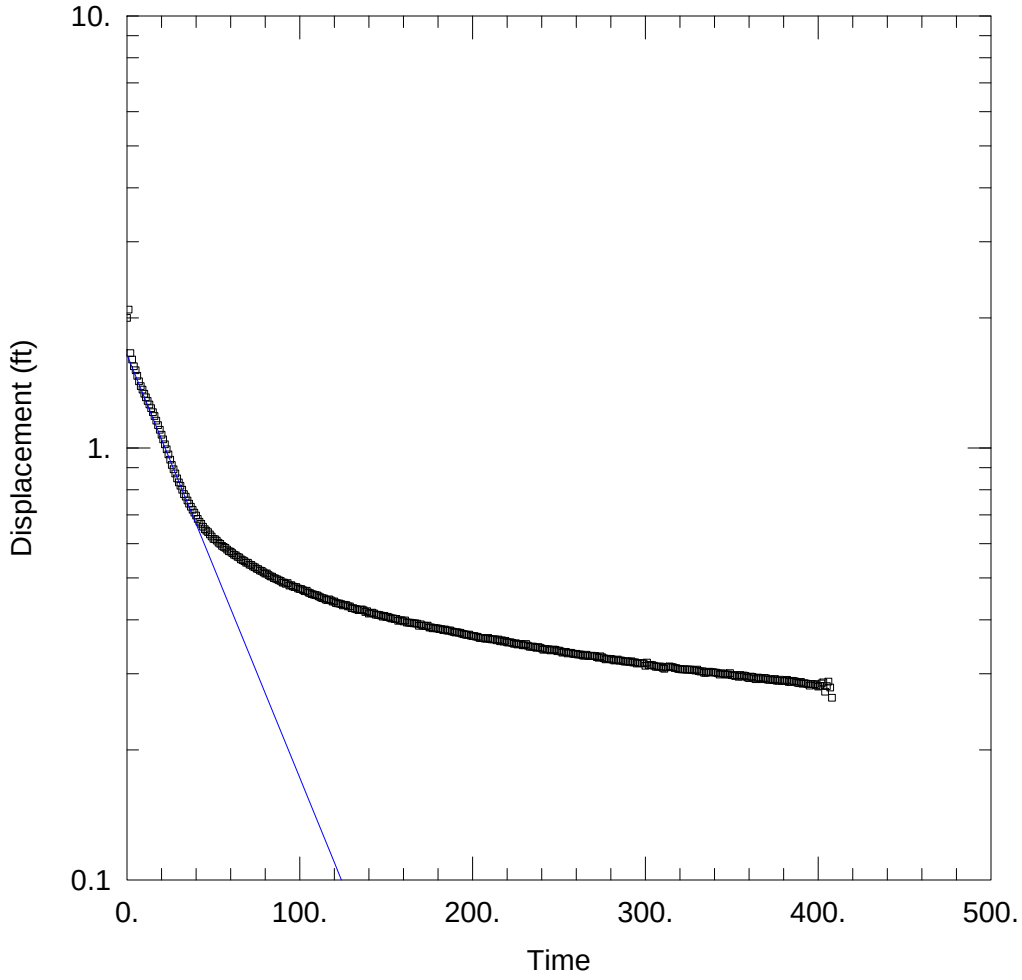
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.589

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00707	cm/sec
y0	2.794	ft

$T = K*b = 2.047$ cm²/sec



NMW-5 TEST 1

Data Set: J:\...\NMW-5_test1.aqt
Date: 04/14/16 Time: 15:52:56

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Well: NMW-5
Test Date: 12/13/2011

AQUIFER DATA

Saturated Thickness: 3.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (NMW-5)

Initial Displacement: 2. ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004169 cm/sec y0 = 1.643 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 December 2011_Slug Tests\A
Title: NMW-5 Test 1
Date: 04/14/16
Time: 15:53:14

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Date: 12/13/2011
Test Well: NMW-5

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: NMW-5

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2. ft
Static Water Column Height: 3.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 3.5 ft
Total Well Penetration Depth: 3.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 408

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	2.091	205.	0.3632
2.	1.657	206.	0.3633
3.	1.602	207.	0.3619
4.	1.545	208.	0.3617
5.	1.513	209.	0.3634
6.	1.468	210.	0.3613
7.	1.426	211.	0.3603
8.	1.39	212.	0.3606
9.	1.364	213.	0.3603
10.	1.335	214.	0.3587
11.	1.31	215.	0.3601
12.	1.285	216.	0.3569
13.	1.26	217.	0.3585
14.	1.236	218.	0.3561
15.	1.21	219.	0.3578
16.	1.185	220.	0.3547
17.	1.157	221.	0.3547
18.	1.129	222.	0.355
19.	1.102	223.	0.3539
20.	1.073	224.	0.3519
21.	1.047	225.	0.3531
22.	1.02	226.	0.3508
23.	0.9929	227.	0.3513
24.	0.9659	228.	0.3515
25.	0.939	229.	0.3492
26.	0.9134	230.	0.3492
27.	0.8922	231.	0.3515

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
28.	0.8727	232.	0.3488
29.	0.85	233.	0.3466
30.	0.8324	234.	0.3467
31.	0.8173	235.	0.347
32.	0.8003	236.	0.3457
33.	0.7818	237.	0.3445
34.	0.7712	238.	0.3459
35.	0.7559	239.	0.3447
36.	0.7429	240.	0.3432
37.	0.7307	241.	0.341
38.	0.7194	242.	0.3425
39.	0.7083	243.	0.342
40.	0.6972	244.	0.3418
41.	0.6853	245.	0.34
42.	0.6748	246.	0.3407
43.	0.667	247.	0.3413
44.	0.6572	248.	0.3411
45.	0.6486	249.	0.3383
46.	0.6429	250.	0.3394
47.	0.6381	251.	0.338
48.	0.6307	252.	0.336
49.	0.6235	253.	0.3371
50.	0.6159	254.	0.3373
51.	0.6149	255.	0.3344
52.	0.6098	256.	0.3354
53.	0.6033	257.	0.3357
54.	0.5998	258.	0.334
55.	0.593	259.	0.3333
56.	0.5902	260.	0.3337
57.	0.5872	261.	0.3325
58.	0.5816	262.	0.3326
59.	0.5765	263.	0.3322
60.	0.575	264.	0.3304
61.	0.5707	265.	0.3307
62.	0.5659	266.	0.3322
63.	0.564	267.	0.3301
64.	0.5596	268.	0.33
65.	0.5576	269.	0.3305
66.	0.5521	270.	0.3299
67.	0.5498	271.	0.3299
68.	0.5468	272.	0.328
69.	0.5423	273.	0.3267
70.	0.5422	274.	0.3292
71.	0.5366	275.	0.3276
72.	0.5358	276.	0.326
73.	0.5311	277.	0.3241
74.	0.5294	278.	0.3251
75.	0.5255	279.	0.3248
76.	0.524	280.	0.3248
77.	0.5203	281.	0.3236
78.	0.5193	282.	0.3221
79.	0.5153	283.	0.3227
80.	0.5117	284.	0.3237
81.	0.5122	285.	0.3219
82.	0.5078	286.	0.322
83.	0.5045	287.	0.3213
84.	0.5034	288.	0.3203
85.	0.4998	289.	0.3204
86.	0.4982	290.	0.3205
87.	0.4965	291.	0.3197
88.	0.4937	292.	0.3208
89.	0.492	293.	0.3186
90.	0.488	294.	0.3191
91.	0.4877	295.	0.3169
92.	0.4847	296.	0.3181
93.	0.4867	297.	0.3176

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
94.	0.48	298.	0.3177
95.	0.4812	299.	0.3169
96.	0.4782	300.	0.3132
97.	0.4764	301.	0.3186
98.	0.4766	302.	0.314
99.	0.4726	303.	0.3149
100.	0.4716	304.	0.3142
101.	0.471	305.	0.3132
102.	0.4684	306.	0.3115
103.	0.4659	307.	0.3117
104.	0.4671	308.	0.3117
105.	0.4629	309.	0.3117
106.	0.4611	310.	0.3097
107.	0.4587	311.	0.3081
108.	0.4578	312.	0.3106
109.	0.4563	313.	0.3112
110.	0.4558	314.	0.312
111.	0.4532	315.	0.3109
112.	0.451	316.	0.3107
113.	0.4493	317.	0.3095
114.	0.4483	318.	0.309
115.	0.4457	319.	0.3078
116.	0.4442	320.	0.3078
117.	0.446	321.	0.3071
118.	0.4437	322.	0.3073
119.	0.4406	323.	0.3071
120.	0.4412	324.	0.3068
121.	0.4374	325.	0.3069
122.	0.4366	326.	0.3071
123.	0.4363	327.	0.3062
124.	0.4349	328.	0.3063
125.	0.432	329.	0.3053
126.	0.4335	330.	0.3067
127.	0.4326	331.	0.3042
128.	0.4297	332.	0.3036
129.	0.4295	333.	0.3043
130.	0.4256	334.	0.3017
131.	0.4257	335.	0.3017
132.	0.4243	336.	0.3021
133.	0.4231	337.	0.3033
134.	0.4213	338.	0.3027
135.	0.4221	339.	0.3026
136.	0.4226	340.	0.302
137.	0.4211	341.	0.302
138.	0.4172	342.	0.3007
139.	0.4189	343.	0.2987
140.	0.4136	344.	0.3006
141.	0.415	345.	0.3005
142.	0.4155	346.	0.2992
143.	0.4138	347.	0.2989
144.	0.4109	348.	0.299
145.	0.411	349.	0.301
146.	0.4103	350.	0.2978
147.	0.4092	351.	0.2979
148.	0.4069	352.	0.2966
149.	0.4086	353.	0.2977
150.	0.4061	354.	0.2953
151.	0.4066	355.	0.298
152.	0.4048	356.	0.2957
153.	0.4029	357.	0.2972
154.	0.4032	358.	0.2965
155.	0.4015	359.	0.2942
156.	0.402	360.	0.2932
157.	0.3978	361.	0.2954
158.	0.3988	362.	0.2953
159.	0.3988	363.	0.2928

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
160.	0.3966	364.	0.2915
161.	0.3985	365.	0.2941
162.	0.3944	366.	0.2938
163.	0.3944	367.	0.2934
164.	0.3938	368.	0.2916
165.	0.3932	369.	0.2934
166.	0.3927	370.	0.2927
167.	0.3927	371.	0.2909
168.	0.3919	372.	0.2905
169.	0.3876	373.	0.2914
170.	0.3905	374.	0.29
171.	0.3878	375.	0.2917
172.	0.3877	376.	0.2893
173.	0.3869	377.	0.289
174.	0.3878	378.	0.2907
175.	0.384	379.	0.2889
176.	0.3844	380.	0.2893
177.	0.3823	381.	0.2884
178.	0.3834	382.	0.2905
179.	0.3824	383.	0.2873
180.	0.3819	384.	0.2873
181.	0.3807	385.	0.289
182.	0.3806	386.	0.2886
183.	0.3786	387.	0.2879
184.	0.3801	388.	0.286
185.	0.3781	389.	0.2854
186.	0.3776	390.	0.2874
187.	0.3782	391.	0.2846
188.	0.3761	392.	0.2854
189.	0.3751	393.	0.2848
190.	0.3738	394.	0.2842
191.	0.3746	395.	0.2817
192.	0.3738	396.	0.2841
193.	0.3733	397.	0.2838
194.	0.3715	398.	0.2839
195.	0.3705	399.	0.2823
196.	0.3697	400.	0.2803
197.	0.3693	401.	0.2813
198.	0.3699	402.	0.2848
199.	0.3675	403.	0.2866
200.	0.3666	404.	0.2728
201.	0.3671	405.	0.2809
202.	0.3658	406.	0.2877
203.	0.3654	407.	0.2788
204.	0.3634	408.	0.2641

SOLUTION

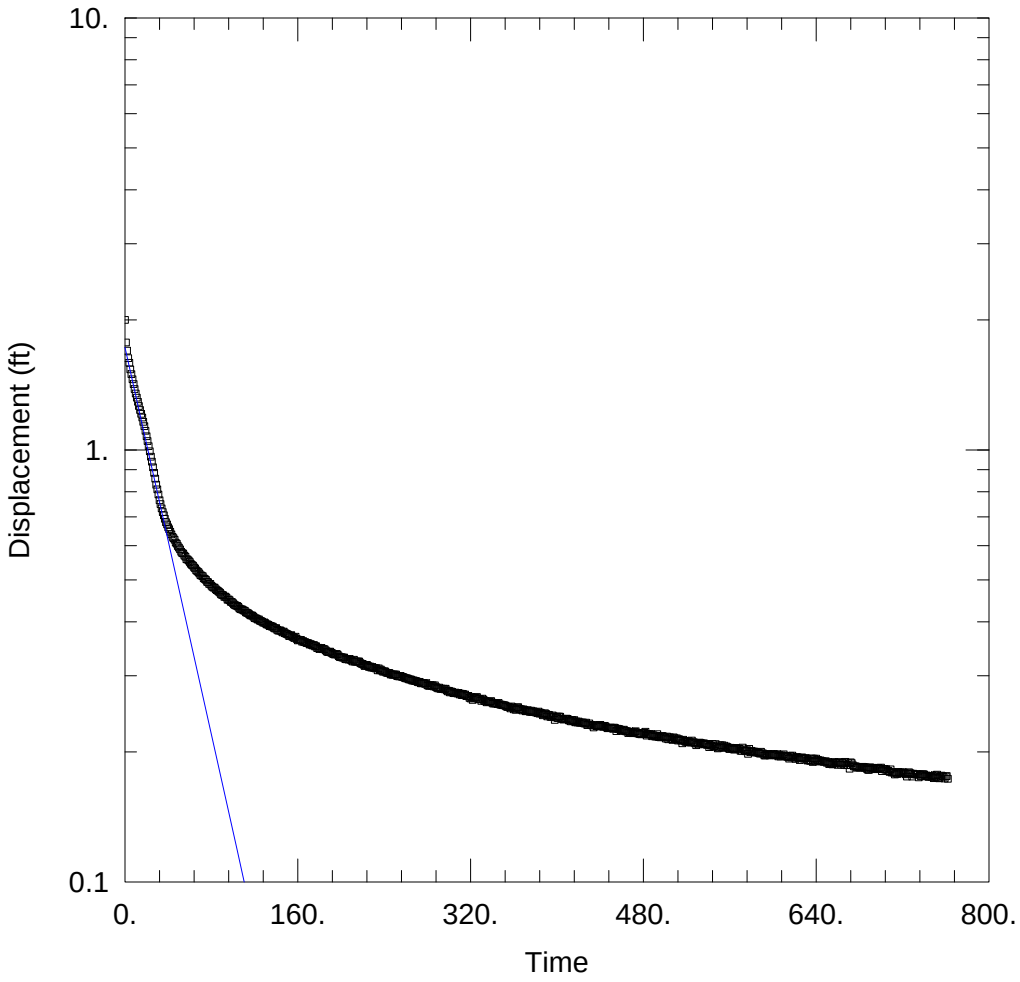
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.744

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.004169	cm/sec
y0	1.643	ft

$T = K*b = 0.4447$ cm²/sec



NMW-5 TEST 2

Data Set: J:\...\NMW-5_test2.aqt
Date: 04/14/16 Time: 15:55:49

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Well: NMW-5
Test Date: 12/13/2011

AQUIFER DATA

Saturated Thickness: 3.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (NMW-5)

Initial Displacement: 2. ft
Total Well Penetration Depth: 3.5 ft
Casing Radius: 0.08 ft
Static Water Column Height: 3.5 ft
Screen Length: 3.5 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004768 cm/sec y0 = 1.727 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\Slug tests and water level events\2011 December 2011_Slug Tests\A
Title: NMW-5 Test 2
Date: 04/14/16
Time: 15:54:22

PROJECT INFORMATION

Company: PBW, LLC
Client: R&H Oil
Project: 1651
Location: San Antonio, Texas
Test Date: 12/13/2011
Test Well: NMW-5

AQUIFER DATA

Saturated Thickness: 3.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: NMW-5

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2. ft
Static Water Column Height: 3.5 ft
Casing Radius: 0.08 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 3.5 ft
Total Well Penetration Depth: 3.5 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.156 ft
Gravel Pack Porosity: 0.2

No. of Observations: 762

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	1.773	382.	0.2458
2.	1.697	383.	0.2479
3.	1.631	384.	0.2451
4.	1.591	385.	0.2464
5.	1.537	386.	0.2453
6.	1.497	387.	0.2431
7.	1.458	388.	0.2441
8.	1.42	389.	0.2457
9.	1.383	390.	0.2448
10.	1.351	391.	0.2416
11.	1.322	392.	0.2437
12.	1.292	393.	0.2432
13.	1.264	394.	0.241
14.	1.237	395.	0.2411
15.	1.212	396.	0.2428
16.	1.188	397.	0.2416
17.	1.162	398.	0.2371
18.	1.135	399.	0.2403
19.	1.107	400.	0.2414
20.	1.075	401.	0.2395
21.	1.049	402.	0.2414
22.	1.021	403.	0.2413
23.	0.9929	404.	0.2386
24.	0.9647	405.	0.2385
25.	0.939	406.	0.2376
26.	0.9114	407.	0.2383
27.	0.8846	408.	0.2383

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
28.	0.8579	409.	0.2388
29.	0.8308	410.	0.2383
30.	0.8104	411.	0.2366
31.	0.7887	412.	0.2364
32.	0.765	413.	0.2354
33.	0.7491	414.	0.2371
34.	0.7324	415.	0.2357
35.	0.718	416.	0.2369
36.	0.7056	417.	0.2342
37.	0.6929	418.	0.2351
38.	0.6805	419.	0.2339
39.	0.6726	420.	0.2352
40.	0.6619	421.	0.2338
41.	0.6551	422.	0.2337
42.	0.6465	423.	0.2338
43.	0.638	424.	0.234
44.	0.6292	425.	0.2329
45.	0.6246	426.	0.2324
46.	0.6194	427.	0.2337
47.	0.6099	428.	0.2308
48.	0.6065	429.	0.2309
49.	0.599	430.	0.2327
50.	0.5944	431.	0.2309
51.	0.5887	432.	0.2306
52.	0.5811	433.	0.2302
53.	0.5774	434.	0.2278
54.	0.5758	435.	0.2305
55.	0.5694	436.	0.2303
56.	0.5659	437.	0.2294
57.	0.5581	438.	0.2303
58.	0.5576	439.	0.2291
59.	0.5544	440.	0.231
60.	0.5504	441.	0.23
61.	0.5451	442.	0.2292
62.	0.5416	443.	0.2286
63.	0.5395	444.	0.2297
64.	0.5343	445.	0.2292
65.	0.5318	446.	0.2279
66.	0.5264	447.	0.2268
67.	0.5235	448.	0.2273
68.	0.5215	449.	0.2273
69.	0.5173	450.	0.2275
70.	0.5129	451.	0.2273
71.	0.5118	452.	0.2261
72.	0.5102	453.	0.2277
73.	0.5046	454.	0.2271
74.	0.5029	455.	0.2235
75.	0.5003	456.	0.2262
76.	0.4951	457.	0.2258
77.	0.4943	458.	0.2257
78.	0.4895	459.	0.2243
79.	0.4897	460.	0.2248
80.	0.4851	461.	0.2236
81.	0.4823	462.	0.2252
82.	0.4799	463.	0.2237
83.	0.48	464.	0.223
84.	0.4762	465.	0.2234
85.	0.4737	466.	0.2211
86.	0.472	467.	0.2218
87.	0.4695	468.	0.2212
88.	0.4673	469.	0.2226
89.	0.4631	470.	0.2209
90.	0.4618	471.	0.222
91.	0.4608	472.	0.2227
92.	0.4571	473.	0.2232
93.	0.4577	474.	0.221

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
94.	0.4554	475.	0.2207
95.	0.4501	476.	0.2204
96.	0.4506	477.	0.2198
97.	0.449	478.	0.2197
98.	0.445	479.	0.2208
99.	0.4444	480.	0.2209
100.	0.4418	481.	0.2213
101.	0.4388	482.	0.2226
102.	0.437	483.	0.2181
103.	0.4361	484.	0.22
104.	0.435	485.	0.2195
105.	0.4333	486.	0.22
106.	0.4296	487.	0.2195
107.	0.4279	488.	0.2173
108.	0.4273	489.	0.2188
109.	0.4269	490.	0.2181
110.	0.4248	491.	0.217
111.	0.4241	492.	0.2172
112.	0.4207	493.	0.2198
113.	0.42	494.	0.2166
114.	0.4188	495.	0.2164
115.	0.4167	496.	0.216
116.	0.4143	497.	0.2176
117.	0.4139	498.	0.2175
118.	0.4134	499.	0.2163
119.	0.4112	500.	0.216
120.	0.4079	501.	0.2147
121.	0.4076	502.	0.2171
122.	0.4068	503.	0.2138
123.	0.4047	504.	0.216
124.	0.4051	505.	0.2159
125.	0.4023	506.	0.214
126.	0.4017	507.	0.2131
127.	0.4004	508.	0.216
128.	0.3983	509.	0.2152
129.	0.3988	510.	0.2136
130.	0.3974	511.	0.215
131.	0.3946	512.	0.2124
132.	0.3945	513.	0.2141
133.	0.3937	514.	0.2132
134.	0.391	515.	0.2124
135.	0.3916	516.	0.2094
136.	0.3898	517.	0.2134
137.	0.3899	518.	0.212
138.	0.3872	519.	0.211
139.	0.386	520.	0.2111
140.	0.387	521.	0.211
141.	0.3832	522.	0.2118
142.	0.3816	523.	0.2103
143.	0.3818	524.	0.2102
144.	0.382	525.	0.2124
145.	0.3802	526.	0.2107
146.	0.3781	527.	0.2102
147.	0.3797	528.	0.2093
148.	0.3765	529.	0.2073
149.	0.3758	530.	0.2098
150.	0.3748	531.	0.2082
151.	0.3735	532.	0.21
152.	0.3708	533.	0.2099
153.	0.3715	534.	0.2092
154.	0.3726	535.	0.2089
155.	0.3694	536.	0.2093
156.	0.3684	537.	0.2084
157.	0.367	538.	0.2082
158.	0.3694	539.	0.2076
159.	0.365	540.	0.2086

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
160.	0.3623	541.	0.2051
161.	0.3637	542.	0.2069
162.	0.3629	543.	0.207
163.	0.3631	544.	0.2086
164.	0.3598	545.	0.2056
165.	0.3611	546.	0.206
166.	0.3589	547.	0.2085
167.	0.359	548.	0.2059
168.	0.3573	549.	0.2038
169.	0.3572	550.	0.2044
170.	0.3567	551.	0.2072
171.	0.3544	552.	0.2054
172.	0.3552	553.	0.2072
173.	0.3539	554.	0.2047
174.	0.3524	555.	0.2066
175.	0.3534	556.	0.2044
176.	0.3506	557.	0.2058
177.	0.3512	558.	0.2051
178.	0.3477	559.	0.2035
179.	0.3484	560.	0.203
180.	0.3461	561.	0.2045
181.	0.3471	562.	0.2039
182.	0.3479	563.	0.2033
183.	0.3458	564.	0.2023
184.	0.3459	565.	0.2038
185.	0.3454	566.	0.2042
186.	0.3434	567.	0.2033
187.	0.3414	568.	0.2035
188.	0.3406	569.	0.2034
189.	0.3407	570.	0.2011
190.	0.3413	571.	0.2011
191.	0.3393	572.	0.2047
192.	0.3382	573.	0.2027
193.	0.337	574.	0.2011
194.	0.3361	575.	0.2007
195.	0.3365	576.	0.2019
196.	0.3371	577.	0.198
197.	0.3358	578.	0.2032
198.	0.3329	579.	0.1996
199.	0.3315	580.	0.2012
200.	0.3312	581.	0.2004
201.	0.331	582.	0.2004
202.	0.3305	583.	0.2004
203.	0.3307	584.	0.1993
204.	0.328	585.	0.1996
205.	0.3276	586.	0.1993
206.	0.3279	587.	0.1988
207.	0.3271	588.	0.198
208.	0.3283	589.	0.2002
209.	0.3268	590.	0.1985
210.	0.3251	591.	0.1983
211.	0.3236	592.	0.1962
212.	0.3267	593.	0.1962
213.	0.3236	594.	0.1972
214.	0.3238	595.	0.1969
215.	0.3233	596.	0.1977
216.	0.3237	597.	0.1963
217.	0.3236	598.	0.1973
218.	0.3209	599.	0.1969
219.	0.3198	600.	0.1971
220.	0.3195	601.	0.1978
221.	0.3181	602.	0.1966
222.	0.3162	603.	0.1963
223.	0.317	604.	0.1976
224.	0.3181	605.	0.1953
225.	0.3164	606.	0.1966

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
226.	0.3146	607.	0.195
227.	0.3152	608.	0.1963
228.	0.3135	609.	0.1961
229.	0.3144	610.	0.1973
230.	0.3131	611.	0.1957
231.	0.3129	612.	0.1952
232.	0.312	613.	0.1953
233.	0.3122	614.	0.1945
234.	0.3089	615.	0.193
235.	0.3121	616.	0.1959
236.	0.3088	617.	0.1941
237.	0.3103	618.	0.1961
238.	0.3083	619.	0.1944
239.	0.3066	620.	0.1938
240.	0.3072	621.	0.1926
241.	0.3071	622.	0.1945
242.	0.3053	623.	0.1943
243.	0.3047	624.	0.1934
244.	0.3047	625.	0.1914
245.	0.3044	626.	0.1937
246.	0.3021	627.	0.1943
247.	0.3025	628.	0.1931
248.	0.3017	629.	0.1929
249.	0.302	630.	0.1934
250.	0.3019	631.	0.1932
251.	0.3021	632.	0.191
252.	0.2996	633.	0.1914
253.	0.2993	634.	0.191
254.	0.2991	635.	0.1906
255.	0.2999	636.	0.1931
256.	0.2987	637.	0.1895
257.	0.2982	638.	0.1928
258.	0.2977	639.	0.1905
259.	0.2968	640.	0.1929
260.	0.2961	641.	0.1914
261.	0.2959	642.	0.1915
262.	0.2955	643.	0.1899
263.	0.2942	644.	0.191
264.	0.2942	645.	0.1902
265.	0.2939	646.	0.1902
266.	0.2926	647.	0.1897
267.	0.2928	648.	0.1898
268.	0.2922	649.	0.1902
269.	0.2918	650.	0.1886
270.	0.2915	651.	0.1894
271.	0.2903	652.	0.1875
272.	0.2898	653.	0.1883
273.	0.2906	654.	0.1874
274.	0.2883	655.	0.1871
275.	0.2883	656.	0.1881
276.	0.2888	657.	0.1895
277.	0.2885	658.	0.1887
278.	0.2872	659.	0.1885
279.	0.2885	660.	0.1867
280.	0.2854	661.	0.1895
281.	0.2847	662.	0.1888
282.	0.2845	663.	0.187
283.	0.2856	664.	0.1885
284.	0.2844	665.	0.1883
285.	0.2853	666.	0.1864
286.	0.2834	667.	0.1897
287.	0.285	668.	0.1863
288.	0.2824	669.	0.1864
289.	0.2814	670.	0.1882
290.	0.2806	671.	0.1828
291.	0.2817	672.	0.1891

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
292.	0.2797	673.	0.1884
293.	0.2803	674.	0.1863
294.	0.2798	675.	0.185
295.	0.28	676.	0.1851
296.	0.279	677.	0.185
297.	0.2801	678.	0.1838
298.	0.2775	679.	0.1845
299.	0.276	680.	0.184
300.	0.2768	681.	0.1841
301.	0.2746	682.	0.1846
302.	0.2761	683.	0.1847
303.	0.2753	684.	0.1846
304.	0.2737	685.	0.1836
305.	0.2734	686.	0.1842
306.	0.2743	687.	0.1827
307.	0.2734	688.	0.1818
308.	0.273	689.	0.1818
309.	0.2738	690.	0.1843
310.	0.2716	691.	0.1828
311.	0.2728	692.	0.1834
312.	0.2706	693.	0.1838
313.	0.2725	694.	0.1831
314.	0.2708	695.	0.1824
315.	0.2715	696.	0.183
316.	0.2693	697.	0.1828
317.	0.2693	698.	0.1836
318.	0.2695	699.	0.1825
319.	0.2667	700.	0.184
320.	0.2659	701.	0.1805
321.	0.2678	702.	0.1824
322.	0.2639	703.	0.1826
323.	0.2671	704.	0.1819
324.	0.2669	705.	0.1823
325.	0.2672	706.	0.1805
326.	0.2678	707.	0.1807
327.	0.265	708.	0.1797
328.	0.2651	709.	0.1822
329.	0.2646	710.	0.1791
330.	0.2625	711.	0.1796
331.	0.2656	712.	0.179
332.	0.264	713.	0.1772
333.	0.2622	714.	0.1789
334.	0.2619	715.	0.1778
335.	0.2606	716.	0.1797
336.	0.2615	717.	0.1788
337.	0.2612	718.	0.1793
338.	0.2611	719.	0.1792
339.	0.2622	720.	0.1782
340.	0.2601	721.	0.1793
341.	0.2586	722.	0.1788
342.	0.2592	723.	0.1774
343.	0.2589	724.	0.1753
344.	0.2595	725.	0.1781
345.	0.2579	726.	0.1795
346.	0.2596	727.	0.1785
347.	0.2576	728.	0.178
348.	0.2571	729.	0.1753
349.	0.2571	730.	0.1781
350.	0.2565	731.	0.1774
351.	0.2566	732.	0.1775
352.	0.256	733.	0.1773
353.	0.2549	734.	0.1773
354.	0.2541	735.	0.1746
355.	0.2543	736.	0.1773
356.	0.2536	737.	0.1758
357.	0.2521	738.	0.1772

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
358.	0.2547	739.	0.1776
359.	0.2536	740.	0.1774
360.	0.2508	741.	0.1756
361.	0.2524	742.	0.1764
362.	0.2502	743.	0.1759
363.	0.2532	744.	0.175
364.	0.254	745.	0.1756
365.	0.2517	746.	0.1756
366.	0.251	747.	0.175
367.	0.2509	748.	0.1761
368.	0.2494	749.	0.1738
369.	0.2509	750.	0.1766
370.	0.25	751.	0.1749
371.	0.2484	752.	0.1771
372.	0.2486	753.	0.174
373.	0.2498	754.	0.1737
374.	0.2489	755.	0.1754
375.	0.2475	756.	0.1762
376.	0.2491	757.	0.1756
377.	0.2472	758.	0.1751
378.	0.2484	759.	0.1736
379.	0.2476	760.	0.1756
380.	0.2469	761.	0.1758
381.	0.2471	762.	0.1733

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.744

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.004768	cm/sec
y0	1.727	ft

$T = K*b = 0.5087$ cm²/sec

APPENDIX H

TCEQ TRRP TIER 1 TPH PCL CALCULATOR OUTPUT

R&H OIL/TROPICANA ENERGY SITE
REMEDIAL INVESTIGATION REPORT

APPENDIX H

TCEQ TRRP Tier 1 TPH PCL Calculator for TCEQ Method 1006 Data

A protective concentration level (PCL) for total petroleum hydrocarbon (TPH) mixtures was developed for TPH at the Site. This appendix describes how the PCL is established using TPH fractionation and the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) TPH PCL calculator. An excerpt from the TCEQ guidance (TCEQ Publication RG-366/TRRP-27) is provided below:

The development of TPH PCLs is dependent on the composition of the petroleum hydrocarbon product since different hydrocarbon products have different compositions. Therefore, the development of PCLs must be able to reflect the composition of the TPH in question. Contrasts in composition reflect differences in the relative percentages of toxic COCs and mobile COCs in the petroleum hydrocarbon product, both of which directly influence the derived PCL. The gross composition of a petroleum hydrocarbon product can be characterized by the chromatographic profiles or fingerprints generated using analytical gas chromatography techniques over a defined boiling point range.

As part of the R&H Oil/Tropicana Energy RI, soil samples were collected from two locations at the Site containing the highest concentrations of TPH in soil (borings MW-13 and MW-1) and analyzed by Methods TX1005 for TPH and TX1006 for TPH fractionation of various boiling point ranges. Using the TX1006 method, the mass fraction of each boiling point range relative to the total mass of the TPH mixture is determined. PCLs are then developed for each boiling point range by using surrogate toxicity factors and surrogate chemical/physical properties that represent the toxicity and mobility of the hydrocarbon compounds comprising that boiling point range. Once a PCL is established for each of the boiling point ranges comprising the TPH mixture, a PCL is then established for the TPH mixture itself. The PCL for the TPH mixture is established by taking the inverse weighted average of the sum of the individual PCLs determined for each boiling point range for the applicable exposure pathway. The PCLs established for the TPH mixture for each exposure pathway (i.e., direct soil contact, soil leaching to groundwater, groundwater volatilization to air) for an affected environmental medium are then compared to determine the critical/lowest TPH PCL for that medium. The critical TPH mixture PCL is then used as the criteria for comparison of TPH concentrations in the applicable environmental medium.

The TCEQ TRRP Tier 1 TPH PCL calculator is an Excel spreadsheet developed by TCEQ to determine the applicable PCL for each media and exposure pathway and identifies the critical PCL for each pathway. The input and output sheets for the two samples evaluated in the RI are included in this appendix. For use in the RI, the soil sample collected at MW-13 was selected as the representative TPH mixture for the Site

based on having the highest TPH concentration. The critical PCLs based on the TX1006 fractionation data obtained from sample MW-13 were:

Tier 1 $^{Tot}SOIL_{Comb}$ (30 ac. Res) See Page H-4	HQ = 2.24	$PCL_{TPH\ Mix}$ = 8,080 mg/kg
Tier 1 $^{Gw}SOIL_{Ing}$ (30 ac. Res) See Page H-6	HQ = 0.16	$PCL_{TPH\ Mix}$ = **2,270 mg/kg**
Tier 1 $^{Air}SOIL_{Inh\text{-}V}$ (30 ac. Res) See Page H-10	HQ = 1.34	$PCL_{TPH\ Mix}$ = 28,100 mg/kg

Based on the TPH fractionation data and the procedure described above, the critical TPH mixture PCL is 2,270 mg/kg and is based on the soil leaching to groundwater pathway for a hypothetical drinking water resource.

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) for TCEQ Method 1006 Data - Input Sheet

Site Information: R&H Oil/Tropicana Energy Site | **Sample ID:** MW-13R | **Calculation Date:** January 15, 2016

Calculation by: KHTyndall

▼ INPUT ▼

TCEQ Method 1006 Boiling Point Range	i	TCEQ Method 1006 Boiling Point Range Concentrations	Boiling Point Range Molecular Weight[1]	Boiling Point Range Mass Fraction	Mass Fraction / Molecular Wt Ratio	Boiling Point Range Mole Fraction	Theoretical Soil Saturation Limit for TPH NAPL	Test for Theoretical Saturation Limit ($C_{sat,i}$)
		C_i (mg/kg)	MW_i (g/mol)	MF_i (·)	MF_i/MW_i (mol/g)	X_i (·)	$C_{sat,i}$ (mg/kg)	(·)
C_6 Aliphatic	1	65.00 mg/kg	81	9.56E-04	1.18E-05	2.65E-03	5.57E-01 mg/kg	Csat,1 EXCEEDED
>C_6 - C_8 Aliphatic	2	62.00 mg/kg	100	9.12E-04	9.12E-06	2.05E-03	1.59E-01 mg/kg	Csat,2 EXCEEDED
>C_8 - C_{10} Aliphatic	3	64.00 mg/kg	130	9.41E-04	7.24E-06	1.63E-03	5.14E-02 mg/kg	Csat,3 EXCEEDED
>C_{10} - C_{12} Aliphatic	4	1,600.00 mg/kg	160	2.35E-02	1.47E-04	3.31E-02	5.82E-01 mg/kg	Csat,4 EXCEEDED
>C_{12} - C_{16} Aliphatic	5	15,000.00 mg/kg	200	2.21E-01	1.10E-03	2.48E-01	1.90E+00 mg/kg	Csat,5 EXCEEDED
>C_{16} - C_{21} Aliphatic	6	13,000.00 mg/kg	270	1.91E-01	7.08E-04	1.59E-01	5.02E-01 mg/kg	Csat,6 EXCEEDED
>C_{21} - C_{35} Aliphatic	7	13,000.00 mg/kg	270	1.91E-01	7.08E-04	1.59E-01	5.02E-01 mg/kg	Csat,7 EXCEEDED
Transformer mineral oil (aliphatic)			270	-	-	-	-	-
>C_7 - C_8 Aromatic	8	110.00 mg/kg	92	1.62E-03	1.76E-05	3.95E-03	8.65E-01 mg/kg	Csat,8 EXCEEDED
>C_8 - C_{10} Aromatic	9	170.00 mg/kg	120	2.50E-03	2.08E-05	4.68E-03	1.01E+00 mg/kg	Csat,9 EXCEEDED
>C_{10} - C_{12} Aromatic	10	39.00 mg/kg	130	5.73E-04	4.41E-06	9.92E-04	1.27E-01 mg/kg	Csat,10 EXCEEDED
>C_{12} - C_{16} Aromatic	11	2,000.00 mg/kg	150	2.94E-02	1.96E-04	4.41E-02	2.59E+00 mg/kg	Csat,11 EXCEEDED
>C_{16} - C_{21} Aromatic	12	6,900.00 mg/kg	190	1.01E-01	5.34E-04	1.20E-01	2.48E+00 mg/kg	Csat,12 EXCEEDED
>C_{21} - C_{35} Aromatic	13	16,000.00 mg/kg	240	2.35E-01	9.80E-04	2.20E-01	3.66E-01 mg/kg	Csat,13 EXCEEDED
Transformer mineral oil (aromatic)			240	-	-	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6292	$\sum MF_i$	$\sum (MF_i/MW_i)$	$\sum X_i$		
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708	= 1.00E+00	= 4.45E-03 mol/g	= 1.00E+00		
SumTotal TPH:		68,010.00 mg/kg	1.0000					

[1] *from* TRRP Table [§350.73(4)]

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) for TCEQ Method 1006 Data - Results

Site Information: R&H Oil/Tropicana Energy Site | **Sample Information:** MW-13R | **Calculation Date:** January 15, 2016

TPH NAPL Present?: Theoretical soil saturation limit IS EXCEEDED for one or more TPH fractions - Presence of NAPL is indicated - See TRRP-32 for NAPL management guidance

Mobile NAPL Present?: Presence of Mobile NAPL IS indicated - See TRRP-32 for guidance on the Mobile NAPL Trigger

Click here for TRRP-32

Tier 1 $^{Tot}SOIL_{Comb}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	8.08E+03 mg/kg	8.08E+03 mg/kg	6.35E+04 mg/kg	3.49E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	2.05	2.24	2.53	1.99

Tier 1 $^{GW}SOIL_{Ing}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10 - See Pg 16 TRRP-27	HI<10 - See Pg 16 TRRP-27	HI<10 - See Pg 16 TRRP-27	HI<10 - See Pg 16 TRRP-27
Hazard Index (HI) of TPH_{Mix} =	0.08	0.16	0.03	0.05

Tier 1 $^{GW}SOIL_{Class\ 3}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	HI<10 - See Pg 16 TRRP-27	HI<10 - See Pg 16 TRRP-27	HI<10 - See Pg 16 TRRP-27	HI<10 - See Pg 16 TRRP-27
Hazard Index (HI) of TPH_{Mix} =	0.00	0.00	0.00	0.00

Tier 1 $^{Air}SOIL_{Inh-V}$	0.5 Acre Residential	30 Acre Residential	0.5 Acre Comm / Ind	30 Acre Comm / Ind
$PCL_{TPH\ Mix}$ =	5.44E+04 mg/kg	2.81E+04 mg/kg	7.71E+04 mg/kg	3.94E+04 mg/kg
Hazard Index (HI) of TPH_{Mix} =	1.33	1.34	1.34	1.34

Click here for TRRP-27

INSTRUCTIONS

1. Enter site data in yellow boxes on Input Sheet
2. Enter TCEQ Method 1006 concentrations (mg/kg)
3. Results are summarized in boxes to the left
4. Calculation details in (tabbed) spreadsheets

   NOTE: PCL precision is two (2) significant digits
5. Print individual *sheets* or *workbook* (all pages)

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Total Soil Combined Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample ID:** MW-13R **Calculation Date:** February 1, 2016

Calculation by: KHTyndall

RESIDENTIAL TIER 1 $^{TOT}SOIL_{COMB}$ (TPH_{Mix})

TCEQ Method 1006 Boiling Point Range	i	TCEQ Method 1006 Boiling Point Range Concentrations C_i ($^{mg}/_{kg}$)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ $^{Tot}SOIL_{Comb}$ PCL_i ($^{mg}/_{kg}$)[1]	0.5 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ MF_i/PCL_i ($^{kg}/_{mg}$)	0.5 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ PCL_i/MF_i ($^{mg}/_{kg}$)	0.5 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ Hazard Quotient HQ_i (·)	30 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ $^{Tot}SOIL_{Comb}$ PCL_i ($^{mg}/_{kg}$)[1]	30 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ MF_i/PCL_i ($^{kg}/_{mg}$)	30 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ PCL_i/MF_i ($^{mg}/_{kg}$)	30 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ Hazard Quotient HQ_i (·)
C_6 Aliphatic	1	65.00 mg/kg	9.56E-04	3.3E+03	2.90E-07	3.45E+06	2.34E-03	2.5E+03	3.82E-07	2.62E+06	3.09E-03
>C_6 - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	3.3E+03	2.76E-07	3.62E+06	2.23E-03	2.5E+03	3.65E-07	2.74E+06	2.95E-03
>C_8 - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	4.0E+03	2.35E-07	4.25E+06	1.90E-03	2.7E+03	3.49E-07	2.87E+06	2.81E-03
>C_{10} - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	3.6E+03	6.53E-06	1.53E+05	5.28E-02	2.5E+03	9.41E-06	1.06E+05	7.60E-02
>C_{12} - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	4.3E+03	5.13E-05	1.95E+04	4.14E-01	3.2E+03	6.89E-05	1.45E+04	5.57E-01
>C_{16} - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	1.3E+05	1.47E-06	6.80E+05	1.19E-02	1.3E+05	1.47E-06	6.80E+05	1.19E-02
>C_{21} - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	1.1E+05	1.74E-06	5.75E+05	1.40E-02	1.1E+05	1.74E-06	5.75E+05	1.40E-02
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	1.1E+05	-	-	-	1.1E+05	-	-	-
>C_7 - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	6.4E+03	2.53E-07	3.96E+06	2.04E-03	5.3E+03	3.05E-07	3.28E+06	2.46E-03
>C_8 - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	1.6E+03	1.56E-06	6.40E+05	1.26E-02	1.1E+03	2.27E-06	4.40E+05	1.84E-02
>C_{10} - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	1.9E+03	3.02E-07	3.31E+06	2.44E-03	1.5E+03	3.82E-07	2.62E+06	3.09E-03
>C_{12} - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	2.3E+03	1.28E-05	7.82E+04	1.03E-01	2.0E+03	1.47E-05	6.80E+04	1.19E-01
>C_{16} - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	1.9E+03	5.34E-05	1.87E+04	4.31E-01	1.9E+03	5.34E-05	1.87E+04	4.31E-01
>C_{21} - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	1.9E+03	1.24E-04	8.08E+03	1.00E+00	1.9E+03	1.24E-04	8.08E+03	1.00E+00
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	2.6E+04	-	-	-	2.0E+04	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6292	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 3.94E+04 mg/kg		$MIN\left\lvert PCL_i/MF_i \right\rvert$ = 8.08E+03 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 2.05E+00	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 3.60E+04 mg/kg		$MIN\left\lvert PCL_i/MF_i \right\rvert$ = 8.08E+03 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 2.24E+00
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	1.0000				$HQ_i = \frac{MF_i \times PCL_{TPH\,Mix}}{PCL_i}$				$HQ_i = \frac{MF_i \times PCL_{TPH\,Mix}}{PCL_i}$

[1] *from* TRRP Table 1 * *where* HI = 10

[1] *from* TRRP Table 1 * *where* HI = 10

$$PCL_{TPHMix} = MIN\left\lvert \frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}, MIN\left\lvert \frac{PCL_i}{MF_i} \right\rvert \right\rvert$$

⇨

0.5 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ $PCL_{TPH\,Mix}$	= 8.08E+03 mg/kg
30 Acre Residential Tier 1 $^{Tot}SOIL_{Comb}$ $PCL_{TPH\,Mix}$	= 8.08E+03 mg/kg

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Total Soil Combined Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample ID:** MW-13R **Calculation Date:** February 1, 2016

Calculation by: KHTyndall

COMMERCIAL / INDUSTRIAL TIER 1 $^{TOT}SOIL_{COMB}$ (TPH_{Mix})

TCEQ Method 1006 Boiling Point Range	i	TCEQ Method 1006 Boiling Point Range Concentrations C_i (mg/kg)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Commercial / Industrial Tier 1 $^{Tot}SOIL_{Comb}$ $^{Tot}SOIL_{Comb}$ PCL_i (mg/kg)[1]	0.5 Acre MF_i/PCL_i (kg/mg)	0.5 Acre PCL_i/MF_i (mg/kg)	0.5 Acre Hazard Quotient HQ_i (·)	30 Acre Commercial / Industrial Tier 1 $^{Tot}SOIL_{Comb}$ $^{Tot}SOIL_{Comb}$ PCL_i (mg/kg)[1]	30 Acre MF_i/PCL_i (kg/mg)	30 Acre PCL_i/MF_i (mg/kg)	30 Acre Hazard Quotient HQ_i (·)
C_6 Aliphatic	1	65.00 mg/kg	9.56E-04	1.2E+04	7.96E-08	1.26E+07	5.06E-03	6.6E+03	1.45E-07	6.91E+06	5.06E-03
$>C_6$ - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	1.2E+04	7.60E-08	1.32E+07	4.82E-03	6.6E+03	1.38E-07	7.24E+06	4.82E-03
$>C_8$ - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	9.7E+03	9.70E-08	1.03E+07	6.16E-03	5.2E+03	1.81E-07	5.53E+06	6.32E-03
$>C_{10}$ - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	9.3E+03	2.53E-06	3.95E+05	1.61E-01	5.1E+03	4.61E-06	2.17E+05	1.61E-01
$>C_{12}$ - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	1.4E+04	1.58E-05	6.35E+04	1.00E+00	7.7E+03	2.86E-05	3.49E+04	1.00E+00
$>C_{16}$ - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	1.21E-02	1.0E+06	1.91E-07	5.23E+06	6.67E-03
$>C_{21}$ - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	1.21E-02	1.0E+06	1.91E-07	5.23E+06	6.67E-03
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	1.0E+06	-	-	-	1.0E+06	-	-	-
$>C_7$ - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	2.9E+04	5.58E-08	1.79E+07	3.54E-03	1.7E+04	9.51E-08	1.05E+07	3.32E-03
$>C_8$ - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	3.9E+03	6.41E-07	1.56E+06	4.07E-02	2.1E+03	1.19E-06	8.40E+05	4.16E-02
$>C_{10}$ - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	6.9E+03	8.31E-08	1.20E+07	5.28E-03	4.0E+03	1.43E-07	6.98E+06	5.01E-03
$>C_{12}$ - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	1.2E+04	2.45E-06	4.08E+05	1.56E-01	7.8E+03	3.77E-06	2.65E+05	1.32E-01
$>C_{16}$ - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	1.9E+04	5.34E-06	1.87E+05	3.39E-01	1.9E+04	5.34E-06	1.87E+05	1.86E-01
$>C_{21}$ - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	1.9E+04	1.24E-05	8.08E+04	7.86E-01	1.9E+04	1.24E-05	8.08E+04	4.32E-01
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	8.0E+04	-	-	-	5.2E+04	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6292	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 2.51E+05 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 6.35E+04 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 2.53E+00	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 1.75E+05 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 3.49E+04 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 1.99E+00
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	1.0000	[1] *from* TRRP Table 2 * *where* HI = 10			$HQ_i = \frac{MF_i \times PCL_{TPH\,Mix}}{PCL_i}$	[1] *from* TRRP Table 2 * *where* HI = 10			$HQ_i = \frac{MF_i \times PCL_{TPH\,Mix}}{PCL_i}$

$$PCL_{TPHMix} = MIN \left| \frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i} \right| , \quad MIN \left| \frac{PCL_i}{MF_i} \right|$$

⇨

0.5 Acre Comm / Ind Tier 1 $^{Tot}SOIL_{Comb}$ $PCL_{TPH\,Mix}$ = 6.35E+04 mg/kg

30 Acre Comm / Ind Tier 1 $^{Tot}SOIL_{Comb}$ $PCL_{TPH\,Mix}$ = 3.49E+04 mg/kg

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Soil-to-Groundwater (Class 3) Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample ID:** MW-13R **Calculation Date:** October 28, 2016

Calculation by: KHTyndall

RESIDENTIAL TIER 1 $^{GW}SOIL_{Class\ 3}$ $PCL_{TPH\ Mix}$

TCEQ Method 1006 Boiling Point Range	*i*	TCEQ Method 1006 Boiling Point Range Concentrations C_i ($^{mg}/_{kg}$)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ $^{GW}SOIL_{Class\ 3}\ PCL_i$ ($^{mg}/_{kg}$)[1]	0.5 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ MF_i/PCL_i ($^{kg}/_{mg}$)	0.5 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ PCL_i/MF_i ($^{mg}/_{kg}$)	0.5 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ Hazard Quotient HQ_i (·)	30 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ $^{GW}SOIL_{Class\ 3}\ PCL_i$ ($^{mg}/_{kg}$)[1]	30 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ MF_i/PCL_i ($^{kg}/_{mg}$)	30 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ PCL_i/MF_i ($^{mg}/_{kg}$)	30 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ Hazard Quotient HQ_i (·)
C_6 Aliphatic	1	65.00 mg/kg	0.00E+00	1.7E+04	-	-	3.28E-05	8.6E+03	-	-	6.48E-05
$>C_6$ - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	4.2E+04	2.17E-08	4.61E+07	3.78E-06	2.1E+04	4.34E-08	2.30E+07	7.56E-06
$>C_8$ - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	3.6E+05	2.61E-09	3.83E+08	1.43E-07	1.8E+05	5.23E-09	1.91E+08	2.85E-07
$>C_{10}$ - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	1.0E+06	2.35E-08	4.25E+07	5.82E-07	1.0E+06	2.35E-08	4.25E+07	5.82E-07
$>C_{12}$ - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	1.0E+06	2.21E-07	4.53E+06	1.90E-06	1.0E+06	2.21E-07	4.53E+06	1.90E-06
$>C_{16}$ - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
$>C_{21}$ - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	1.0E+06	-	-	-	1.0E+06	-	-	-
$>C_7$ - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	2.0E+03	8.09E-07	1.24E+06	4.33E-04	1.0E+03	1.62E-06	6.18E+05	8.65E-04
$>C_8$ - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	6.5E+03	3.85E-07	2.60E+06	1.56E-04	3.3E+03	7.57E-07	1.32E+06	3.07E-04
$>C_{10}$ - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	1.0E+04	5.73E-08	1.74E+07	1.27E-05	5.0E+03	1.15E-07	8.72E+06	2.55E-05
$>C_{12}$ - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	2.0E+04	1.47E-06	6.80E+05	1.29E-04	9.9E+03	2.97E-06	3.37E+05	2.62E-04
$>C_{16}$ - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	4.7E+04	2.16E-06	4.63E+05	5.28E-05	2.3E+04	4.41E-06	2.27E+05	1.08E-04
$>C_{21}$ - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	3.7E+05	6.36E-07	1.57E+06	9.90E-07	1.8E+05	1.31E-06	7.65E+05	2.04E-06
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	1.0E+06	-	-	-	1.0E+06	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6282	$\frac{HI\ *}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 1.62E+06 mg/kg		$MIN\left\lvert PCL_i/MF_i \right\rvert$ = 4.63E+05 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 8.25E-04	$\frac{HI\ *}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 8.44E+05 mg/kg		$MIN\left\lvert PCL_i/MF_i \right\rvert$ = 2.27E+05 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 1.65E-03
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	0.9990				$HQ_i = \frac{X_i S_i}{K_{sw,i} PCL_i}$				$HQ_i = \frac{X_i S_i}{K_{sw,i} PCL_i}$

[1] *from* TRRP Table 1 * *where* HI = 10

$$PCL_{TPHMix} = MIN\left\lvert \frac{HI*}{\sum_{i=1}^{13} MF_i/PCL_i} \quad MIN\left\lvert \frac{PCL_i}{MF_i} \right\rvert \right\rvert$$

⇨

0.5 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ $PCL_{TPH\ Mix}$ = 4.63E+05 mg/kg

30 Acre Tier 1 Residential $^{GW}SOIL_{Class\ 3}$ $PCL_{TPH\ Mix}$ = 2.27E+05 mg/kg

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Soil-to-Groundwater (Class 3) Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample ID:** MW-13R **Calculation Date:** October 28, 2016

Calculation by: KHTyndall

COMMERCIAL / INDUSTRIAL TIER 1 $^{GW}SOIL_{Class\ 3}$ $PCL_{TPH\ Mix}$

TCEQ Method 1006 Boiling Point Range	*i*	TCEQ Method 1006 Boiling Point Range Concentrations C_i ($^{mg}/_{kg}$)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ $^{GW}SOIL_{Class\ 3}\ PCL_i$ ($^{mg}/_{kg}$)[1]	0.5 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ MF_i/PCL_i ($^{kg}/_{mg}$)	0.5 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ PCL_i/MF_i ($^{mg}/_{kg}$)	0.5 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ Hazard Quotient HQ (·)	30 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ $^{GW}SOIL_{Class\ 3}\ PCL_i$ ($^{mg}/_{kg}$)[1]	30 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ MF_i/PCL_i ($^{kg}/_{mg}$)	30 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ PCL_i/MF_i ($^{mg}/_{kg}$)	30 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Class\ 3}$ Hazard Quotient HQ (·)
C_6 Aliphatic	1	65.00 mg/kg	9.56E-04	5.1E+04	1.87E-08	5.34E+07	1.09E-05	2.6E+04	3.68E-08	2.72E+07	2.14E-05
$>C_6$ - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	1.3E+05	7.01E-09	1.43E+08	1.22E-06	6.3E+04	1.45E-08	6.91E+07	2.52E-06
$>C_8$ - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	1.0E+06	9.41E-10	1.06E+09	5.14E-08	5.4E+05	1.74E-09	5.74E+08	9.51E-08
$>C_{10}$ - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	1.0E+06	2.35E-08	4.25E+07	5.82E-07	1.0E+06	2.35E-08	4.25E+07	5.82E-07
$>C_{12}$ - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	1.0E+06	2.21E-07	4.53E+06	1.90E-06	1.0E+06	2.21E-07	4.53E+06	1.90E-06
$>C_{16}$ - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
$>C_{21}$ - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	1.0E+06	-	-	-	1.0E+06	-	-	-
$>C_7$ - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	6.0E+03	2.70E-07	3.71E+06	1.44E-04	3.0E+03	5.39E-07	1.85E+06	2.88E-04
$>C_8$ - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	1.9E+04	1.32E-07	7.60E+06	5.33E-05	9.7E+03	2.58E-07	3.88E+06	1.04E-04
$>C_{10}$ - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	3.0E+04	1.91E-08	5.23E+07	4.25E-06	1.5E+04	3.82E-08	2.62E+07	8.49E-06
$>C_{12}$ - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	5.9E+04	4.98E-07	2.01E+06	4.39E-05	3.0E+04	9.80E-07	1.02E+06	8.63E-05
$>C_{16}$ - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	1.4E+05	7.25E-07	1.38E+06	1.77E-05	7.0E+04	1.45E-06	6.90E+05	3.55E-05
$>C_{21}$ - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	1.0E+06	2.35E-07	4.25E+06	3.66E-07	5.5E+05	4.28E-07	2.34E+06	6.66E-07
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	1.0E+06	-	-	-	1.0E+06	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6292	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 3.95E+06 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 1.38E+06 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 2.79E-04	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 2.29E+06 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 6.90E+05 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 5.51E-04
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	1.0000	[1] *from* TRRP Table 2 * *where* HI = 10			$HQ_i = \frac{X_i S_i}{K_{sw,i} PCL_i}$				$HQ_i = \frac{X_i S_i}{K_{sw,i} PCL_i}$

$$PCL_{TPHMix} = MIN \left| \frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i} \quad MIN \left| \frac{PCL_i}{MF_i} \right| \right|$$

⇨

0.5 Acre Tier 1 Comm / Ind $^{GW}SOIL_{Class\ 3}\ PCL_{TPH\ Mix}$ **= 1.00E+06 mg/kg**

30 Acre Tier 1 Comm / Ind $^{GW}SOIL_{Class\ 3}\ PCL_{TPH\ Mix}$ **= 6.90E+05 mg/kg**

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Soil-to-Groundwater (Ingestion) Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample ID:** MW-13R **Calculation Date:** October 28, 2016

Calculation by: KHTyndall

RESIDENTIAL TIER 1 $^{GW}SOIL_{Ing}$ $PCL_{TPH\ Mix}$

TCEQ Method 1006 Boiling Point Range	i	TCEQ Method 1006 Boiling Point Range Concentrations C_i ($^{mg}/_{kg}$)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Tier 1 Residential $^{GW}SOIL_{Ing}$ $^{GW}SOIL_{Ing}$ PCL_i ($^{mg}/_{kg}$)[1]	MF_i/PCL_i ($^{kg}/_{mg}$)	PCL_i/MF_i ($^{mg}/_{kg}$)	Hazard Quotient HQ (·)	30 Acre Tier 1 Residential $^{GW}SOIL_{Ing}$ $^{GW}SOIL_{Ing}$ PCL_i ($^{mg}/_{kg}$)[1]	MF_i/PCL_i ($^{kg}/_{mg}$)	PCL_i/MF_i ($^{mg}/_{kg}$)	Hazard Quotient HQ (·)
C_6 Aliphatic	1	65.00 mg/kg	0.00E+00	1.7E+02	-	-	3.28E-03	8.6E+01	-	-	6.48E-03
>C_6 - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	4.2E+02	2.17E-06	4.61E+05	3.78E-04	2.1E+02	4.34E-06	2.30E+05	7.56E-04
>C_8 - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	3.6E+03	2.61E-07	3.83E+06	1.43E-05	1.8E+03	5.23E-07	1.91E+06	2.85E-05
>C_{10} - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	2.5E+04	9.41E-07	1.06E+06	2.33E-05	1.3E+04	1.81E-06	5.53E+05	4.48E-05
>C_{12} - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	4.9E+05	4.50E-07	2.22E+06	3.88E-06	2.5E+05	8.82E-07	1.13E+06	7.61E-06
>C_{16} - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
>C_{21} - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	1.0E+06	-	-	-	1.0E+06	-	-	-
>C_7 - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	2.0E+01	8.09E-05	1.24E+04	4.33E-02	1.0E+01	1.62E-04	6.18E+03	8.65E-02
>C_8 - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	6.5E+01	3.85E-05	2.60E+04	1.56E-02	3.3E+01	7.57E-05	1.32E+04	3.07E-02
>C_{10} - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	1.0E+02	5.73E-06	1.74E+05	1.27E-03	5.0E+01	1.15E-05	8.72E+04	2.55E-03
>C_{12} - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	2.0E+02	1.47E-04	6.80E+03	1.29E-02	9.9E+01	2.97E-04	3.37E+03	2.62E-02
>C_{16} - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	4.7E+02	2.16E-04	4.63E+03	5.28E-03	2.3E+02	4.41E-04	2.27E+03	1.08E-02
>C_{21} - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	3.7E+03	6.36E-05	1.57E+04	9.90E-05	1.8E+03	1.31E-04	7.65E+03	2.04E-04
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	2.5E+05	-	-	-	1.3E+05	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6282	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 1.80E+04 mg/kg		$MIN\left\lvert PCL_i/MF_i\right\rvert$ = 4.63E+03 mg/kg	$HI=\sum_{i=1}^{13} HQ_i$ = 8.21E-02	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 8.88E+03 mg/kg		$MIN\left\lvert PCL_i/MF_i\right\rvert$ = 2.27E+03 mg/kg	$HI=\sum_{i=1}^{13} HQ_i$ = 1.64E-01
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	0.9990	[1] *from* TRRP Table 1 * *where* HI = 10			$HQ_i=\frac{X_i S_i}{K_{sw,i} PCL_i}$				$HQ_i=\frac{X_i S_i}{K_{sw,i} PCL_i}$

$$PCL_{TPHMix} = MIN\left\lvert \frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i} \quad MIN\left\lvert \frac{PCL_i}{MF_i}\right\rvert \right\rvert$$

⇨

0.5 Acre Tier 1 Residential $^{GW}SOIL_{Ing}$ $PCL_{TPH\ Mix}$ = 4.63E+03 mg/kg

30 Acre Tier 1 Residential $^{GW}SOIL_{Ing}$ $PCL_{TPH\ Mix}$ = 2.27E+03 mg/kg

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Soil-to-Groundwater (Ingestion) Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample ID:** MW-13R **Calculation Date:** October 28, 2016

Calculation by: KHTyndall

COMMERCIAL / INDUSTRIAL TIER 1 $^{GW}SOIL_{Ing}$ $PCL_{TPH\ Mix}$

TCEQ Method 1006 Boiling Point Range	*i*	TCEQ Method 1006 Boiling Point Range Concentrations C_i (mg/kg)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Ing}$ $^{GW}SOIL_{Ing}$ PCL_i (mg/kg)[1]	MF_i/PCL_i (kg/mg)	PCL_i/MF_i (mg/kg)	Hazard Quotient HQ (·)	30 Acre Commercial / Industrial Tier 1 $^{GW}SOIL_{Ing}$ $^{GW}SOIL$ PCL_i (mg/kg)[1]	MF_i/PCL_i (kg/mg)	PCL_i/MF_i (mg/kg)	Hazard Quotient HQ (·)
C_6 Aliphatic	1	65.00 mg/kg	9.56E-04	5.1E+02	1.87E-06	5.34E+05	1.09E-03	2.6E+02	3.68E-06	2.72E+05	2.14E-03
>C_6 - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	1.3E+03	7.01E-07	1.43E+06	1.22E-04	6.3E+02	1.45E-06	6.91E+05	2.52E-04
>C_8 - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	1.1E+04	8.55E-08	1.17E+07	4.67E-06	5.4E+03	1.74E-07	5.74E+06	9.51E-06
>C_{10} - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	7.6E+04	3.10E-07	3.23E+06	7.66E-06	3.8E+04	6.19E-07	1.62E+06	1.53E-05
>C_{12} - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	1.0E+06	2.21E-07	4.53E+06	1.90E-06	7.4E+05	2.98E-07	3.36E+06	2.57E-06
>C_{16} - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
>C_{21} - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	1.0E+06	1.91E-07	5.23E+06	5.02E-07	1.0E+06	1.91E-07	5.23E+06	5.02E-07
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	1.0E+06	-	-	-	1.0E+06	-	-	-
>C_7 - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	6.0E+01	2.70E-05	3.71E+04	1.44E-02	3.0E+01	5.39E-05	1.85E+04	2.88E-02
>C_8 - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	1.9E+02	1.32E-05	7.60E+04	5.33E-03	9.7E+01	2.58E-05	3.88E+04	1.04E-02
>C_{10} - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	3.0E+02	1.91E-06	5.23E+05	4.25E-04	1.5E+02	3.82E-06	2.62E+05	8.49E-04
>C_{12} - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	5.9E+02	4.98E-05	2.01E+04	4.39E-03	3.0E+02	9.80E-05	1.02E+04	8.63E-03
>C_{16} - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	1.4E+03	7.25E-05	1.38E+04	1.77E-03	7.0E+02	1.45E-04	6.90E+03	3.55E-03
>C_{21} - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	1.1E+04	2.14E-05	4.68E+04	3.33E-05	5.5E+03	4.28E-05	2.34E+04	6.66E-05
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	7.5E+05	-	-	-	3.7E+05	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6292	$\frac{HI\ *}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 5.34E+04 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 1.38E+04 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 2.76E-02	$\frac{HI\ *}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 2.66E+04 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 6.90E+03 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 5.48E-02
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	1.0000	[1] *from* TRRP Table 2 * *where* HI = 10			$HQ_i = \frac{X_i S_i}{K_{sw,i} PCL_i}$				$HQ_i = \frac{X_i S_i}{K_{sw,i} PCL_i}$

$$PCL_{TPHMix} = MIN \left| \frac{HI *}{\sum_{i=1}^{13} MF_i/PCL_i} \quad MIN \left| \frac{PCL_i}{MF_i} \right| \right|$$

⇨

0.5 Acre Tier 1 Comm / Ind $^{GW}SOIL_{Ing}$ $PCL_{TPH\ Mix}$	= 1.38E+04 mg/kg
30 Acre Tier 1 Comm / Ind $^{GW}SOIL_{Ing}$ $PCL_{TPH\ Mix}$	= 6.90E+03 mg/kg

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Soil (Volatilization)-to-Ambient Air Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample #:** MW-13R **Calculation Date:** October 28, 2016

Calculation by: KHTyndall

RESIDENTIAL TIER 1 $^{Air}SOIL_{Inh\text{-}V}$ $PCL_{TPH\ Mix}$

TCEQ Method 1006 Boiling Point Range	i	TCEQ Method 1006 Boiling Point Range Concentrations C_i (mg/kg)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Tier 1 Residential $^{Air}SOIL_{Inh\text{-}V}$ $^{Air}SOIL_{Inh\text{-}V}$ PCL_i (mg/kg)[1]	0.5 Acre MF_i/PCL_i (kg/mg)	0.5 Acre PCL_i/MF_i (mg/kg)	0.5 Acre Hazard Quotient HQ (·)	30 Acre Tier 1 Residential $^{Air}SOIL_{Inh\text{-}V}$ $^{Air}SOIL_{Inh\text{-}V}$ PCL_i (mg/kg)[1]	30 Acre MF_i/PCL_i (kg/mg)	30 Acre PCL_i/MF_i (mg/kg)	30 Acre Hazard Quotient HQ (·)
C_6 Aliphatic	1	65.00 mg/kg	0.00E+00	1.0E+04	-	-	0.00E+00	5.3E+03	-	-	0.00E+00
>C_6 - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	1.0E+04	9.12E-08	1.10E+07	4.96E-03	5.3E+03	1.72E-07	5.81E+06	4.84E-03
>C_8 - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	7.7E+03	1.22E-07	8.18E+06	6.65E-03	3.9E+03	2.41E-07	4.14E+06	6.78E-03
>C_{10} - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	7.7E+03	3.06E-06	3.27E+05	1.66E-01	3.9E+03	6.03E-06	1.66E+05	1.70E-01
>C_{12} - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	1.2E+04	1.84E-05	5.44E+04	1.00E+00	6.2E+03	3.56E-05	2.81E+04	1.00E+00
>C_{16} - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	**	-	-	-	**	-	-	-
>C_{21} - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	**	-	-	-	**	-	-	-
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	**	-	-	-	**	-	-	-
>C_7 - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	2.9E+04	5.58E-08	1.79E+07	3.03E-03	1.5E+04	1.08E-07	9.27E+06	3.03E-03
>C_8 - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	3.1E+03	8.06E-07	1.24E+06	4.39E-02	1.6E+03	1.56E-06	6.40E+05	4.39E-02
>C_{10} - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	6.6E+03	8.69E-08	1.15E+07	4.73E-03	3.4E+03	1.69E-07	5.93E+06	4.74E-03
>C_{12} - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	1.5E+04	1.96E-06	5.10E+05	1.07E-01	7.8E+03	3.77E-06	2.65E+05	1.06E-01
>C_{16} - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	**	-	-	-	**	-	-	-
>C_{21} - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	**	-	-	-	**	-	-	-
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	8.4E+04	-	-	-	4.3E+04	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6282	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 4.07E+05 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 5.44E+04 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 1.33E+00	$\frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i}$ = 2.10E+05 mg/kg		MIN $\lvert PCL_i/MF_i \rvert$ = 2.81E+04 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 1.34E+00
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	0.9990	[1] *from* TRRP Table 1 * *where* HI = 10		** PCL not defined	$HQ_i = \frac{MF_i \times PCL_{TPH\ Mix}}{PCL_i}$	[1] *from* TRRP Table 1 * *where* HI = 10		** PCL not defined	$HQ_i = \frac{MF_i \times PCL_{TPH\ Mix}}{PCL_i}$

$$PCL_{TPH Mix} = MIN \left| \frac{HI^*}{\sum_{i=1}^{13} MF_i/PCL_i} \quad MIN \left| \frac{PCL_i}{MF_i} \right| \right.$$

⇨

0.5 Acre Tier 1 Residential $^{Air}SOIL_{Inh\text{-}V}$ $PCL_{TPH\ Mix}$ = 5.44E+04 mg/kg

30 Acre Tier 1 Residential $^{Air}SOIL_{Inh\text{-}V}$ $PCL_{TPH\ Mix}$ = 2.81E+04 mg/kg

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Soil (Volatilization)-to-Ambient Air Exposure Pathway

Site Information: R&H Oil/Tropicana Energy Site **Sample ID:** MW-13R **Calculation Date:** October 28, 2016

Calculation by: KHTyndall

COMMERCIAL / INDUSTRIAL TIER 1 $^{Air}SOIL_{Inh\text{-}V}$ $PCL_{TPH\ Mix}$

TCEQ Method 1006 Boiling Point Range	i	TCEQ Method 1006 Boiling Point Range Concentrations C_i (mg/kg)	Boiling Point Range Mass Fraction MF_i (·)	0.5 Acre Commercial / Industrial Tier 1 $^{Air}SOIL_{Inh\text{-}V}$ $^{Air}SOIL_{Inh\text{-}V}$ PCL_i (mg/kg)[1]	0.5 Acre MF_i/PCL_i (kg/mg)	0.5 Acre PCL_i/MF_i (mg/kg)	0.5 Acre Hazard Quotient HQ (·)	30 Acre Commercial / Industrial Tier 1 $^{Air}SOIL_{Inh\text{-}V}$ $^{Air}SOIL_{Inh\text{-}V}$ PCL_i (mg/kg)[1]	30 Acre MF_i/PCL_i (kg/mg)	30 Acre PCL_i/MF_i (mg/kg)	30 Acre Hazard Quotient HQ (·)
C_6 Aliphatic	1	65.00 mg/kg	9.56E-04	1.4E+04	6.83E-08	1.46E+07	5.26E-03	7.4E+03	1.29E-07	7.74E+06	5.09E-03
>C_6 - C_8 Aliphatic	2	62.00 mg/kg	9.12E-04	1.4E+04	6.51E-08	1.54E+07	5.02E-03	7.4E+03	1.23E-07	8.12E+06	4.86E-03
>C_8 - C_{10} Aliphatic	3	64.00 mg/kg	9.41E-04	1.1E+04	8.55E-08	1.17E+07	6.59E-03	5.5E+03	1.71E-07	5.84E+06	6.75E-03
>C_{10} - C_{12} Aliphatic	4	1,600.00 mg/kg	2.35E-02	1.1E+04	2.14E-06	4.68E+05	1.65E-01	5.5E+03	4.28E-06	2.34E+05	1.69E-01
>C_{12} - C_{16} Aliphatic	5	15,000.00 mg/kg	2.21E-01	1.7E+04	1.30E-05	7.71E+04	1.00E+00	8.7E+03	2.54E-05	3.94E+04	1.00E+00
>C_{16} - C_{21} Aliphatic	6	13,000.00 mg/kg	1.91E-01	**	-	-	-	**	-	-	-
>C_{21} - C_{35} Aliphatic	7	13,000.00 mg/kg	1.91E-01	**	-	-	-	**	-	-	-
Transformer mineral oil (aliphatic)		0.00 mg/kg	0.00E+00	**	-	-	-	**	-	-	-
>C_7 - C_8 Aromatic	8	110.00 mg/kg	1.62E-03	4.1E+04	3.94E-08	2.53E+07	3.04E-03	2.1E+04	7.70E-08	1.30E+07	3.04E-03
>C_8 - C_{10} Aromatic	9	170.00 mg/kg	2.50E-03	4.3E+03	5.81E-07	1.72E+06	4.48E-02	2.2E+03	1.14E-06	8.80E+05	4.48E-02
>C_{10} - C_{12} Aromatic	10	39.00 mg/kg	5.73E-04	9.2E+03	6.23E-08	1.60E+07	4.80E-03	4.8E+03	1.19E-07	8.37E+06	4.71E-03
>C_{12} - C_{16} Aromatic	11	2,000.00 mg/kg	2.94E-02	2.1E+04	1.40E-06	7.14E+05	1.08E-01	1.1E+04	2.67E-06	3.74E+05	1.05E-01
>C_{16} - C_{21} Aromatic	12	6,900.00 mg/kg	1.01E-01	**	-	-	-	**	-	-	-
>C_{21} - C_{35} Aromatic	13	16,000.00 mg/kg	2.35E-01	**	-	-	-	**	-	-	-
Transformer mineral oil (aromatic)		0.00 mg/kg	0.00E+00	1.2E+05	-	-	-	6.1E+04	-	-	-
Sum Aliphatic Fraction:		42,791.00 mg/kg	0.6292	$\frac{HI\ *}{\sum_{i=1}^{13} MF_i / PCL_i}$ = 5.76E+05 mg/kg		MIN $\lvert PCL_i / MF_i \rvert$ = 7.71E+04 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 1.34E+00	$\frac{HI\ *}{\sum_{i=1}^{13} MF_i / PCL_i}$ = 2.94E+05 mg/kg		MIN $\lvert PCL_i / MF_i \rvert$ = 3.94E+04 mg/kg	$HI = \sum_{i=1}^{13} HQ_i$ = 1.34E+00
Sum Aromatic Fraction:		25,219.00 mg/kg	0.3708								
Total TPH:		68,010.00 mg/kg	1.0000	[1] *from* TRRP Table 2 * *where* HI = 10		** PCL not defined	$HQ_i = \frac{MF_i \times PCL_{TPH\ Mix}}{PCL_i}$	[1] *from* TRRP Table 1 * *where* HI = 10		** PCL not defined	$HQ_i = \frac{MF_i \times PCL_{TPH\ Mix}}{PCL_i}$

$$PCL_{TPHMix} = MIN \left| \frac{HI\ *}{\sum_{i=1}^{13} MF_i / PCL_i} \quad MIN \left| \frac{PCL_i}{MF_i} \right| \right|$$

⇨

0.5 Acre Tier 1 Comm / Ind $^{Air}SOIL_{Inh\text{-}V}$ $PCL_{TPH\ Mix}$ = 7.71E+04 mg/kg

30 Acre Tier 1 Comm / Ind $^{Air}SOIL_{Inh\text{-}V}$ $PCL_{TPH\ Mix}$ = 3.94E+04 mg/kg

TCEQ Texas Risk Reduction Program (TRRP) Tier 1 TPH PCL Calculator (v 1.7 - 9/2012) - Parameter Values*

*** *from* 30 TAC §350.73(f)**

TCEQ Method 1006 Boiling Point Range		Boiling Point Range Solubility	Boiling Point Range Henry's Law Constant	Boiling Point Range Soil Organic C-Water Partition Coefficient	Boiling Point Range Soil-Water Partition Coefficient	Boiling Point Range Soil-Water Partition Factor
				$k_d = k_{oc} \times f_{oc}$	$k_{sw} = \frac{\rho_b}{\theta_{ws} + k_d \rho_b + H'\theta_{as}}$	
	i	S_i ($^{mg}/_{L}$)	H' (·)	Log $K_{oc,i}$ (cm^3-H_2O/g-C)	$K_{d,i}$ (cm^3-H_2O/g-Soil)	K_{sw} ($^{mg/L\text{-}H20}/_{mg/kg\text{-}soil}$)
C_6 Aliphatic	1	3.60E+01 mg/L	3.30E+01	2.90E+00	1.59E+00	1.71E-01
>C_6 - C_8 Aliphatic	2	5.40E+00 mg/L	5.00E+01	3.60E+00	7.96E+00	6.97E-02
>C_8 - C_{10} Aliphatic	3	4.30E-01 mg/L	8.00E+01	4.50E+00	6.32E+01	1.36E-02
>C_{10} - C_{12} Aliphatic	4	3.40E-02 mg/L	1.20E+02	5.40E+00	5.02E+02	1.93E-03
>C_{12} - C_{16} Aliphatic	5	7.60E-04 mg/L	5.20E+02	6.70E+00	1.00E+04	9.91E-05
>C_{16} - C_{21} Aliphatic	6	2.50E-06 mg/L	4.90E+03	8.80E+00	1.26E+06	7.92E-07
>C_{21} - C_{35} Aliphatic	7	2.50E-06 mg/L	4.90E+03	8.80E+00	1.26E+06	7.92E-07
>C_7 - C_8 Aromatic	8	5.30E+02 mg/L	2.76E-01	2.15E+00	2.83E-01	2.42E+00
>C_8 - C_{10} Aromatic	9	6.50E+01 mg/L	4.80E-01	3.20E+00	3.17E+00	3.01E-01
>C_{10} - C_{12} Aromatic	10	2.50E+01 mg/L	1.40E-01	3.40E+00	5.02E+00	1.95E-01
>C_{12} - C_{16} Aromatic	11	5.80E+00 mg/L	5.30E-02	3.70E+00	1.00E+01	9.88E-02
>C_{16} - C_{21} Aromatic	12	6.50E-01 mg/L	1.30E-02	4.20E+00	3.17E+01	3.15E-02
>C_{21} - C_{35} Aromatic	13	6.60E-03 mg/L	6.70E-04	5.10E+00	2.52E+02	3.97E-03

TRRP Chem/Phys Parameter		Tier 1 Default Chem/Phys Parameter Value**
Fraction Organic Carbon (GWSoil)	*foc*	0.002 g-C/g-soil
Fraction Organic Carbon (AirSOILInh-V)	*foc*	0.008 g-C/g-soil
Fraction air (volumetric) of vadose zone soil	Θ_{as}	0.21 cm3-air/cm3-soil
Fraction water (volumetric) of vadose zone soil	Θ_{ws}	0.16 cm3-H2O/cm3-soil
Dry bulk soil density	ρ_b	1.67 g-soil/cm3-soil

**** *from* 30 TAC §350.75(b)**

APPENDIX I

LNAPL BAILDOWN AND TRANSMISSIVITY TESTING

R&H OIL/TROPICANA ENERGY SITE
REMEDIAL INVESTIGATION REPORT

APPENDIX I

LNAPL BAILDOWN AND TRANSMISSIVITY TESTING

Tests were performed at the R&H Oil/Tropicana Energy Site during the RI to evaluate the rate at which light non-aqueous phase liquid (LNAPL) would recover to a well, and to evaluate the feasibility of manual LNAPL recovery as part of a Site remedy. Two test methods were used at the Site; NAPL baildown and NAPL skimming. The field activities and test results are described below.

LNAPL Baildown Testing

Huntley (2000) described a methodology by which LNAPL transmissivities can be determined using aquifer slug test procedures. Baildown tests were performed at the Site at three wells (MW-12, MW-13, and MW-15) in December 2011 using this methodology. Prior to the baildown testing the monitoring wells had been undisturbed i.e., no LNAPL removal since installation, and were gauged on a monthly basis for over one year to ensure that LNAPL in the wells was at equilibrium. During this testing, as much LNAPL as possible was removed from the test well as quickly as possible and then the well was monitored for LNAPL recovery. LNAPL removal was accomplished by using a bailer, which resulted in the removal of LNAPL and some water from the well during each of the tests. Based on previous aquifer testing performed at the Site, groundwater in the wells was expected to recover in a near-instantaneous manner, allowing the recovery rate of the LNAPL to be calculated without interference from variability in the water elevation.

The change in LNAPL thickness during the recovery period was used as the data set for determining the hydraulic conductivity using Hydrosolve, Inc.'s AQTESOLV® software (Duffield, 2007). The test data and graphic output for these tests are provided on Figure G.1. The measured hydraulic conductivity was adjusted for the LNAPL density (0.762 based on analysis of LNAPL from well MW-12) and then used to calculate the density-adjusted transmissivity. Transmissivity values determined using this method ranged from 0.06 to 0.7 ft^2/day (Table G.1).

LNAPL Skimming Test

A LNAPL skimming test was performed on January 8, 2015 at well MW-15 to directly measure the transmissivity of LNAPL at the Site. The manual skimming procedure provides a way to quantify LNAPL recoverability through the estimation of LNAPL transmissivity based on LNAPL recovery rates observed during a test. This is different than the baildown technique, which depends on changes in LNAPL drawdown or in-well thickness observed following an initial purge of LNAPL from a well. The fundamental premise of the manual skimming technique is that LNAPL is removed from a well such

that a relatively consistent level of LNAPL drawdown is maintained until a stabilized/consistent removal rate is observed.

The field procedure for this test is a simplified version of the methodology presented in ASTM International Standard E2856-13 *Standard Guide for Estimation of LNAPL Transmissivity*. Following an initial purge of all LNAPL from the well, the LNAPL recharge to the well is monitored and LNAPL removed before the in-well thickness has recovered to 25% of its pre-purging value. The monitoring and removal is continued until the recovery rates are within 25% of each other for 3-4 purges (and there is no consistent declining trend).

The LNAPL recovery rates measured in the field are used to estimate LNAPL transmissivity according to the following equation (ASTM 2013, Eq. 16):

$$T_n = \frac{Q_n \ln\left(\frac{R_{oi}}{r_w}\right)}{2\pi S_n}$$

Where: T_n = LNAPL transmissivity (ft^2/day)

Q_n = stabilized LNAPL recovery rate (ft^3/day)

R_{oi} = radius of influence (ft)

r_w = well radius (ft)

S_n = LNAPL drawdown, the geometric mean of LNAPL drawdown values measured/calculated over the course of a given test (see below)

NOTES:

1. ASTM 2013 indicates that assuming the $\ln(R_{oi}/r_w)$ term is equal to 4.6 is a common practice that introduces little additional error. Therefore, this value was used in the transmissivity calculation.
2. In cases where LNAPL recovery rates are still declining at the termination of a test, the use of the last LNAPL recovery rate estimate will provide a conservative/upper bound estimate of LNAPL transmissivity (i.e., continuation of the test would most likely only result in a lower LNAPL transmissivity estimate).
3. The LNAPL drawdown calculation (S_n) will vary depending on whether LNAPL is present under confined, unconfined or perched conditions. The following discussion details the calculation of LNAPL drawdown at any given time (t) during a test for the different conditions.

LNAPL at well MW -15 is considered unconfined, therefore, the evaluation for unconfined conditions as described in ASTM 2013 were used.

Unconfined/Perched – Measured LNAPL Drawdown

The LNAPL drawdown at any point during the test is estimated via the following calculation where conditions are unconfined or perched (ASTM 2013):

$$S_{nt} = Z_{AN*} - Z_{AN(t)} \quad (2)$$

Where: Z_{AN*} = the air/oil interface (or top of LNAPL) in-well elevation for equilibirium/pre-test conditions (ft)
$Z_{AN(t)}$ = the air/oil interface (or top of LNAPL) in-well elevation at time t (ft)
S_{nt} = LNAPL drawdown at time t (ft)

Unconfined/Perched – Theoretical Maximum LNAPL Drawdown

The theoretical maximum LNAPL drawdown that can be achieved at a given site/well can be calculated to compare against measured LNAPL drawdown values according to the following methodology (ASTM 2013):

$$S_{n-unconfined} = b_n(1-\rho_r) \quad (3)$$

$$S_{n-perched} = b_{nf-perched} \quad (4)$$

Where: b_n = pre-recovery LNAPL thickness in a well (ft)
$b_{nf-perched}$ = LNAPL thickness in the formation, can be estimated as the difference between the equilibrium/pre-test air/LNAPL interface (or top of LNAPL) elevation and the elevation of the top of the perched layer in contact with the LNAPL (ft)
ρ_r = LNAPL relative density or specific gravity (dimensionless)

NOTES:

1. Where measured LNAPL drawdowns exceed the theoretical maximum LNAPL drawdown, the following possibilities should be considered:
   a. The assumed conditions that the LNAPL is present under (unconfined, confined, perched) may not be correct. Review

available well logs and historical well gauging data to confirm actual conditions.

b. The extraction of water during the LNAPL purges may result in an apparent exaggeration of LNAPL drawdown. Where this is suspected as being the case, the theoretical maximum LNAPL drawdown should be used in lieu of the measured LNAPL drawdown values (where applicable).

The data and transmissivity calculations for the LNAPL skimming test are presented on Table G.2 and Figure G.2. The results of the testing indicate an LNAPL transmissivity of 0.1 ft^2/day.

Summary

Based on these two separate LNAPL transmissivity evaluation approaches at multiple locations, it is projected that the LNAPL transmissivity at the Site could be expected to range from approximately 0.1 to 0.7 ft2/day. These values can be compared against a de minimis recoverability criterion of 0.8 ft^2/day suggested by the Interstate Technical and Regulatory Council (ITRC) in their guidance document *Evaluating LNAPL Remedial Technologies for Achieving Project Goals* (ITRC, 2009). As such, LNAPL recovery would be expected to be marginally effective, except perhaps under drought conditions. These conditions were present during the initial part of the RI and reflected lower water table conditions more conducive to LNAPL mobility and thus recovery.

References

Duffield, G. 2007. AQTESOLV® Standard Version 4.5. Hydrosolve, Inc.

ASTM, 2013. Standard Guide for Estimation of LNAPL Transmissivity. Designation E2856 – 13.

ITRC (Interstate Technology & Regulatory Council). 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. LNAPL-2. Washington, D.C.: Interstate Technology & Regulatory Council, LNAPLs Team. www.itrcweb.org.

TABLE I.1
LNAPL TRANSMISSIVITY TEST: BAILDOWN METHOD
R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

Well ID	LNAPL Saturated Thickness (feet)	Hydraulic Conductivity (cm/sec)	LNAPL Density Adjustment Factor	LNAPL Density-Adjusted Hydraulic Conductivity (cm/sec)	LNAPL Density-Adjusted Transmissivity (ft^2/day)
MW-12	2.55	1.02E-05	4.2	4.29E-05	3.10E-01
MW-13	1.53	3.08E-06	4.2	1.29E-05	5.60E-02
MW-15	3.37	1.75E-05	4.2	7.36E-05	7.03E-01

Notes:

1. LNAPL density adjustment factor is difference between the density of water and LNAPL:
   $[1/(1-n_o)]$ where n_o = density of LNAPL
2. LNAPL density of 0.762 was used based on analysis of LNAPL in MW-12.

TABLE I.2

MW-15 LNAPL TRANSMISSIVITY TEST: SKIMMING METHOD

R&H Oil Company/Tropicana Energy Site, San Antonio, Texas

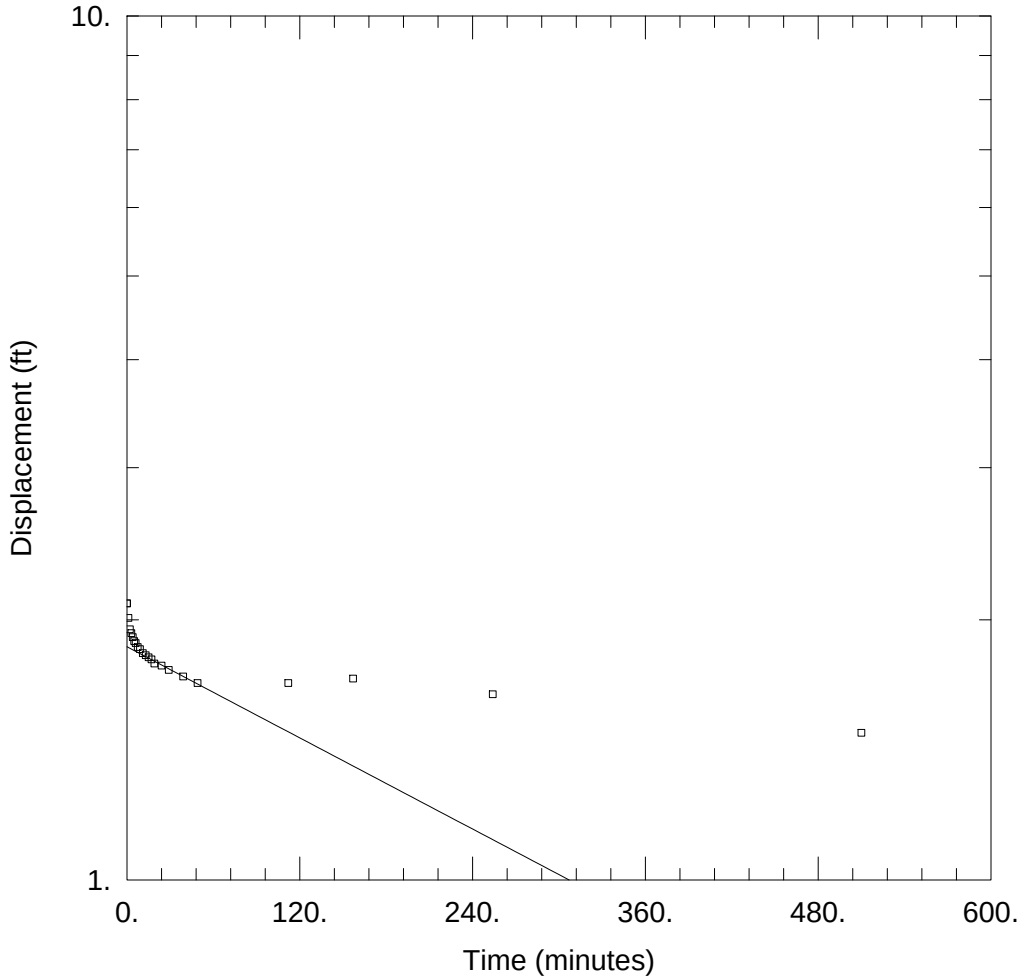
Day	Time	DTP (ft btor)	DTW (ft btor)	Thickness (in)	Vol Removed (mL)	Recovery Rate (mL/hr)	Percent of Recovery	LNAPL Drawdown - S_n (feet)	LNAPL Recovery Rate - Q_n (ft^3/hr)	LNAPL Recovery Rate - Q_n (ft^3/day)
1/8/2015	10:28	21.58	22.34	9.1						
1/8/2015	10:49	22.11	22.12	0.1				0.53		
1/8/2015	10:49	--	--	0.0	1200.0					
1/8/2015	11:00	21.99	22.05	0.7				0.41		
1/8/2015	11:10	21.93	22.01	1.0				0.35		
1/8/2015	11:20	21.88	21.96	1.0				0.30		
1/8/2015	11:21	--	--	0.0	75.0	140.6			0.004964063	0.119
1/8/2015	11:30	21.87	21.91	0.5				0.29		
1/8/2015	11:40	21.84	21.89	0.6				0.26		
1/8/2015	11:50	21.81	21.86	0.6				0.23		
1/8/2015	11:50	--	--	0.0	45.0	93.1	51%		0.003286552	0.079
1/8/2015	12:00	21.79	21.83	0.5				0.21		
1/8/2015	12:10	21.76	21.81	0.6				0.18		
1/8/2015	12:20	21.74	21.78	0.5				0.16		
1/8/2015	12:20	--	--	0.0	38.0	76.0	23%		0.0026828	0.064
1/8/2015	12:30	21.73	21.76	0.4				0.15		
1/8/2015	12:40	21.71	21.74	0.4				0.13		
1/8/2015	12:50	21.69	21.73	0.5				0.11		
1/8/2015	12:50	--	--	0.0	20.0	40.0	90%		0.001412	0.034
1/8/2015	13:20	21.65	21.68	0.4				0.07		
1/8/2015	13:30	21.64	21.66	0.2				0.06		
1/8/2015	13:40	21.63	21.65	0.2				0.05		
1/8/2015	13:40	--	--	0.0	20.0	24.0	67%		0.0008472	0.020
1/8/2015	14:10	21.60	21.62	0.2				0.02		
1/8/2015	14:20	21.59	21.61	0.2				0.01		
1/8/2015	14:30	21.58	21.61	0.4				0.00		
1/8/2015	14:30	--	--	0.0	20.0	24.0	0%		0.0008472	0.020
1/8/2015	15:00	21.57	21.59	0.2				-0.01		
1/8/2015	15:10	21.56	21.59	0.4				-0.02		
1/8/2015	15:20	21.56	21.58	0.2				-0.02		
1/8/2015	15:20	--	--	0.0	15.0	18.0	33%		0.0006354	0.015
1/8/2015	15:50	21.55	21.57	0.0						
1/8/2015	16:00	21.55	21.57	0.2				-0.03		
1/8/2015	16:10	21.54	21.56	0.2				-0.04		
1/8/2015	16:10	--	--	0.0	12.0	14.4	25%		0.00050832	0.012

	S_n		Q_n
Inputs	**0.11**	**0.0014**	**0.017**

$\ln(R_{oi}/R_w)$ is equal to 4.6 per ASTM Guidance.

LNAPL Transmissivity - T_n (ft^2/day) **0.1**

FIGURE I.1
AQTESOLV Output



MW-12

Data Set: J:\...\MW-12_Baildown.aqt
Date: 04/07/16 Time: 15:13:21

PROJECT INFORMATION

Company: PBW
Client: R&H
Project: 1651
Location: San Antonio
Test Well: MW-12
Test Date: December 2011

AQUIFER DATA

Saturated Thickness: 2.55 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-12)

Initial Displacement: 2.09 ft
Total Well Penetration Depth: 2.55 ft
Casing Radius: 0.083 ft
Static Water Column Height: 2.55 ft
Screen Length: 2.55 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.021E-5 cm/sec
y0 = 1.861 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\NAPL evaluation\WFV_Evaluation_4-6-16\MW-12_Baildown.aqt

PROJECT INFORMATION

Company: PBW
Client: R&H
Project: 1651
Location: San Antonio
Test Date: December 2011
Test Well: MW-12

AQUIFER DATA

Saturated Thickness: 2.55 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-12

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.09 ft
Static Water Column Height: 2.55 ft
Casing Radius: 0.083 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 2.55 ft
Total Well Penetration Depth: 2.55 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1834 ft
Gravel Pack Porosity: 0.3

No. of Observations: 22

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.09	15.	1.81
1.	2.01	17.	1.8
2.	1.95	19.	1.78
3.	1.93	24.	1.77
4.	1.91	29.	1.75
5.	1.89	39.	1.72
6.	1.88	49.	1.69
7.5	1.86	112.	1.69
9.	1.85	157.	1.71
11.	1.83	254.	1.64
13.	1.82	510.	1.48

SOLUTION

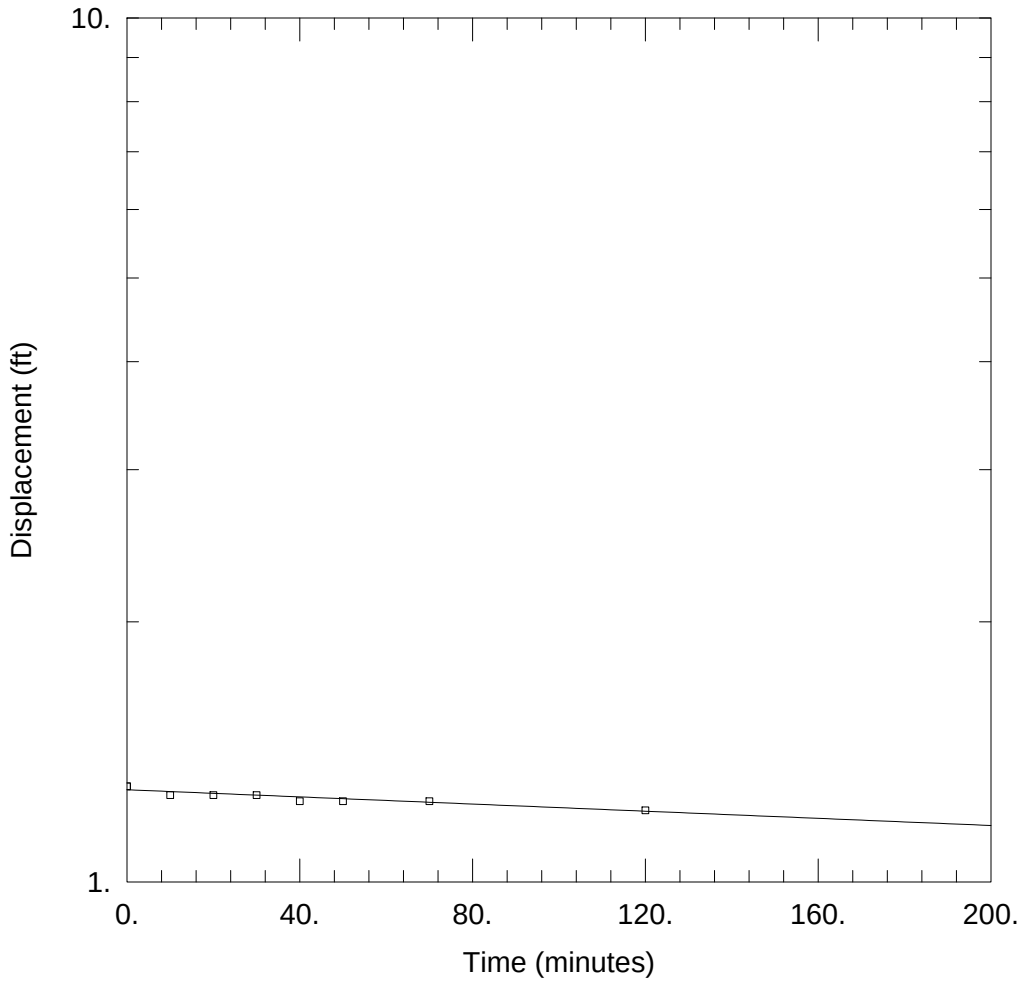
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.505

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.021E-5	cm/sec
y0	1.861	ft

$T = K*b = 0.0007936$ cm²/sec



MW-13

Data Set: J:\...\MW-13_Baildown.aqt
Date: 04/07/16 Time: 15:15:17

PROJECT INFORMATION

Company: PBW
Client: R&H
Project: 1651
Location: San Antonio
Test Well: MW-13
Test Date: December 2011

AQUIFER DATA

Saturated Thickness: 1.53 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-15)

Initial Displacement: 1.29 ft
Total Well Penetration Depth: 1.53 ft
Casing Radius: 0.083 ft
Static Water Column Height: 1.53 ft
Screen Length: 1.53 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 3.077E-6 cm/sec
y0 = 1.278 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\NAPL evaluation\WFV_Evaluation_4-6-16\MW-13_Baildown.aqt

PROJECT INFORMATION

Company: PBW
Client: R&H
Project: 1651
Location: San Antonio
Test Date: December 2011
Test Well: MW-13

AQUIFER DATA

Saturated Thickness: 1.53 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-15

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.29 ft
Static Water Column Height: 1.53 ft
Casing Radius: 0.083 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 1.53 ft
Total Well Penetration Depth: 1.53 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1834 ft
Gravel Pack Porosity: 0.3

No. of Observations: 8

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.29	40.	1.24
10.	1.26	50.	1.24
20.	1.26	70.	1.24
30.	1.26	120.	1.21

SOLUTION

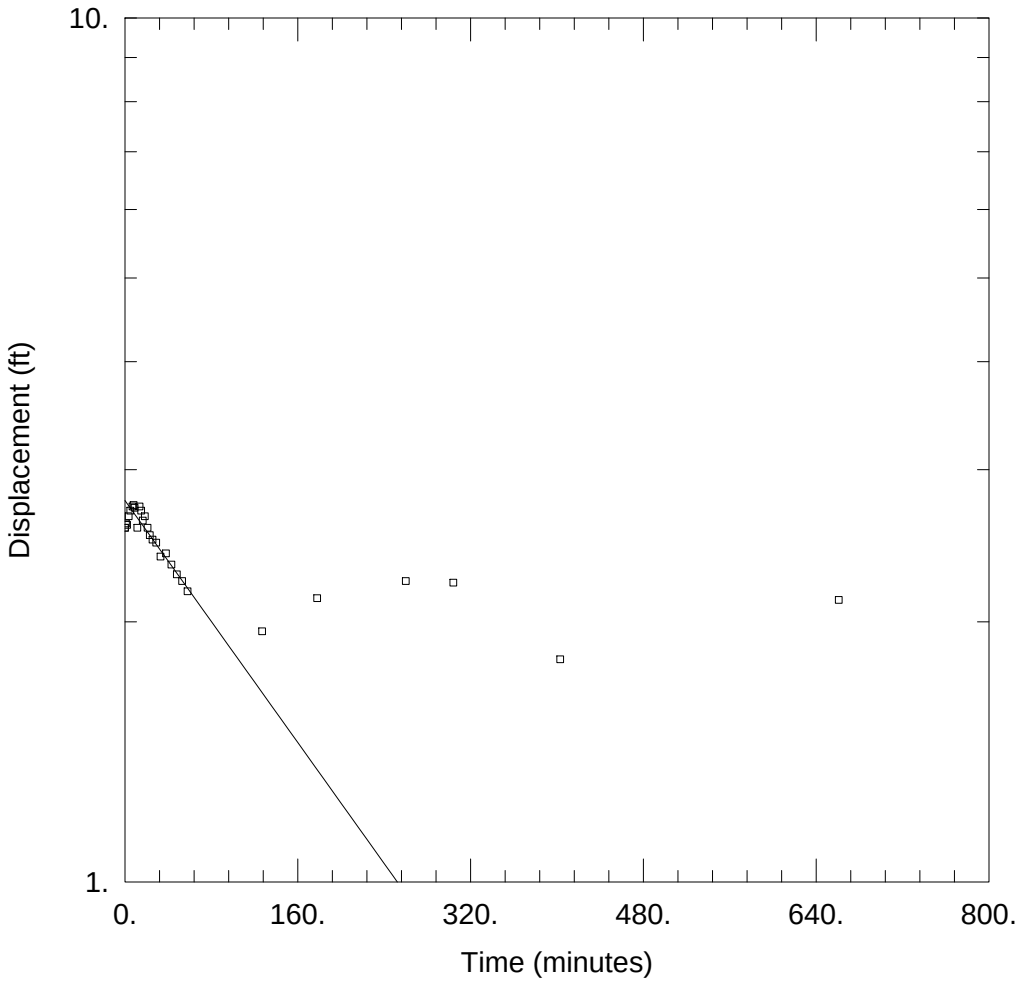
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.156

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.077E-6	cm/sec
y0	1.278	ft

$T = K*b = 0.0001435$ cm²/sec



MW-15

Data Set: J:\...\MW-15_Baildown.aqt
Date: 04/07/16 Time: 15:17:56

PROJECT INFORMATION

Company: PBW
Client: R&H
Project: 1651
Location: San Antonio
Test Well: MW-15
Test Date: December 2011

AQUIFER DATA

Saturated Thickness: 3.37 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-15)

Initial Displacement: 2.57 ft
Total Well Penetration Depth: 3.37 ft
Casing Radius: 0.083 ft
Static Water Column Height: 3.37 ft
Screen Length: 3.37 ft
Well Radius: 0.31 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.753E-5 cm/sec
y0 = 2.763 ft

Data Set: J:\1651 - R&H Oil RI-FS Implementation\NAPL evaluation\WFV_Evaluation_4-6-16\MW-15_Baildown.aqt

PROJECT INFORMATION

Company: PBW
Client: R&H
Project: 1651
Location: San Antonio
Test Date: December 2011
Test Well: MW-15

AQUIFER DATA

Saturated Thickness: 3.37 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW-15

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.57 ft
Static Water Column Height: 3.37 ft
Casing Radius: 0.083 ft
Well Radius: 0.31 ft
Well Skin Radius: 0.31 ft
Screen Length: 3.37 ft
Total Well Penetration Depth: 3.37 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1834 ft
Gravel Pack Porosity: 0.3

No. of Observations: 30

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.57	25.5	2.49
1.	2.6	29.	2.47
2.	2.59	33.	2.38
3.5	2.65	38.	2.4
5.	2.69	43.	2.33
7.	2.72	48.	2.27
8.	2.73	53.	2.23
9.	2.71	58.	2.17
11.5	2.57	127.	1.95
13.5	2.72	178.	2.13
15.	2.69	260.	2.23
16.5	2.62	304.	2.22
18.5	2.65	403.	1.81
21.	2.57	661.	2.12
23.	2.52	1263.	2.

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 1.715

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.753E-5	cm/sec
y0	2.763	ft

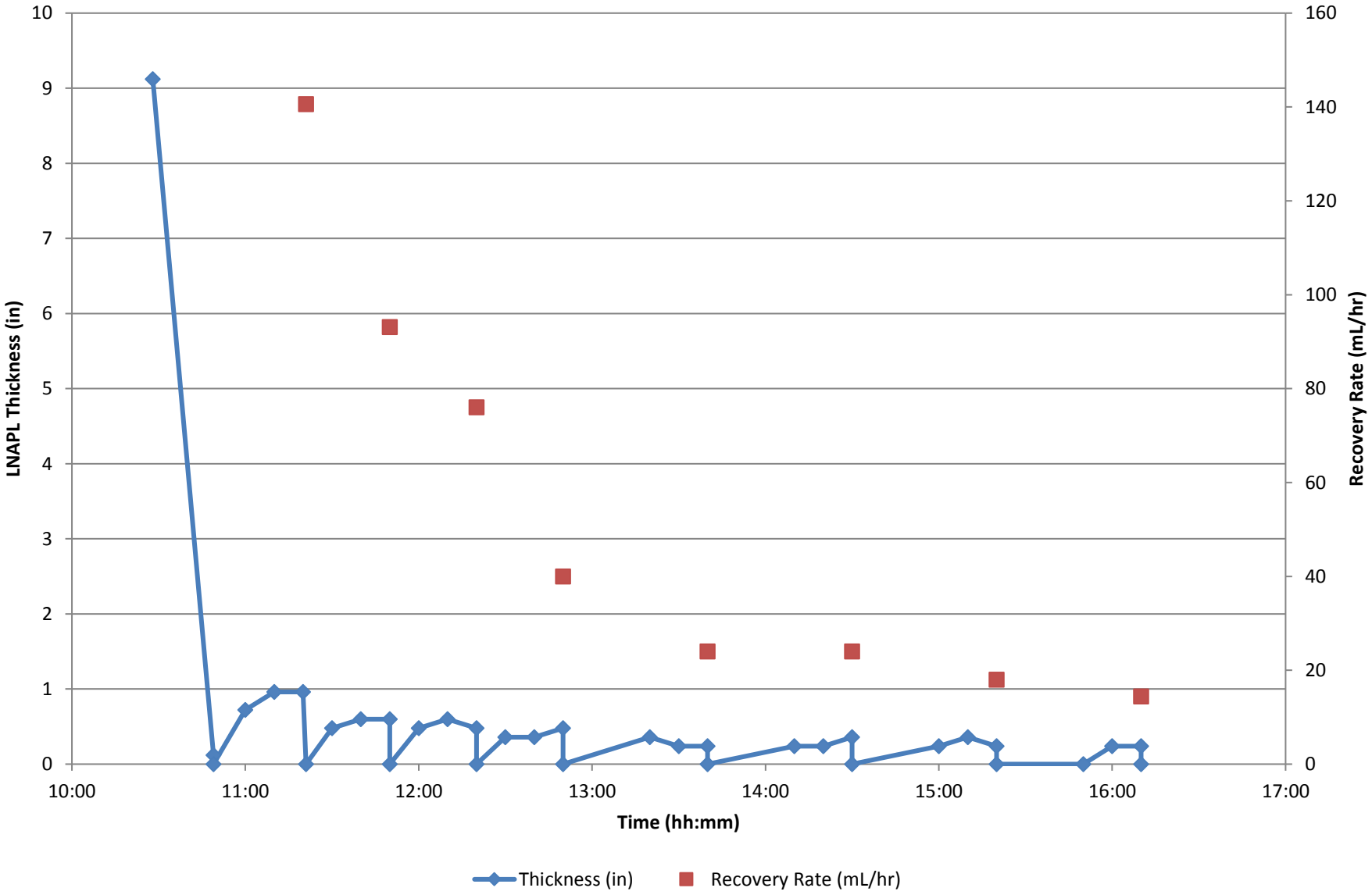



FIGURE I.2
LNAPL SKIMMING TEST MW-15