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Long Beach, CA 90802

Technical Report

Response to Investigative Order No. R4-2015-0413
California Water Code Section 13267

16 February 2016

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Introduction

The Los Angeles Regional Water Quality Control Board ("Water Board") directive pursuant to California Water Code (CWC) Section 13267 was received by Warren E&P, Inc. ("Warren") on December 21, 2015. The Investigative Order No. R4-2015-0413 required Warren to provide information on the management of the discharges of wastes to land during drilling and completion of oil and gas wells and the discharge of fluids associated with oil and gas production and to assess the threat to water quality from such discharges. The Water Board cites authority under CWC §13267 (b)(1):

"In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.

When waste is defined as material for which you no longer have intended purpose, it may be stated that Warren's oil and gas operations in Wilmington and Long Beach, since inception in 2005, have not included the discharge of waste to land or to water. All wastes generated during the drilling, completion or production of oil and gas wells have been sent to third party waste disposal companies using approved waste transportation companies.

No Discharges to Land

The Regional Board writes on page -2- of the directive that "A common oil and gas industry practice is to discharge well drilling fluids, well completion fluids, and oil production fluids to land, typically into sumps or ponds."

There are no produced fluids that are 'discharged' to land, where land is described as an earthen excavation or unlined receptacle. During oil and gas production, the Warren produced fluids from oil wells are either sold (crude oil) via pipeline or reinjected (produced water) into DOGGR permitted Class II wells in the Underground Injection Control Program (waterflood) that prevents subsidence and promotes secondary recovery of crude oil.

Warren operates in the South Coast Air Quality Management District (SCAQMD) and is subject to the rules and regulations that apply to oil and gas production operations. SCAQMD Rule 1176 specifically prohibits the use of open sumps for oil and gas production fluids.

There are no wastes discharged to land. Wastes are collected into tanks or roll-off bins and are hauled by vacuum truck or 'rocket launcher' trucks to third party disposal facilities.

Location of Current and Historic Sumps

Warren has four active concrete lined sumps, three active concrete and steel lined sumps, five inactive empty steel lined sumps, and two historic closed sumps as a result of voluntary clean-up. The sumps are described as follows:

Active Concrete Lined Sumps

1) Filter Flush Pit T-850

The Filter Flush Pit T-850 is a concrete lined rectangular subsurface impoundment with vapor tight steel roof connected to vapor recovery system. The pit received oily produced water (salty brine). It is adjacent to and shares one wall with the Clarifier Pit T-1210.

Dimensions:	54'-0" L x 16'-8" W x 8'-0" D
Volume (ft^3):	7200
Location:	625 E. Anaheim Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.780747 / -118.255411
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the south.

2) Clarifier Pit T-1210

The Clarifier Pit T-1210 is a concrete lined rectangular subsurface impoundment with vapor tight steel roof connected to vapor recovery system. The pit received oily produced water (salty brine). It is adjacent to and shares one wall with the Filter Flush Pit T-850.

Dimensions:	54'-0" L x 16'-8" W x 8'-0" D
Volume (ft^3):	7200
Location:	625 E. Anaheim Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.780676 / -118. 255390
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the south.

Active Concrete Lined Sumps (cont'd)

3) Treater Pit T-1110

The Treater Pit T-1110 is a concrete lined rectangular subsurface impoundment with vapor tight steel roof connected to vapor recovery system. The pit receives crude oil and produced water (salty brine).

Dimensions:	44'-0" L x 9'-10" W x 7'-0" D
Volume (ft^3):	3029
Location:	625 E. Anaheim Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.780765 / -118.256532
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the south.

4) Recycle Pit

The Recycle Pit is a concrete lined rectangular subsurface impoundment with vapor tight steel roof connected to vapor recovery system. The pit receives crude oil and produced water (salty brine).

Dimensions:	30'-0" L x 30'-0" W x 10'-0" D
Volume (ft^3):	9000
Location:	2209 E. I Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.784052 / -118.233898
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the north. Pit is seaward of the Dominguez Gap Barrier Project.

Active Concrete and Steel Lined Sumps

5) Clarifier Tank Drain Pit

The Clarifier Tank Drain Pit is a concrete and steel lined cylindrical subsurface impoundment with vapor tight steel roof connected to vapor recovery system. The pit receives crude oil and produced water (salty brine).

Dimensions:	2'-0" Diameter x 8'-0" Depth
Volume (ft^3):	25
Location:	2209 E. I Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.784289 / -118.233855
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the north. Pit is seaward of the Dominguez Gap Barrier Project.

Active Concrete and Steel Lined Sumps (cont'd)

6) LACT Area Drain Pit

The LACT Area Drain Pit is a concrete and steel lined cylindrical subsurface impoundment with vapor tight steel roof connected to vapor recovery system. The pit receives crude oil and produced water (salty brine).

Dimensions:	2'-0" Diameter x 8'-0" Depth
Volume (ft^3):	25
Location:	2209 E. I Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.783940 / -118.233906
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the north. Pit is seaward of the Dominguez Gap Barrier Project.

7) Free Water Knock Out Area Drain Pit

The Free Water Knock Out Area Drain Pit is a concrete and steel lined cylindrical subsurface impoundment with vapor tight steel roof connected to vapor recovery system. The pit receives crude oil and produced water (salty brine).

Dimensions:	2'-0" Diameter x 8'-0" Depth
Volume (ft^3):	25
Location:	2209 E. I Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.783694 / -118.234342
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the north. Pit is seaward of the Dominguez Gap Barrier Project.

Inactive Empty Steel Lined Sumps

8) Satellite 1 Sump

The Satellite 1 sump is a steel cylindrical unit with a welded roof. The sump is currently empty and inactive. The historic use for the sump was to receive small volumes of oily produced water (salty brine) and traces of hydraulic oil from the artificial lift hydraulic pumping system which is also inactive.

Dimensions:	4'-0" Diameter x 7'-0" Depth
Volume (ft^3):	88
Location:	1108 E. Colon Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.791427 / -118.248649
Water wells within ½ mile:	None

Inactive Empty Steel Lined Sumps (cont'd)

9) Satellite 2 Sump

The Satellite 2 sump is a steel cylindrical unit with a welded roof. The sump is currently empty and inactive. The historic use for the sump was to receive small volumes of oily produced water (salty brine) and traces of hydraulic oil from the artificial lift hydraulic pumping system which is also inactive.

Dimensions:	4'-0" Diameter x 6'-0" Depth
Volume (ft^3):	75
Location:	1560 E. L Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.787130 / -118.243110
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the south.

10) Satellite 5 Sump

The Satellite 5 sump is a steel cylindrical unit with a welded roof. The sump is currently empty and inactive. The historic use for the sump was to receive small volumes of oily produced water (salty brine) and traces of hydraulic oil from the artificial lift hydraulic pumping system which is also inactive.

Dimensions:	4'-0" Diameter x 6'-0" Depth
Volume (ft^3):	75
Location:	1950 E. Grant Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.785662 / -118.237723
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the south and one active production well (27N6) owned by Tesoro is to the north.

11) Satellite 6 Sump

The Satellite 6 sump is a steel cylindrical unit with a welded roof. The sump is currently empty and inactive. The historic use for the sump was to receive small volumes of oily produced water (salty brine) and traces of hydraulic oil from the artificial lift hydraulic pumping system which is also inactive.

Dimensions:	4'-0" Diameter x 7'-0" Depth
Volume (ft^3):	88
Location:	Hobson and Grant in Wilmington, CA 90744
Lat/Long Coordinates:	33.786095 / -118.225916
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the west. Sump is seaward of Dominguez Gap Barrier Project.

Inactive Empty Steel Lined Sumps (cont'd)

12) Satellite 7 Sump

The Satellite 7 sump is a steel cylindrical unit with a welded roof. The sump is currently empty and inactive. The historic use for the sump was to receive small volumes of oily produced water (salty brine) and traces of hydraulic oil from the artificial lift hydraulic pumping system which is also inactive.

Dimensions:	4'-0" Diameter x 6'-0" Depth
Volume (ft^3):	75
Location:	1445 Judson Ave. in Long Beach, CA 90813
Lat/Long Coordinates:	33.783504 / -118.220838
Water wells within ½ mile:	None

Voluntarily Closed (with Clean-Up) Historic Steel Sumps

13) Satellite 3 Sump

The Satellite 3 sump was a steel cylindrical unit with a welded roof. The sump was removed in whole in mid-2014. The historic use for the sump was to receive small volumes of oily produced water (salty brine) and traces of hydraulic oil from the artificial lift hydraulic pumping system which has also been removed.

Dimensions:	4'-0" Diameter x 6'-0" Depth
Volume (ft^3):	75
Location:	825 N. Mahar Ave. in Wilmington, CA 90744
Lat/Long Coordinates:	33.781404 / -118.246513
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the east.

14) Satellite 4 Sump

The Satellite 4 sump was a steel cylindrical unit with a welded roof. The sump was removed in whole on October 28, 2015. The historic use for the sump was to receive small volumes of oily produced water (salty brine) and traces of hydraulic oil from the artificial lift hydraulic pumping system which has also been removed.

Dimensions:	4'-0" Diameter x 6'-0" Depth
Volume (ft^3):	75
Location:	1831 E. I Street in Wilmington, CA 90744
Lat/Long Coordinates:	33.782711/ -118.239270
Water wells within ½ mile:	Dominguez Gap Barrier Project Injection wells are to the north. Sump was seaward of Dominguez Gap Barrier Project.

Please refer to Attachment B and Figures 1-10 that follow for additional information.

Procedure to Close Sumps

Two of Warren's sumps have been voluntarily closed with clean-up at Satellite 3 and Satellite 4. The sumps were first emptied of their fluids and returned to process at Warren's North Wilmington Unit (NWU) central facility. The historical inactive metal cylindrical sumps were exposed by Warren's subcontractor using an excavator/backhoe. The sumps were removed in-whole and were subsequently disposed of off-site at an appropriate recycling/disposal facility. Clean overburden soil was segregated from potentially impacted soil based on South Coast Air Quality Management District (SCAQMD) Rule 1166 air monitoring. TPH-impacted soil was removed and disposed of at Waste Management's Simi Valley Landfill. Clean third party backfill aggregate base was trucked in to fill to grade.

Estimated Total Annual Fluid Discharged to Sumps

Please refer to Attachment B.

Physical and Chemical Compositions of Sump Fluids

Warren operates a mature oil field that is supported by a waterflood. The fluids produced from Warren's oil wells have an oil/water ratio of approximately 2% crude oil and 98% produced water (salty brine). The majority of the liquids routed to the four active concrete lined sumps and three active concrete and steel lined sumps at Warren's two central facilities are the same constituents as the fluids produced from the oil wells. The sumps serve as a low point drain to receive liquids from sample boxes on tanks or vessels, Lease Acquisition Custody Transfer (LACT) unit drain boxes at the oil sales point, water drained from vapor recovery compressors and piping. During the rainy season, the sumps may receive water collected from well cellars after a rain.

A geochemical water analysis for Warren Produced Water is enclosed with this report that may be used to represent the majority of fluids discharged into active concrete lined sumps and concrete/steel lined sumps. An MSDS for Warren's crude oil as well as an analysis of the crude oil vapor pressure by the Lawrence Berkley HOST Method is also enclosed.

The inactive steel lined sumps at the satellite facilities were primarily associated with an artificial lift hydraulic pump system which was used to bring crude oil to surface. That hydraulic lift system was subsequently replaced with an electrical lift system. The inactive empty steel sumps used to receive small amounts of excess hydraulic motor oil that was then recycled back to the artificial lift pumps for reuse. Additionally, these sumps received small volumes of produced water (salty brine) and crude oil. All inactive steel lined sumps are currently empty.

Physical and Chemical Compositions of Solidified Waste in Each Sump

Warren did not dispose of any solidified waste into the sumps.

Location of Domestic, Municipal, and Commercial Water Wells Within ½ Mile Radius of Sumps

Warren has performed an investigation of the wells reported in the Water Replenishment District Well Finder program and determined there are no domestic, municipal, or commercial water wells within ½ mile radius of the sumps. There are three active concrete lined pits located at the WTU (Wilmington Townlot Unit) central facility that are within a ½ mile north of the Dominguez Gap Barrier Project (DGBP) injection wells. Two inactive sumps (Satellite 2 & Satellite 5) are also within a ½ mile north of the DGBP injection wells. One voluntarily closed sump (Satellite 3) is within a ½ mile north of the DGBP injection wells. There is one active concrete lined sump and three active concrete and steel lined sumps at the NWU central facility that are within a ½ mile seaward of the DGBP injection wells. There is one voluntarily closed sump (Satellite 4) and one inactive sump (Satellite 6) that are both within a ½ mile seaward of the DGB injection wells. There is one active production well (27N6 owned by Tesoro) within a ½ mile north of the inactive Satellite 5 sump. See Figure 1.

Historic Water Quality Data for Wells

Water quality data was unavailable for Tesoro industrial well #10, also identified as 27N6 in the Water Replenishment District's well finder. See Figure 11.

Current Sampling Result for Water Wells

Water quality data was unavailable for Tesoro industrial well #10, also identified as 27N6 in the Water Replenishment District's well finder. See Figure 11.

Monitoring Well Data

There were no monitoring wells in the vicinity of the current or historic sumps.

Conclusion

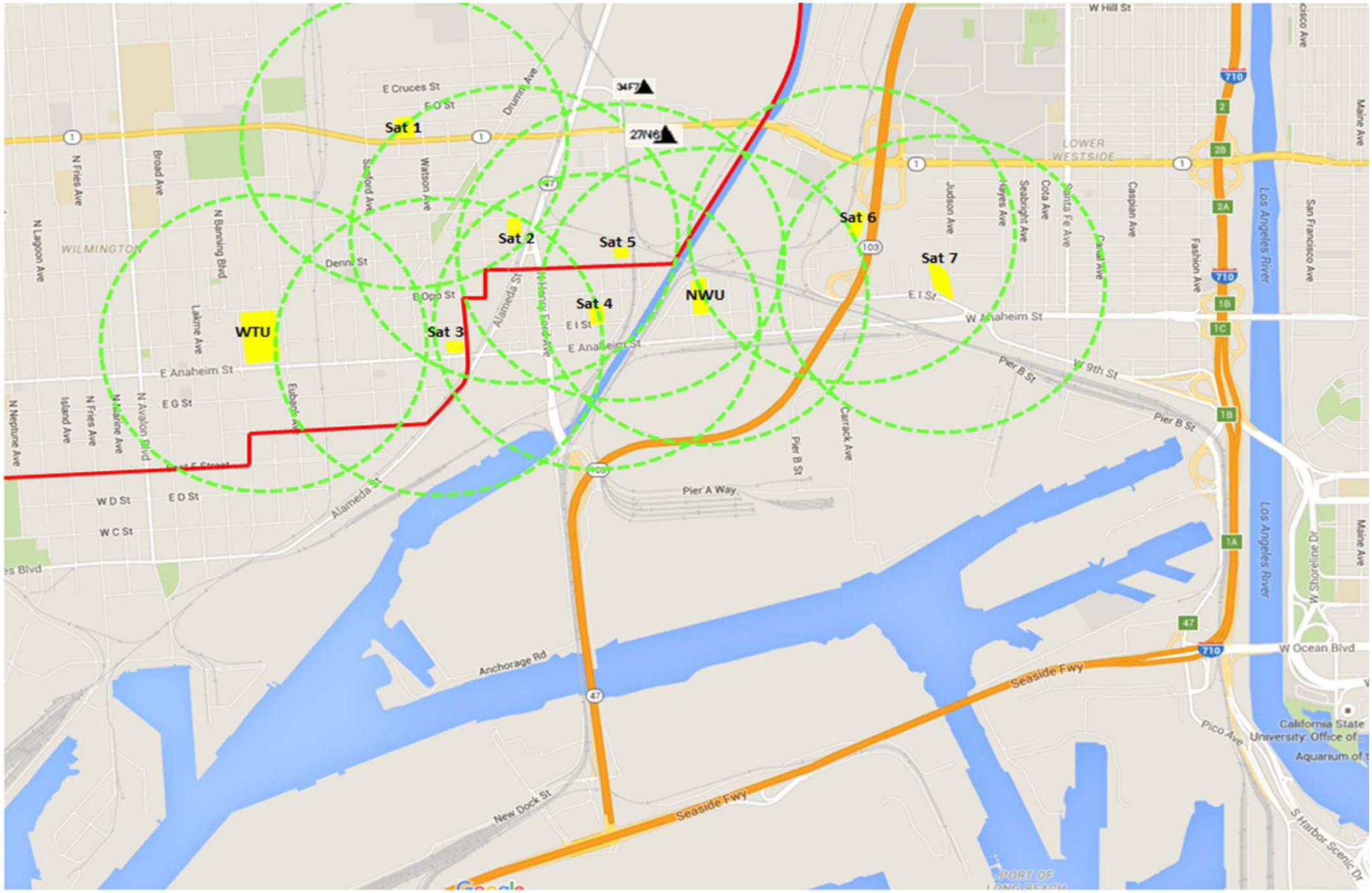
The following conclusions were determined based on the data collected during this investigation:

- Warren E&P, Inc. has never practiced the discharge oil and gas production fluids or waste to land.
- Warren has four active concrete lined sumps, three active concrete and steel lined sumps, five inactive empty steel lined sumps and two historic voluntarily closed with clean-up steel lined sumps.
- One inactive empty steel sump is within ½ mile of an active production well. Water quality data for the Tesoro industrial production well (27N6) was unavailable (Figure 11).
- Dominguez Gap Barrier Project Injection Wells are within a ½ mile of twelve of the fourteen sumps (Figure 1). Six of those twelve sumps are seaward of the Dominguez Gap Barrier Project Injection Wells.

Attachment B

A.	B.	C.	D.	E.		F.	G.	H.	I.	J.	K.	L.	M.	N.	O.
Owner and/or Operator	**Field Name**	**County**	**Sump Name/Description**	**Sump Location**		**(LxWxD) Sump**	**When was the sump first excavated?**	**How many years was the sump active**	**Total Annual Amount of Fluid Discharged in bbls.**	**Composition of Fluid(s)**	**Was Sump filled with Soil or Other Material? (Yes/No)**	**When was the Sump Filled?**	**What material was used to fill the Sump?**	**Was there solidified waste? (Yes/No)**	**If Yes, what was the composition of those solids?**
				Latitude	**Longitude**	**Volume in ft.^{3}**									
Warren E&P, Inc.	Wilmington Townlot Unit	Los Angeles	**Filter Flush Pit: T-850** Concrete lined pit with vapor tight steel roof	33.780747	-118.255411	7,200	UNK	> 10	< 10	Crude oil & produced water	No	n/a	n/a	No	n/a
Warren E&P, Inc.	Wilmington Townlot Unit	Los Angeles	**Clarifier Pit: T-1210** Concrete lined pit with vapor tight steel roof	33.780676	-118.255390	7,200	UNK	> 10	< 10	Crude oil & produced water	No	n/a	n/a	No	n/a
Warren E&P, Inc.	Wilmington Townlot Unit	Los Angeles	**Treater Pit: T-1110** Concrete lined pit with vapor tight steel roof	33.780765	-118.256532	3,029	UNK	> 10	6,200	Crude oil & produced water	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Recycle Pit** Concrete lined pit with vapor tight steel roof	33.784052	-118.233898	9,000	UNK	> 10	21,669	Crude oil & produced water	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Clarifier Tank Drain Pit** Concrete & steel lined pit with vapor tight steel roof	33.784289	-118.233855	25	2010	6	150	Crude oil & produced water	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**LACT Area Drain Pit** Concrete & steel lined pit with vapor tight steel roof	33.783940	-118.233906	25	2012	4	50	Crude oil & produced water	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Free Water Knock Out Area Drain Pit** Concrete & steel lined pit with vapor tight steel roof	33.783694	-118.234342	25	2012	4	75	Crude oil & produced water	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Satellite 1 Sump** Metal with welded roof Currently empty & inactive	33.791427	-118.248649	88	UNK	UNK	UNK	Crude oil, produced water & hydraulic motor oil	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Satellite 2 Sump** Metal with welded roof Currently empty & inactive	33.787130	-118.243110	75	UNK	UNK	UNK	Crude oil, produced water & hydraulic motor oil	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Satellite 3 Sump** Metal with welded roof (Historical - voluntarily closed & removed)	33.781404	-118.246513	75	Mid 2014 (excavation date for voluntary removal)	UNK	UNK	Crude oil, produced water & hydraulic motor oil	Yes	Mid 2014	On site soil and trucked in aggregate base	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Satellite 4 Sump** Metal with welded roof (Historical - voluntarily closed & removed)	33.782711	-118.239270	75	10/28/2015 (excavation date for voluntary removal)	UNK	UNK	Crude oil, produced water & hydraulic motor oil	Yes	12/10/2015	On site soil and trucked in aggregate base	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Satellite 5 Sump** Metal with welded roof Currently empty & inactive	33.785662	-118.237723	75	UNK	UNK	UNK	Crude oil, produced water & hydraulic motor oil	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Satellite 6 Sump** Metal with welded roof Currently empty & inactive	33.786095	-118.225916	88	UNK	UNK	UNK	Crude oil, produced water & hydraulic motor oil	No	n/a	n/a	No	n/a
Warren E&P, Inc.	North Wilmington Unit	Los Angeles	**Satellite 7 Sump** Metal with welded roof Currently empty & inactive	33.783504	-118.220838	75	UNK	UNK	UNK	Crude oil, produced water & hydraulic motor oil	No	n/a	n/a	No	n/a

Figures and Maps



Legend

- DGBP Injection Wells/Barrier Pipeline
- WRD Production Wells
- Warren Properties with active or historical "sumps"
- 1/2 mile radius

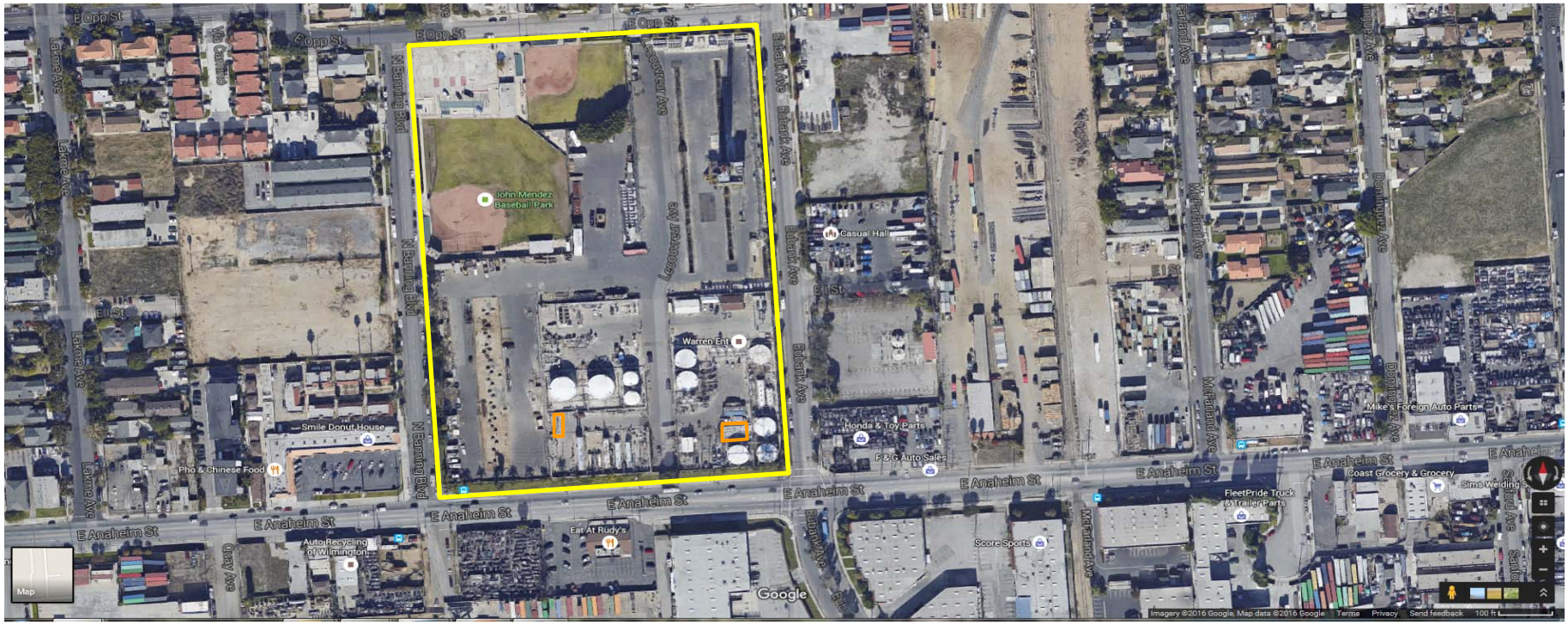
N

1000 ft

Warren E&P

Overview of Facilities with Sumps

Figure 1



Legend

- Concrete Lined Sump
- Warren Property Boundary

N

100 ft

Warren E&P

"Wilmington Townlot Unit" (WTU)
Concrete Lined Sumps

Figure
2

Legend

- Concrete Lined Sump
- Concrete and Steel Lined Sump
- Warren Property Boundary

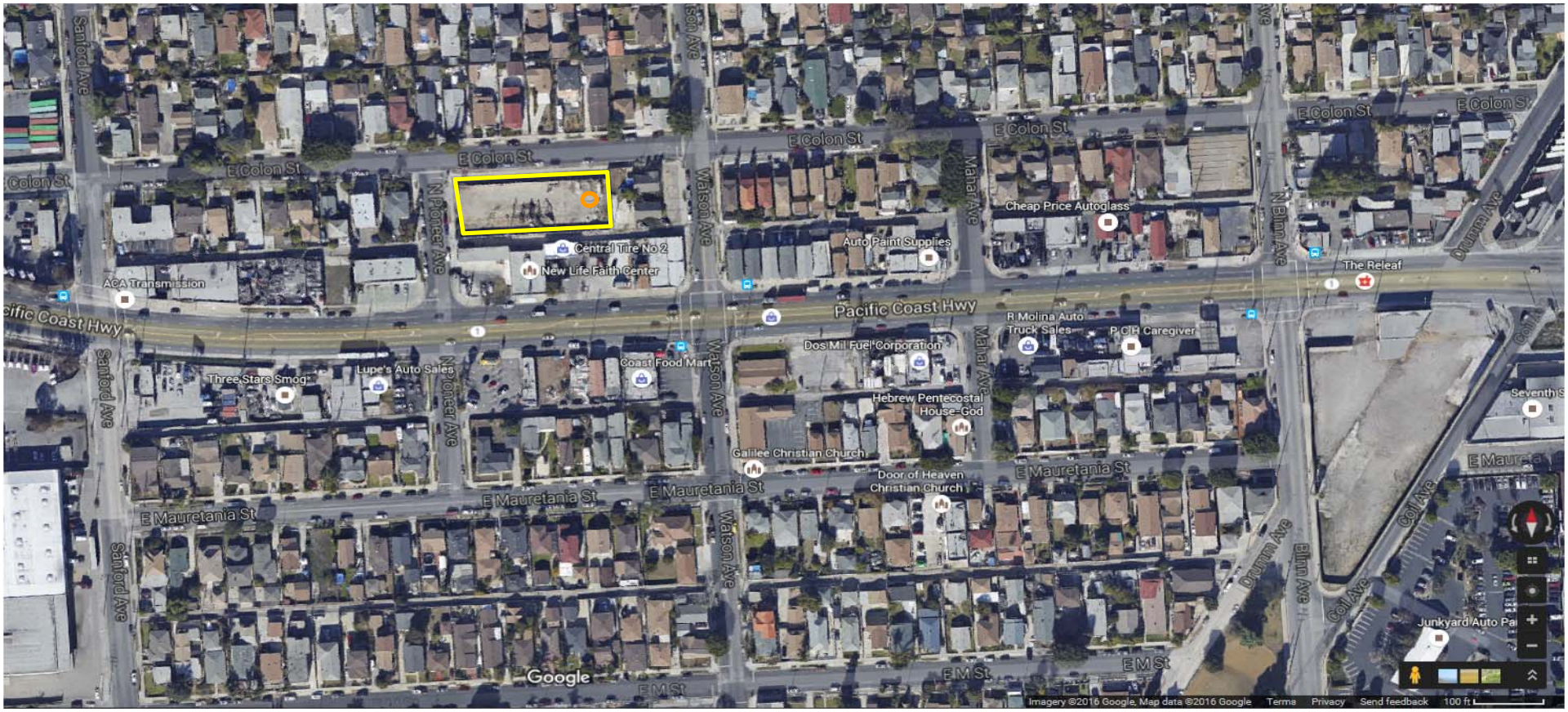
N

100 ft

Warren E&P

"North Wilmington Unit" (NWU)
Concrete Lined Sump and Concrete and Steel Lined Sumps

Figure
3



Legend

- Steel Lined Sump
- Warren Property Boundary

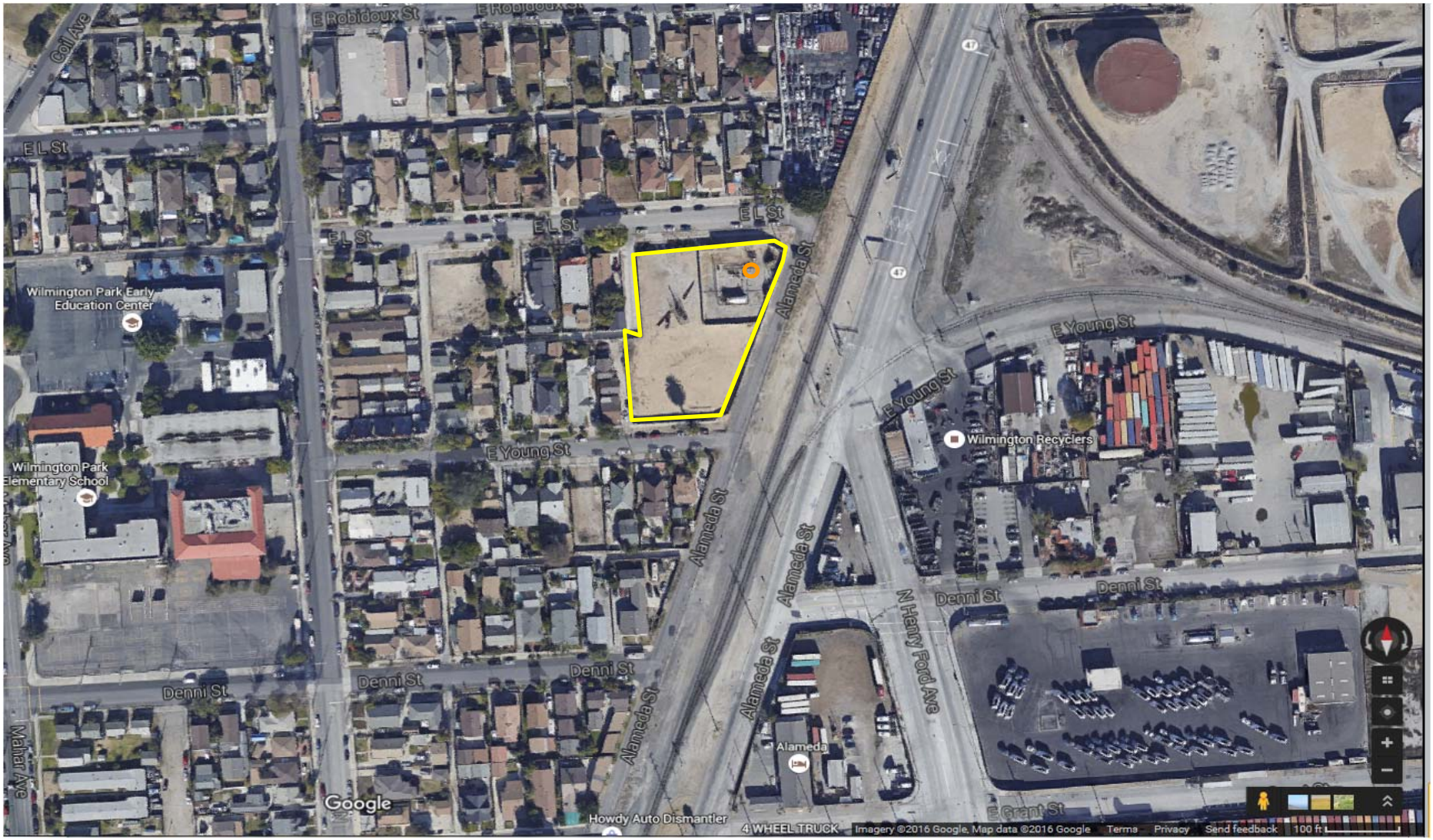
N

100 ft

Warren E&P

Satellite 1 (Sat 1)
Inactive Empty Steel Lined Sump

Figure
4



Legend

- Steel Lined Sump
- Warren Property Boundary

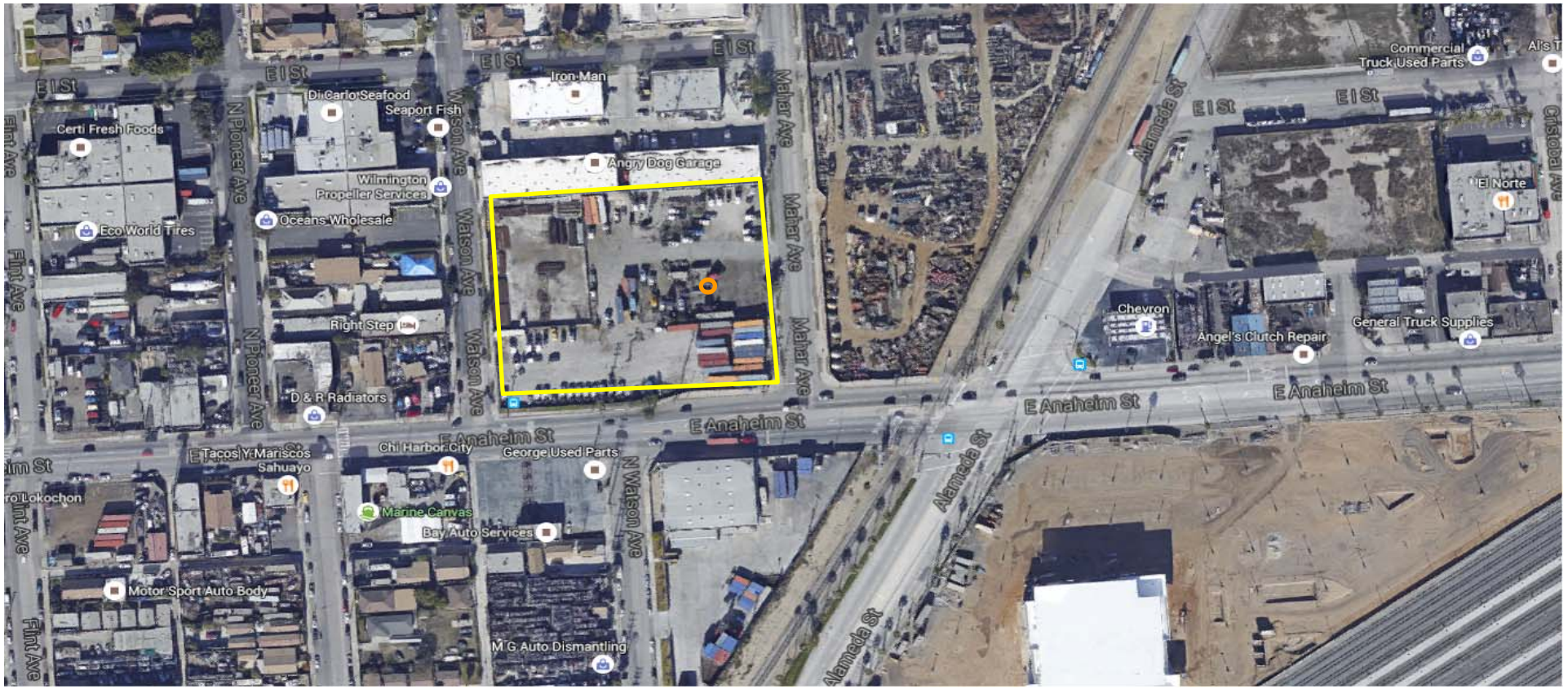
N

100 ft

Warren E & P

Satellite 2 (Sat 2)
Inactive Empty Steel Lined Sump

Figure
5



Legend

- Steel Lined Sump
- Property Boundary (Property sold in 2015)

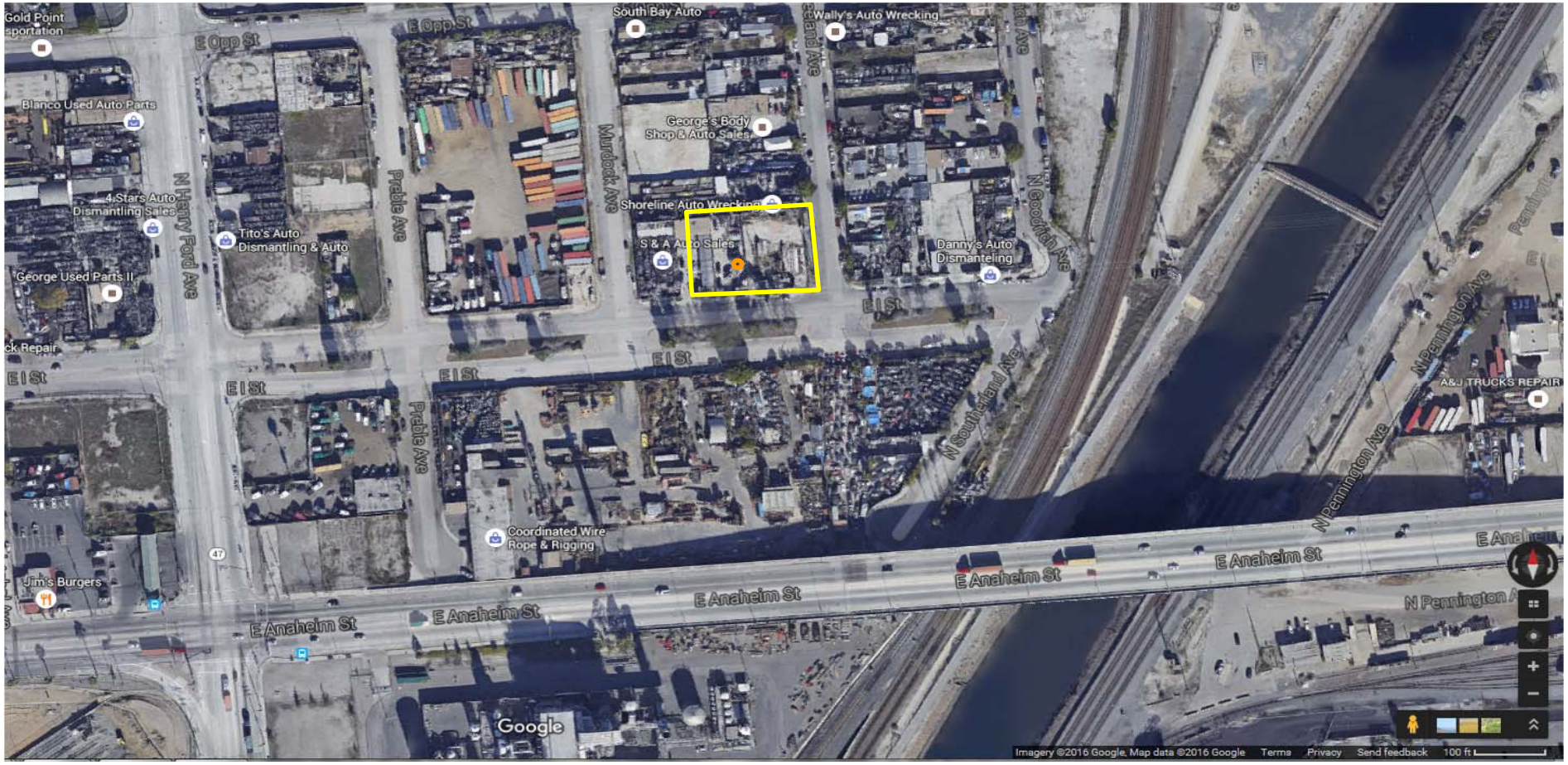
N

100 ft

Warren E & P

Satellite 3 (Sat 3)
Closed Steel Lined Sump

Figure
6



Legend

- Closed Steel Lined Sump
- Warren Property Boundary

N

100 ft

Warren E&P

Satellite 4 (Sat 4)
Closed Sump

Figure
7

Legend

- Steel Lined Sump
- Warren Property Boundary

N

100 ft

Warren E & P

Satellite 5 (Sat 5)
Inactive Empty Steel Lined Sump

Figure
8

Legend

- Steel Lined Sump
- Warren Property Boundary

N

100 ft

Warren E&P

Satellite 6 (Sat 6)
Inactive Empty Steel Lined Sump

Figure
9

Legend

- Steel Lined Sump
- Warren Property Boundary

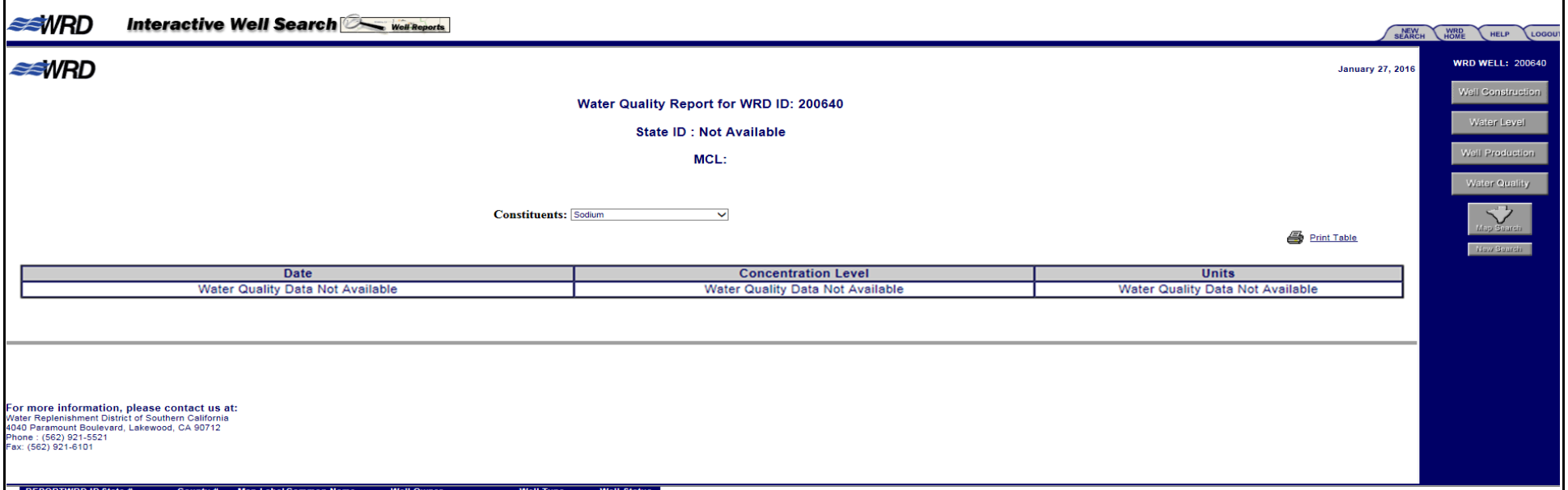
N

100 ft

Warren E & P

Satellite 7 (Sat 7)
Inactive Empty Steel Lined Sump

Figure
10



WRD Interactive Well Search — Well Reports

NEW SEARCH | WRD HOME | HELP | LOGOUT

WRD

January 27, 2016

WRD WELL: 200640

Well Construction | Water Level | Well Production | Water Quality | Map Search | New Search

Water Quality Report for WRD ID: 200640

State ID : Not Available

MCL:

Constituents: Sodium

Print Table

Date	Concentration Level	Units
Water Quality Data Not Available	Water Quality Data Not Available	Water Quality Data Not Available

For more information, please contact us at:
Water Replenishment District of Southern California
4040 Paramount Boulevard, Lakewood, CA 90712
Phone : (562) 921-5521
Fax: (562) 921-6101

REPORT	WRD ID	State #	County #	Map Label	Common Name	Well Owner	Well Type	Well Status
◉	200640	Not Available		27N6	10	Tesoro Refining & Marketing Company	Production Well	Active
○	200651	Not Available		34F7	11	Tesoro Refining & Marketing Company	Production Well	Active
○	300016	4S/13W-33X06S	342F	33X6	25T	LA County Department of Public Works	Barrier Injection Well	Active
○	300017	4S/13W-33X10S	352J	33X10	25W	LA County Department of Public Works	Barrier Injection Well	Active
○	300018	NOT AVAILABLE	352K	33X11	25Y	LA County Department of Public Works	Barrier Injection Well	Active
○	300019	4S/13W-33K05S	351R	33K5	26B	LA County Department of Public Works	Barrier Injection Well	Active
○	300020	4S/13W-33K06S	351V	33K6	26B	LA County Department of Public Works	Barrier Injection Well	Active
○	300021	4S/13W-33G04S	351P	33G4	26D	LA County Department of Public Works	Barrier Injection Well	Active
○	300022	4S/13W-33G05S	351W	33G5	26D	LA County Department of Public Works	Barrier Injection Well	Active

Tools
Print Table
Map Results

Water Quality Report for Well 27N6 (WRD ID: 200640)

Warren E&P

Figure 11

Produced Water
and
Crude Oil Analyses

Strata-Analysts GROUP

Warren E&P
100 Ocean Gate, Ste. 950
Long Beach, CA 90802

Date Received: August 19, 2015
Date Sampled: August 19, 2015
Date Reported: August 25, 2015

Attention: Gonzolo Bucio
CC:

Lab ID: 150973
File ID: 08-19-15 WTU Produced Water Geochem
DHS 2052
LACSD 10220

Location: WTU Produced Water

Matrix: Water
Temp: Deg F.

Geochemical Analysis

pH (Lab):	6.91	
Total Hardness (as CaCO3):	2,254	mg/l
Calcium (as CaCO3):	1,117	mg/l
Magnesium (as CaCO3):	1,137	mg/l
Total Alkalinity (as CaCO3):	553	mg/l
Chloride:	15,680	mg/l
Sulfate:	0	mg/l
Boron:	28.5	mg/l
Conductivity (mmhos/cm @ 25 C):	42.9	
Resistivity (ohm meter @ 25 C):	0.233	
Specific Gravity @ 60 F:	1.0079	
Silicon (AA):	21.6	mg/l
Silica (SiO2) by Calc.	46.2	mg/l
Barium (AA):	43.32	mg/l
Iron (AA):	4.67	mg/l

RADICALS -		ANIONS	
		(meq/L)	(mg/L)
Bicarbonate	HCO_3	11.06	675
Sulfate	SO_4	0.00	0
Chloride	Cl	442.31	15680
Borate	B_4O_7	1.32	102
	TOTAL	454.69	16,457
		CATIONS	
		(meq/L)	(mg/L)
Calcium	Ca	22.34	447
Magnesium	Mg	22.74	277
Barium	Ba	0.63	43
Silicon	Si	0.77	21.6
Sodium	Na.K	408.21	9385
	TOTAL	454.69	10,173
Total Dissolved Solids (by calculation):			**26,630**

3302 Industry Dr., Signal Hill, CA 90755
Tel: 562-426-0199 Fax: 562-426-5664
www.strata-analysts.com

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Date Received: August 19, 2015
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Attention: Gonzolo Bucio
CC:

Location: NWU Produced Water

Lab ID: 150973
File ID: 08-19-15 NWU Produced Water Geochem
DHS 2052
LACSD 10220

Matrix: Water
Temp: Deg F.

Geochemical Analysis

pH (Lab):	7.30	
Total Hardness (as CaCO3):	2,077	mg/l
Calcium (as CaCO3):	1,100	mg/l
Magnesium (as CaCO3):	977	mg/l
Total Alkalinity (as CaCO3):	720	mg/l
Chloride:	14,440	mg/l
Sulfate:	0	mg/l
Boron:	33.9	mg/l
Conductivity (mmhos/cm @ 25 C):	39.6	
Resistivity (ohm meter @ 25 C):	0.253	
Specific Gravity @ 60 F:	1.0054	
Silicon (AA):	21.6	mg/l
Silica (SiO2) by Calc.	46.2	mg/l
Barium (AA):	32.61	mg/l
Iron (AA):	0.31	mg/l

RADICALS -		ANIONS	
		(meq/L)	(mg/L)
Bicarbonate	HCO_3	14.40	878
Sulfate	SO_4	0.00	0
Chloride	Cl	407.33	14440
Borate	B_4O_7	1.57	121
	TOTAL	423.30	15,440
		CATIONS	
		(meq/L)	(mg/L)
Calcium	Ca	22.00	440
Magnesium	Mg	19.54	238
Barium	Ba	0.48	33
Silicon	Si	0.77	21.6
Sodium	Na.K	380.52	8748
	TOTAL	423.30	9,480
Total Dissolved Solids (by calculation):			**24,920**

3302 Industry Dr., Signal Hill, CA 90755
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Oilfield Environmental and Compliance, INC.

Blake Fletcher
STRATA Analytical
3302 Industry Drive
Signal Hill, CA 90755

02 February 2016

RE: Strata Analytical Work Order: 1600348

Dear Client:

Enclosed is an analytical report for the above referenced project. The samples included in this report were received on 20-Jan-16 18:00 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Manual, applicable standard operating procedures, and other related documentation. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Marissa L. Censullo

Project Manager

Oilfield Environmental and Compliance, INC.

STRATA Analytical	Project: Strata Analytical	
3302 Industry Drive	Project Number: Warren Host	**Reported:**
Signal Hill CA, 90755	Project Manager: Blake Fletcher	02-Feb-16 13:15

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
NWU T-100	1600348-01	Oil	12-Jan-16 12:20	20-Jan-16 18:00
WTU T-420	1600348-02	Oil	12-Jan-16 11:42	20-Jan-16 18:00

STRATA Analytical	Project: Strata Analytical	
3302 Industry Drive	Project Number: Warren Host	**Reported:**
Signal Hill CA, 90755	Project Manager: Blake Fletcher	02-Feb-16 13:15

NWU T-100

1600348-01 (Oil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Oilfield Environmental and Compliance									
Vapor Pressure									
HOST Vapor Pressure	**0.154 @ 135°F**	0.005	psi	1	B6B0025	29-Jan-16	29-Jan-16	LBNL HOST	

WTU T-420

1600348-02 (Oil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Oilfield Environmental and Compliance									
Vapor Pressure									
HOST Vapor Pressure	**0.074 @ 127°F**	0.005	psi	1	B6B0025	29-Jan-16	29-Jan-16	LBNL HOST	

Oilfield Environmental and Compliance, INC.

STRATA Analytical	Project: Strata Analytical	
3302 Industry Drive	Project Number: Warren Host	**Reported:**
Signal Hill CA, 90755	Project Manager: Blake Fletcher	02-Feb-16 13:15

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

Oilfield Environmental and Compliance, INC.

STRATA Analytical	Project: Strata Analytical	
3302 Industry Drive	Project Number: Warren Host	**Reported:**
Signal Hill CA, 90755	Project Manager: Blake Fletcher	02-Feb-16 13:15

Notes and Definitions

HOSTa	0.154 @ 135°F
HOST	0.074 @ 127°F
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Oilfield Environmental and Compliance
307 Roemer Way Suite 300, Santa Maria CA 93454
phone: (805) 922-4772 fax: (805) 925-3376 www.oecusa.com

Highway 33, McKittrick CA
phone: (661) 762-9143

CHAIN OF CUSTODY

Page 1 of 1

Company: Strata Analysts
Address:
City/State/ZIP:
Phone: 562 426 0199 Fax: E-mail:
Report To: Blake Fletcher Sampler: Victor Rojas
Send report via- FAX- ☐ PDF- ☒ Col#LUFT EDF- ☐ EDD- ☐
Turnaround Time: 10 Days- ☒ 5 Days- ☐ 72 hr- ☐ 48 hr- ☐ 24 hr- ☐ NP- ☐

Project Name/#: Warren Host
Site:

OEC Sample ID	Date/Time Sampled	Matrix	# of Cont.	Client Sample ID	Analysis Requested: TPH	Special Instructions:
1601031-1A-R	1-12-16 1120	oil	2	NWU T-100 OEC-0396	X	@ 135°F
2A-R	1-12-16 1142	oil	2	WTU T-420 OEC-0379	X	@ 127°F

Relinquished By: Date: 1/12/16 Time: 1600
Received By: Date: 1-20-16 Time: 1600
Relinquished By: Date: 1-20-16 Time: 1800
Received By: Date: 1.20.16 Time: 1900
Relinquished By: Date: Time:
Received By: Date: Time:

Comments/PO#:
Rec'd @ 4°C

CLIENT: Strata

WORK ORDER: 1600348 01-21-16

TEMPERATURE: 4 °C
Acceptable Range: 0°C to 6°C [see exception notes below]

SAMPLE RECEIPT

COC RECEIVED DATE/TIME: 1-20 1601800

LOGIN DATE/TIME: 1-20 1601 (by) 0821

REFRIGERATOR(S): 5

SAMPLE TRANSPORT

- [x] OEC Courier/Sampler
- [ ] Delivery (Other than OEC)
- [ ] After-Hours Outside Drop-Off [Brought Inside]
  - Initials/Date/Time: _____
- [ ] Shipment Carrier: _____
  - Tracking #: _____

CUSTODY SEALS

- [x] None Present

Cooler(s): [ ] Present, Intact [ ] Present, Not Intact [ ] None

Sample(s): [ ] Present, Intact [ ] Present, Not Intact [ ] None

SAMPLE RECEIPT, CONDITION, PRESERVATION

- [ ] Samples Received Outside Temperature Range [Acceptable]
  - [x] Direct from Field, on Ice
  - [ ] Ambient: Air or Filter Matrix
  - [ ] Received Ambient, Placed on Ice for Transport
  - [ ] Sample Temperature Acceptable for Analysis Requested
- [ ] Samples Received Outside Temperature Range [Exception]
  - [ ] See Problem Chain *
  - [ ] Insufficient Ice or Unknown Cause
  - [ ] Expedited PM Notification [Init/Date/Time]: _____

	YES	NO	N/A	(**) OEC PRES. ID
COC Document(s) Received With Samples	[x]	[ ]*	[ ]	
Correct Container(s) for Analysis Requested	[x]	[ ]*	[ ]	
Container(s) Intact and in Good Condition	[x]	[ ]*	[ ]	
Container Label(s) Consistent with COC	[x]	[ ]*	[ ]	
Proper Preservation on Sample Label(s)	[ ]	[ ]	[x]	
OEC Preservative Added **	[ ]	[ ]	[x]	
VOA Containers Free of Headspace	[ ]	[ ]*	[x]	
Tedlar Bag(s) Free of Condensation	[ ]	[ ]*	[x]	

(*) PROBLEM CHAIN FORM REQUIRED

CONTAINERS, COC CHANGES, AND/OR CORRECTIONS

OEC CONTAINER ID	CONTAINER DESCRIPTION	PRESERVATIVE	CHECKS: Cl⁻, S⁻ &/or pH	MATRIX	COMMENTS	INITIALS
1-2A	1-1L glass each	-	-	P		
1-2B	1 hoss each	-	-	P		

Rev. 09/25/2015

RECEIPT LOGIN BY: _____

RECEIPT REVIEWED BY: _____

MATERIAL SAFETY DATA BULLETIN

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **CRUDE OIL (<0.002% H2S)**

SUPPLIER: Warren E&P, Inc.
301 East Ocean Blvd., Suite 1010
Wilmington, CA 90744

24 - Hour Health and Safety Emergency: 310-505-4028

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: PETROLEUM CRUDE OIL

GLOBALLY REPORTABLE MSDS INGREDIENTS:

Substance Name	Approx. Wt%
PETROLEUM CRUDE OIL (8002-05-9)	100

COMPONENT(S) OF PRODUCT INGREDIENTS INCLUDE:

XYLENE (1330-20-7)	< 4
TOLUENE (108-88-3)	< 4
N-HEXANE (110-54-3)	< 4
CYCLOHEXANE (110-82-7)	< 3
NAPHTHALENE (91-20-3)	< 2
BENZENE (71-43-2)	< 2
ETHYL BENZENE (100-41-4)	< 0.7

NOTE: Crude oils may contain varying concentrations of hydrogen sulfide depending on gas stripping operations. The concentration of the components shown above are representative of the maximum concentrations expected, and can vary substantially.

See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION

This product is considered hazardous according to regulatory guidelines (See Section 15).

EMERGENCY OVERVIEW: Black Liquid. Extremely flammable. Vapor accumulation could flash and/or explode if in contact with open flame. Exposure to fire can generate highly toxic fumes. DOT ERG No. : 128

POTENTIAL HEALTH EFFECTS: **** Warning: H2S a highly toxic gas may be present, see MSDS toxicology section. Respiratory irritation, headache, dizziness, nausea, loss of consciousness, and in cases of extreme exposure, possibly death. Overexposure to benzene may result in cancer, blood disorders and damage to the bone marrow. Low viscosity material-if swallowed may enter the lungs and cause lung damage. Exposure to normal hexane may result in nerve damage.

POTENTIAL ENVIRONMENTAL EFFECTS: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.

SKIN CONTACT: Dry-wipe the skin. Cleanse the area with waterless hand cleaner, and follow by washing thoroughly with soap and water. Remove contaminated clothing. Launder clothing before reuse. Discard shoes if material has penetrated to inside surface. In case of contact with hot product, flush skin with cold water to dissipate heat. Get medical advice immediately. (See Section 16 - Injection Injury)

INHALATION: Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself and others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

INGESTION: Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIANS: Material if aspirated into the lungs may cause chemical pneumonitis. PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE: Benzene- Individuals with liver disease may be more susceptible to toxic effects. Hexane- Individuals with neurological disease should avoid exposure.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Use water to keep fire exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop leak. Water spray may be used to flush spills away from exposures. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable. Vapor accumulation could flash and/or explode if in contact with open flame. Exposure to fire can generate highly toxic fumes.
Flash Point C(F): > -18(0) (ASTM D-56).
Flammable Limits (approx.% vol.in air) - LEL: NE, UEL: NE
NFPA HAZARD ID: Health: 2, Flammability: 3, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping using explosion-proof equipment or contain spilled liquid with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.
WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.
ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE

HANDLING: Avoid contact with skin. Avoid inhalation of vapors or mists. Use in well ventilated area away from all ignition sources. Trace amounts of H2S may be present. Keep face clear of tank and/or tank car openings. Avoid all personal contact and breathing gas. Avoid sparking conditions. Ground and bond all transfer equipment. See Section 8 for additional personal protection advice when handling this product.

STORAGE: ***Inhalation hazard: Contains trace amounts of H2S. Environment should be tested for contaminant before entering area. Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters. Store away from all ignition sources in a cool area equipped with an automatic sprinkling system. Outside or detached storage preferred. Storage containers should be grounded and bonded.

EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

		---TWA---		----STEL---		NOTE
Substance Name (CAS-No.)	Source	ppm	mg/m3	ppm	mg/m3	
XYLENE (1330-20-7)						
O, M, P, -Isomers	OSHA	100	435	150	655	
O, M, P, -Isomers	ACGIH	100	434	150	651	
TOLUENE (108-88-3)						
	OSHA	100	375	150	560	
Skin	ACGIH	50	188			
	XOM		200			
N-HEXANE (110-54-3)						
	OSHA	50	180			
Other Isomers	OSHA	500	1800	1000	3600	
N-Hexane Skin	ACGIH	50	176			
Other Isomers	ACGIH	500	1760	1000	3500	
CYCLOHEXANE (110-82-7)						
	OSHA	300	1050			
	ACGIH	300	1030			
NAPHTHALENE (91-20-3)						
	OSHA	10	50	15	75	
	ACGIH	10	52	15	79	
BENZENE (71-43-2)						
	OSHA	1		5		
Skin	ACGIH	0.5	1.6	2.5	8	
ETHYL BENZENE (100-41-4)						
	OSHA	100	435	125	545	
	ACGIH	100	434	125	543	

NOTE: Limits shown for guidance only. Follow applicable regulations.

VENTILATION: Ventilation required and equipment must be explosion proof. Use away from all heat and ignition sources.
RESPIRATORY PROTECTION: Use supplied-air respiratory protection in confined or enclosed spaces, if needed.
EYE PROTECTION: Chemical type goggles should be worn.
SKIN PROTECTION: Impervious gloves must be worn. If contact is likely oil impervious clothing must be worn. Good personal hygiene practices should always be followed.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.

APPEARANCE: Liquid
COLOR: Black
ODOR: Hydrocarbon
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): < -18(0)
MELTING POINT C(F): NA
FLASH POINT C(F): > -18(0) (ASTM D-56)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NE
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: NE
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.8-0.99
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: NE
VISCOSITY AT 40 C, cSt: < 7.0
VISCOSITY AT 100 C, cSt: NE
POUR POINT C(F): NE
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

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10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Heat, sparks, flame and build up of static electricity.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---

ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.

DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.

INHALATION TOXICITY (RATS): Harmful (LC50: greater than 2 but 5 mg/l or less). ---Based on testing of similar products and/or the components.

EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: 0 or greater but 6 or less). ---Based on testing of similar products and/or the components.

SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.

OTHER ACUTE TOXICITY DATA: H2S acts as a chemical asphyxiant, preventing the body from utilizing oxygen in the tissue. It can be irritating to the eyes at 10 ppm and to the respiratory tract at 50-100 ppm after 1-hour exposure. Sufficiently high concentrations can result in immediate collapse and death.

---CHRONIC TOXICOLOGY (SUMMARY)---

***Skin tumorigenicity: Positive in mice. Experiments to assess the skin cancer potential of crude oil produced mixed results. Some crudes produced skin tumors in mice, following long term, repeated exposures, while other crudes produced no tumors. IARC has examined the full body of data and concluded that crude oil is not classifiable as to its carcinogenicity (Cat.3), based on the limited evidence in animals. Prolonged repeated skin contact with low viscosity materials may defat the skin resulting in possible irritation and dermatitis.

---OTHER TOXICOLOGY DATA---

Repeated exposures to low levels of benzene (50-500 ppm) have been reported to result in blood abnormalities including anemia and, in rare cases, leukemia in both animals and humans. Benzene has also caused damage to the fetus of test animals in developmental studies. Benzene has tested positive (mutagenic) in a number of short-term cancer/mutation predicative tests. Prolonged exposure to n-hexane may result in a condition known as peripheral neuropathy. This is nervous system damage and is characterized by numbness of the extremities and, in extreme cases, paralysis. Crude oils may contain low levels of polycyclic aromatic compounds (PACs), some of which, when made available by dilution with solvents or oils, and under conditions of poor personal hygiene and prolonged repeated contact, are suspected as a cause of skin cancer in humans. H2S is a colorless, toxic and extremely flammable gas with an odor at low concentrations characteristic of rotten eggs and a sweetish odor at high concentrations. Odor cannot be relied upon as a means of detection because the sense of smell rapidly becomes insensitive to H2S, and the H2S odor may be masked by the general odor of this product.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:

In the absence of specific environmental data for this crude oil product, this assessment is based on information developed with various other crude oils.

ECOTOXICITY: Generally, crude oil is harmful to aquatic organisms. Indirect toxicity to aquatic wildlife may result from physical fouling. Shoreline habitats can be significantly impacted by crude oil.

MOBILITY: Overall, crude oil will float on the water surface if released in an aquatic environment; if released on land, crude will absorb to sediment and soil. Because of the range of components which comprise crude oil, individual hydrocarbon components will begin to partition to specific environmental media (air, water, soil, and sediment) immediately following a release.

PERSISTENCE AND DEGRADABILITY: Volatile components will be degraded in the atmosphere via hydroxyl oxidation. Overall, crude oil is inherently biodegradable in aquatic and terrestrial environments, since most fractions of crude oil are known to degrade at moderate to rapid rates, while some of the heaviest components are expected to persist.

BIOACCUMULATIVE POTENTIAL: Not established.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.

RCRA INFORMATION: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity, or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP).

BENZENE: 1.7999 PCT (TCLP)
FLASH: > -18(0) C(F)

14. TRANSPORT INFORMATION

USA DOT:

SHIPPING NAME:	Petroleum Crude Oil
HAZARD CLASS & DIV:	3
ID NUMBER:	UN1267
ERG NUMBER:	128
PACKING GROUP:	PG I
STCC:	4910165
DANGEROUS WHEN WET:	No
POISON:	No
LABEL(s):	Flammable Liquid
PLACARD(s):	Flammable
PRODUCT RQ:	555 lbs (based on RQ for BENZENE)
MARPOL III STATUS:	NA

RID/ADR:

HAZARD CLASS:	3
PACKING GROUP:	I
LABEL:	3
DANGER NUMBER:	33
UN NUMBER:	1267
SHIPPING NAME:	Petroleum Crude Oil(contains PETROLEUM CRUDE OIL)
REMARKS:	NA

IMO:

HAZARD CLASS & DIV:	3
UN NUMBER:	1267
PACKING GROUP:	PG I
SHIPPING NAME:	Petroleum Crude Oil
LABEL(s):	Flammable Liquid
MARPOL III STATUS:	NA

ICAO/IATA:

HAZARD CLASS & DIV:	3
ID/UN Number:	1267
PACKING GROUP:	PG I
SHIPPING NAME:	Petroleum Crude Oil
SUBSIDIARY RISK:	NA
LABEL(s):	Flammable Liquid

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: Product assessed in accordance with OSHA 29 CFR 1910.1200 and determined to be hazardous.

EU Labeling: Product is dangerous as defined by the European Union Dangerous Substances/Preparations Directives.

Symbol: F+ T Extremely flammable, Toxic.

Risk Phrase(s): R12-45-65-52/53.
Extremely flammable. May cause cancer. Harmful: may cause lung damage if swallowed. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrase(s): S23-36-28-53-62.
Do not breathe vapor. Wear suitable protective clothing. After contact with skin, wash immediately. Avoid exposure - obtain special instructions before use. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Contains: Benzene.

Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, METI, DSL, KOREA, and PHILIPPINES.

U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".

SARA (311/312) REPORTABLE HAZARD CATEGORIES:
FIRE CHRONIC ACUTE

This product contains the following SARA (313) Toxic Release Chemicals:

CHEMICAL NAME	CAS NUMBER	CONC.
BENZENE(COMPONENT ANALYSIS)	71-43-2	<1.8%
NAPHTHALENE(COMPONENT ANALYSIS)	91-20-3	< 2%
TOLUENE(COMPONENT ANALYSIS)	108-88-3	< 4%
N-HEXANE(COMPONENT ANALYSIS)	110-54-3	<3.6%
CYCLOHEXANE(COMPONENT ANALYSIS)	110-82-7	<2.6%
XYLENES(COMPONENT ANALYSIS)	1330-20-7	<4.4%
POLYNUCLEAR AROMATIC HYDROCARBONS(COMPONENT ANALYSIS)		0.1%
ETHYL BENZENE(COMPONENT ANALYSIS)	100-41-4	<0.7%

The following product ingredients are cited on the lists below:

CHEMICAL NAME	CAS NUMBER	LIST CITATIONS *
BENZENE (COMPONENT ANALYSIS) (<1.80%)	71-43-2	1, 2, 4, 6, 9, 10, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
NAPHTHALENE (COMPONENT ANALYSIS) (<2.00%)	91-20-3	1, 10, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26
ETHYL BENZENE (COMPONENT ANALYSIS)	100-41-4	1, 8, 24
TOLUENE (COMPONENT ANALYSIS) (<4.00%)	108-88-3	1, 10, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26
N-HEXANE (COMPONENT ANALYSIS)	110-54-3	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
CYCLOHEXANE (COMPONENT ANALYSIS)	110-82-7	1, 10, 18, 19, 20, 21, 23, 24, 25, 26
XYLENES (COMPONENT ANALYSIS) (<4.40%)	1330-20-7	1, 10, 18, 19, 20, 21, 22, 23, 24, 25, 26
PETROLEUM CRUDE OIL	8002-05-9	16, 19, 20, 21, 25, 26

REGULATORY LISTS SEARCHED

1=ACGIH ALL	6=IARC 1	11=TSCA 4	16=CA P65 CARC	21=LA RTK
2=ACGIH A1	7=IARC 2A	12=TSCA 5a2	17=CA P65 REPRO	22=MI 293
3=ACGIH A2	8=IARC 2B	13=TSCA 5e	18=CA RTK	23=MN RTK
4=NTP CARC	9=OSHA CARC	14=TSCA 6	19=FL RTK	24=NJ RTK
5=NTP SUS	10=OSHA Z	15=TSCA 12b	20=IL RTK	25=PA RTK
				26=RI RTK

* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.
Code key:CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

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16. OTHER INFORMATION

USE: CRUDE OIL

Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:

INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

Precautionary Label Text:

CONTAINS PETROLEUM CRUDE OIL, N-HEXANE, BENZENE

DANGER!

EXTREMELY FLAMMABLE LIQUID AND VAPOR. LOW VISCOSITY MATERIAL-IF SWALLOWED, MAY BE ASPIRATED AND CAN CAUSE SERIOUS OR FATAL LUNG DAMAGE. HARMFUL TO AQUATIC ORGANISMS, MAY CAUSE LONG-TERM ADVERSE EFFECTS IN THE AQUATIC ENVIRONMENT.

OVEREXPOSURE TO BENZENE MAY RESULT IN CANCER, BLOOD DISORDERS, AND DAMAGE TO THE BONE MARROW. EXPOSURE TO NORMAL HEXANE MAY RESULT IN NERVE DAMAGE.

Keep away from heat, sparks, and flame. Avoid breathing mist or vapor. Do not get on skin or clothing. Wear oil impervious gloves and clothing. Use with adequate ventilation.

FIRST AID: In case of skin contact, promptly dry-wipe the skin. Cleanse the area with waterless hand cleaner and follow by washing thoroughly with soap and water. If swallowed, call a physician immediately. Do not induce vomiting or give anything by mouth to an unconscious person.