



**PROPOSED UNDERGROUND STORAGE TANK (UST)
RELEASE CASE CLOSURE EVALUATION SUMMARY**

LUST Case File #: 1520.01-.03
Facility ID # 0-006178
Maricopa County

Inman & Sons Auto and Truck Center
6335 N. 7th Street
Phoenix, Arizona 85014

Background:

The Site is located at 6335 North 7th Street in Phoenix, Arizona and is currently occupied by Inman & Sons Auto and Truck Center (I&S), which was constructed over the former 7th Street Texaco gas station facility footprint. The site operated as a service station by an independent dealer under the Texaco Oil Company name until the UST owner/operator abandoned the business in 1989. It is not known when the UST system was installed. However, the UST system was removed in November 1990 and the tank manufactured tags showed 1950s. Site characterization activities were conducted between 1991 and 1997, by the UST owner/operator MAR-ENE Land Company, which included the installation of several soil borings and the installation of MW-1 through MW-5, and limited remediation by soil vapor extraction (SVE).

In 2007, the ADEQ State Lead Unit (SLU) contracted with MACTEC [now known as Wood Environmental & Infrastructure Solutions, Inc.] to initiate site characterization activities that included the addition of four monitoring wells. Soil contamination was defined laterally within the property boundaries and extended vertically from approximately 25 feet below ground surface (bgs) to groundwater, which was encountered under confined conditions at approximately 90 feet bgs. Six groundwater monitoring wells were installed to assess the extent of the volatile organic compounds (VOCs) in groundwater which extends in a west-northwesterly direction.

The residual groundwater contaminant plume consists of gasoline constituents benzene and 1, 2-dichloroethane (1, 2-DCA) at concentrations that exceed ADEQ Aquifer Water Quality Standards (AWQS) at the source area (MW-6A and MW-7A). The compound 1, 2-DCA is a component of leaded gasoline.

Threatened or impacted drinking water wells:

The contaminant plume has impacted the Upper Aquifer Unit of the Phoenix Basin, which is not used for potable water supply near the subject site. Water supply wells in the central Phoenix Basin typically derive water from the Middle and Lower Aquifer Units. Currently the City of Phoenix (COP) uses surface water [Salt River Project (SRP) reservoirs and the Colorado River] as its main source of drinking water. Nearly 50% comes from the Colorado River, which may begin to have shortages as soon as 2020 according to the Bureau of Reclamation. Because of this, COP views all water within their service area boundary as a potential water supply source in the event that Colorado River allocations are curtailed during a drought declaration.

A review of on-line records at the Arizona Department of Water Resources (ADWR) was conducted to identify potential water production wells within one-half mile of the subject site. ADEQ identified 71 registered wells. Sixty-six of the wells are registered as monitoring or “other”. There are no active COP or SRP wells located within 1/2 mile of the site. Well #55-626547 is registered as a “non-exempt” well and is owned by the COP. This well is to the south of the LUST site approximately ½ mile, and is abandoned. Three wells are registered as “exempt” wells. ADWR well #55-638674 was located at 524 E. Maryland Avenue (parcel number 161-19-081A), and was listed as an irrigation well. A records search of the Maricopa County Assessor’s webpage indicates that this parcel and address no longer exist. The address falls between two existing parcels (one a vacant lot, and the other redeveloped as a commercial property). ADWR well #55-218674 is registered as an “exempt” well drilled to a depth of 285 feet bgs. The well is screened between 200 and 260 feet bgs. According to the imaged record, the well was installed for watering the lawn and plants. This well is within the buffer area around the 7th Avenue and Bethany Home Road Water Quality Assurance Revolving Fund (WQARF) site, as designated by ADWR. This LUST site is not within the site boundaries of the WQARF site. The well replaced #55-482220, which showed chlorinated solvent contamination over AWQS. Well #55-639860 lists irrigation/domestic use and is located down gradient approximately ½ mile from the site. There is no well construction information on the well registration form dated 1982. The site address is 145 E. Lamar Road, which is still a single-family residence. A review of an aerial photo and street view dated February 2019 shows an in-ground water meter box in the front yard near the sidewalk, which reveals the residence has a connection to the City of Phoenix municipal water system.

The lateral extent of the dissolved contaminant plume has significantly shrunk and it is currently restricted to the immediate vicinity of well MW-1. The remaining VOCs with concentrations that exceed AWQS are benzene and 1, 2-DCA. These VOCs are non-detect in the down gradient wells located on site.

Any new or replacement well located at or near this LUST site would need to meet placement criteria of ADWR.

Other exposure pathways:

The residual soil impact above residential Soil Remediation Levels (RSRLs) is limited to a depth of 40-50 feet bgs at MW-7A/7B, which is identified as subsurface soil. The exposure pathways of dermal contact, ingestion, and inhalation will require excavation to this depth, which is unlikely considering current property uses. Therefore, these exposure pathways are incomplete. The residual soil impact also does not represent a threat to groundwater. Therefore, the soil to groundwater exposure pathway is incomplete.

A soil gas sampling event on September 27, 2012 to evaluate the potential for and risks associated with vapor intrusion into the on-site building. A total of 8 primary samples and 3 QA/QC samples (ambient, equipment blank, and duplicate) were collected and analyzed for VOCs using EPA Method TO-15 (11 samples total). ADEQ performed an additional assessment to evaluate the risk associated with vapor intrusion. The soil vapor survey demonstrates the inhalation exposure route shows an acceptable cancer and non-cancer risk.

To complete site characterization, on March 20, 2017, soil boring AFW-1 was advanced to a depth of 15 feet bgs between MW-7A/7B and SP-1S/1D. The boring was advanced using the direct push method and soil samples were collected at 5 and 15 feet bgs. The samples were analyzed for polyaromatic hydrocarbons (PAHs) and tetra-ethyl lead (TEL) by EPA Method 8270SIM. PAHs and TEL were not reported above laboratory reporting limits.

Based on the results of a field receptor survey, there are no surface water, agricultural, or ecological receptors within one-quarter mile of the site.

Groundwater plume stability:

Since November 2014, VOC concentration have been below AWQS in groundwater monitor wells MW-5 and MW-6, located in the down gradient and cross gradient directions from the source area. The groundwater contaminant plume of release related compounds was reduced by in-situ chemical oxidation (ISCO). As of May 2019, all petroleum related chemicals of concern (CoCs) in the groundwater are below AWQS with the exception of 1, 2-DCA at the source well (MW-1). 1, 2-DCA is a recalcitrant compound and remediation can be slow. The general direction of groundwater flow beneath the site is to the west-northwest. An initial Mann-Kendall assessment on benzene was done using the entire analytical data from 2014 through 2018. The trend is downward with a confidence of over 99%. For the second plot, the data from 2016 through 2018 was used to remove the influence of the initial drop in concentration from over 5,000 µg/L in MW-2. This trend is also downward. A Mann-Kendall assessment of COCs was again conducted using groundwater data between November 2016 and March 2019 (post-ISCO) in MW-1 and MW-4. The assessment shows a decreasing trend for 1, 1, 2-DCA in both monitoring wells and a stable and no trend for TMBs, in each well.

The analytical data collected from the monitoring well network indicates that the benzene and 1, 2-DCA plumes are limited in extent to the area of wells MW-6A and MW-7A, thus indicating the plumes have not migrated off-site. The BIOSCREEN Natural Attenuation Decision Support System developed by the Air Force Center for Environmental Excellence (AFCEE) was also used to defend this conclusion.

Groundwater generally flows in a westerly to northwesterly direction. The groundwater plume does not appear to be migrating in the down-gradient direction. VOCs have not been reported above AWQSs in the other Site monitoring since 2014.

Benzene and 1, 2-DCA will continue to slowly decline as trends indicate and are predicted to reach cleanup levels in 2074 and 2023, respectively. However, BIOSCREEN predicts that based on first-order decay and instantaneous reaction rates, the dissolved benzene and 1,2-DCA plumes above 5.0 µg/L will not extend more than 5 feet down gradient of MW-6A, which appears to match the field data. Ethylbenzene and Xylene have been historically below AWQS and there is no regulated AWQS for total BTEX. The analysis of ethylbenzene, xylene, and total BTEX displayed that there is no visible trend at a 95% confidence level. These compounds have reached cleanup levels and there is no statistical trend to show that the concentrations could increase above AWQS. MW-06A serves no threat to current and future potable water sources.

Groundwater Characterization:

MW-1 was installed in February 1991, in the former UST pit. In the summer of 1991, three additional monitoring wells were installed on Site for characterization purposes. Due to rising groundwater levels, which submerged the well screens, MW-5 was installed in August 1997 down gradient of MW-2.

Two nested wells were installed because the historic groundwater elevation during the time of the release was much lower. ADEQ wanted to determine if groundwater VOC concentrations were higher at the groundwater elevations that were common at the site during the time of the release. The first nested well (MW-6A & MW-6B) was placed near the location of where MW-1 used to be, which is the source of LUST File #1520.01. An additional nested well (MW-7A & MW-7B) was installed approximately 25 feet west of MW-6. Both borings of the nested wells were drilled to a total depth of 155 feet bgs.

Monitoring wells MW-5, MW-8, MW-9, MW-10 and MW-11 have been sampled to evaluate down gradient and cross gradient migration of the COCs., The COCs were not reported above AWQSS and were typically non-detect in samples collected from these wells. Xylene and 1, 2-DCA were detected at low concentrations. The maximum xylene concentration reported was 1.7 µg/L in the sample collected from MW-10 on April 3, 2018. The maximum 1, 2-DCA concentration reported was 7.2 µg/L in the July 18, 2019 sample collected from MW-11. This well was sampled on November 27, 2019 and the 1,2-DCA concentration decreased to 1.2 µg/L.

Natural Attenuation:

Natural attenuation processes include diffusion, dispersion, sorption, volatilization, and biodegradation. A decreasing trend in VOC concentrations in groundwater has been established, which supports that natural attenuation is occurring. Hydrologic and geochemical data can be used to indirectly demonstrate the type(s) of natural attenuation processes. The extent of the dissolved 1, 2-DCA plume is restricted to the immediate vicinity of source well MW-11.

Natural attenuation monitoring was conducted at the site from September 2012 through November 2014 to assess whether the groundwater plume would attenuate under natural conditions; however, analytical results for samples collected from off-site well MW-5 indicated that elevated concentrations of benzene and 1, 2-DCA persisted near the down gradient edge of the plume. In-situ chemical oxidation (ISCO) using PersulfOx® injections were therefore performed at all six on-site monitor wells in December 2014 and again in May 2015 to enhance the degradation of the dissolved contaminants.

Baseline dissolved oxygen (DO) and oxidation-reduction potential (ORP) measurements indicated predominantly anaerobic groundwater conditions in all six monitor wells, weak oxidation potentials in wells MW-2 through MW-6 and weak reduction potential in well MW-1. ISCO injections increased DO concentrations in all six wells. Observations and DO measurements from October 2015 indicated ongoing chemical oxidation within and near wells MW-1 through MW-5. Residual oxidant also was observed in wells MW-1, MW-2 and MW-5 during the April 2016 sampling event. Oxidation of remaining petroleum hydrocarbon contamination by residual PersulfOx® and DO supersaturated groundwater conditions continued based on the data collected through May 2019.

Removal or control of the source of contamination:

SVE was performed at the Site in 1993. The SVE system reportedly removed 18,000 pounds of gasoline from the vadose zone. The former UST pit was also excavated for compacting the soils for Site re-development. A new SVE system was installed in 1994, but did not extract much. Based on SVE system monitoring, ADEQ determined in 1997 that no further vadose zone remediation or investigation was required. On-site corrective actions have been performed for the saturated zone soil and groundwater at the Site from 124 to 160 feet (ft.) below ground surface (bgs). The corrective actions have involved in-situ chemical oxidation (ISCO), Perozone® injections near the source area from September 2008 to February 2016, and seven PersulfOx™ treatments from August 2015 to November 2018.

The October 24, 2016 groundwater samples represented the rebound test samples for the third PersulfOx™ treatment that was performed on July 17, 2016. Under certain conditions, PersulfOx™ may not have sufficient oxidation potential to oxidize chlorinated hydrocarbons such as 1, 2-DCA, which had increased in MW-6A and MW-7A since the second PersulfOx™ treatment. Therefore, sodium hydroxide (NaOH) was added as an alkali activator to increase the oxidation potential to more efficiently oxidize the 1, 2-DCA.

On January 7, 2018, RegenOx™ was injected to enhance aerobic biodegradation. Periodic groundwater sampling was also performed to monitor the effectiveness of the on-site corrective actions.

Corrective actions at the Site are challenged by the presence of submerged sorbed-phase hydrocarbons beneath the Inman & Sons building. The location and mass of these sorbed-phase hydrocarbons are unknown, though the depth is suspected to be between 130 and 135 ft. bgs. The presence of the sorbed-phase hydrocarbons was not identified during site characterization that was performed prior to the building being constructed and was discovered by increasing COC concentrations following periodic remediation system shut down rebound testing. All remedial actions require physical contact with the contaminants. Therefore, due to the unknown location and mass, removal of the sorbed hydrocarbons is challenged because of the difficulty in contacting the contaminants.

The average total VOC concentration for the groundwater samples collected on February 12, 2019 is 9.34 µg/L. Assuming an area of 100 feet x 100 feet encompassing the monitoring wells, a contaminated thickness of 20 feet, and a soil porosity of 0.30, the estimated residual dissolved VOC mass is 0.07 pounds. A factor of three was used to estimate the residual sorbed mass, which is 0.21 pounds.

Requirements of A.R.S. §49-1005(D) and (E): The results of the corrective action completed at the site assure protection of public health, welfare and the environment, to the extent practicable, the clean-up activities completed at this site allow for the maximum beneficial use of the site, while being reasonable, necessary and cost effective.

Other information that is pertinent to the LUST case closure approval:

The facility and LUST files were reviewed for information regarding prior cleanup activities, prior site uses and operational history of the UST system prior to removal.

Groundwater data tables:

Groundwater data for MW-1 (located at UST pit)
Total Depth: 175 feet. Screened 150-175 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS is 5.0 µg/L	Depth to Water (feet)
March 1991	770	4.6	154.65
April 1991	2210	28.9	Not Reported
Converted to a Vapor Extraction Well in 1994			

Groundwater data for MW-2 (down gradient of MW-1)
Total Depth: 170 feet. Screened: 150-170 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	Depth to Water (feet)
August 1991	9,400	155.70
August 1992	25	145.36
January 1993	5.6	139.57*
May 1993	6.2	136.64
July 1993	230	134.71
November 1993	200	132.39
March 1994	<0.5	129.91
June 1994	<0.5	131.00
September 1994	2.32	130.67
January 1995	14	129.72
July 1995	6.6	128.34
December 1995	1.7	127.50
May 1996	<0.5	127.71
December 1997	NS	124.39

* Screen submerged

Groundwater data for MW-5 (down-gradient of source area- replaced MW-2)

installed in August 1997
Total Depth: 143 feet. Screened 113-143 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS 5.0 µg/L	Depth to Water (feet)
December 1997	990	Not analyzed	124.17
No data in LUST file			
August 2007	600	55	130.11
September 2008	400	<40	127.36
March 2009	2.3	<1.0	125.82
August 2010	<1.0	<1.0	124.42
August 2011	<1.0	<1.0	123.50
September 2014	<0.50	1.5	130.87
October 2015	<0.50	<0.50	131.69
October 2016	<0.50	<0.50	132.09
August 2017	<0.50	<0.50	132.62
June 2018	<0.50	<0.50	132.98
August 2018	<0.50	<0.50	133.34
February 2019	<0.50	<0.50	132.70
July 2019	<0.50	<0.50	132.95

Groundwater data for MW-6A (near source area) installed in July/August 2007
Total Depth: 150 feet. Screened 110-140 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS 5.0 µg/L	Depth to Water (feet)
August 2007	570	55	130.95
December 2008	7,300	490	126.70
November 2009	630	32	125.85
August 2010	36	5.3	125.21
August 2011	27	5.0	124.35
January-December 2014 (Perozone®)			
September 2014	0.69	4.9	131.65
January 2015	8.7	2.2	130.84
June 2015	11	2.8	131.81
August 2015 (ISCO)			
October 2015	12	41	132.60
December 2015	480	93	132.09
January 2016 (ISCO)			
February 2016	79	71	131.65
April 2016	390	110	132.00
July 2016 (ISCO)			

September 2016	19	27	133.28
October 2016	33	21	132.90
January 2017	<0.50	1.7	132.51
March 2017	120	48	132.51
June 2017	37	19	133.27
August 2017	74	35	133.49
November 2017	38	21	133.11
January 2018 (ISCO)			
February 2018	310	23	133.88
April 2018	390/280	35/27	133.81
June 2018	460/380	43/43	133.92
August 2018	540/470	57/55	134.23
October 2018 (ISCO)			
November 2018 (ISCO)			
December 2018	2.0	11	133.59
February 2019	26/26	20/20	133.58
July 2019	19/12	14/14	133.78

Groundwater data for MW-6B (near source area) installed in July/August 2007
Total Depth: 150 feet. Screened 145-150 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS 5.0 µg/L
August 2007	9.4	<1.0
September 2008	2.3	<2.0
October 2015	<0.50	<0.50
April 2016	<0.50	<0.50
August 2016	<0.50	<0.50
October 2016	<0.50	<0.50
October 2017 (removed from sampling network)		
April 2018	<0.50	<0.50

Groundwater data for MW-7A (source area) in July/August 2007
Total Depth: 140.50 feet. Screened 110-140 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS 5.0 µg/L	Depth to Water (feet)
August 2007	12,000	1,400	130.75
September 2008	10,000	<800	127.89
March 2009	1,100	7.3	126.31
August 2010	2.2	<1.0	124.90
August 2011	56	<1.0	124.02

January – December 2014 (Perozone®)			
September 2014	6,900	72	131.40
January 2015	570	4.3	130.53
June 2015	4,100	28	131.48
August 2015 (ISCO)			
December 2015	2,400	58	131.80
January 2016 (ISCO)			
February 2016	130	56	131.33
April 2016	2,400	130	131.71
July 2016 (ISCO)			
September 2016	52	41	133.29
October 2016	590	89	132.61
December 2016 (ISCO)			
January 2017	2.3	2.8	131.77
March 2017	450	77	132.15
June 2017	1,200	44	132.92
August 2017	640	37	133.25
November 2017	180	18	132.88
January 2018 (ISCO)			
February 2018	160	4.3	133.83
April 2018	1,300	33	133.59
June 2018	870	39	133.76
August 2018	2,300	80	134.05
October 2018 (ISCO)			
November 2018 (ISCO)			
December 2018	0.76	1.2	133.50
February 2019	9.1	1.6	133.70
July 2019	9.2	3.0	133.55

Groundwater data for MW-7B (source area) installed in July/August 2007
Total Depth: 150 feet. Screened 145-150 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS 5.0 µg/L
August 2007	370	<10
September 2008	27	<10
October 2015	<0.50	<0.50
April 2016	<0.50	<0.50
August 2016	<0.50	<0.50
October 2016	<0.50	<0.50
April 2018	<0.50	<0.50

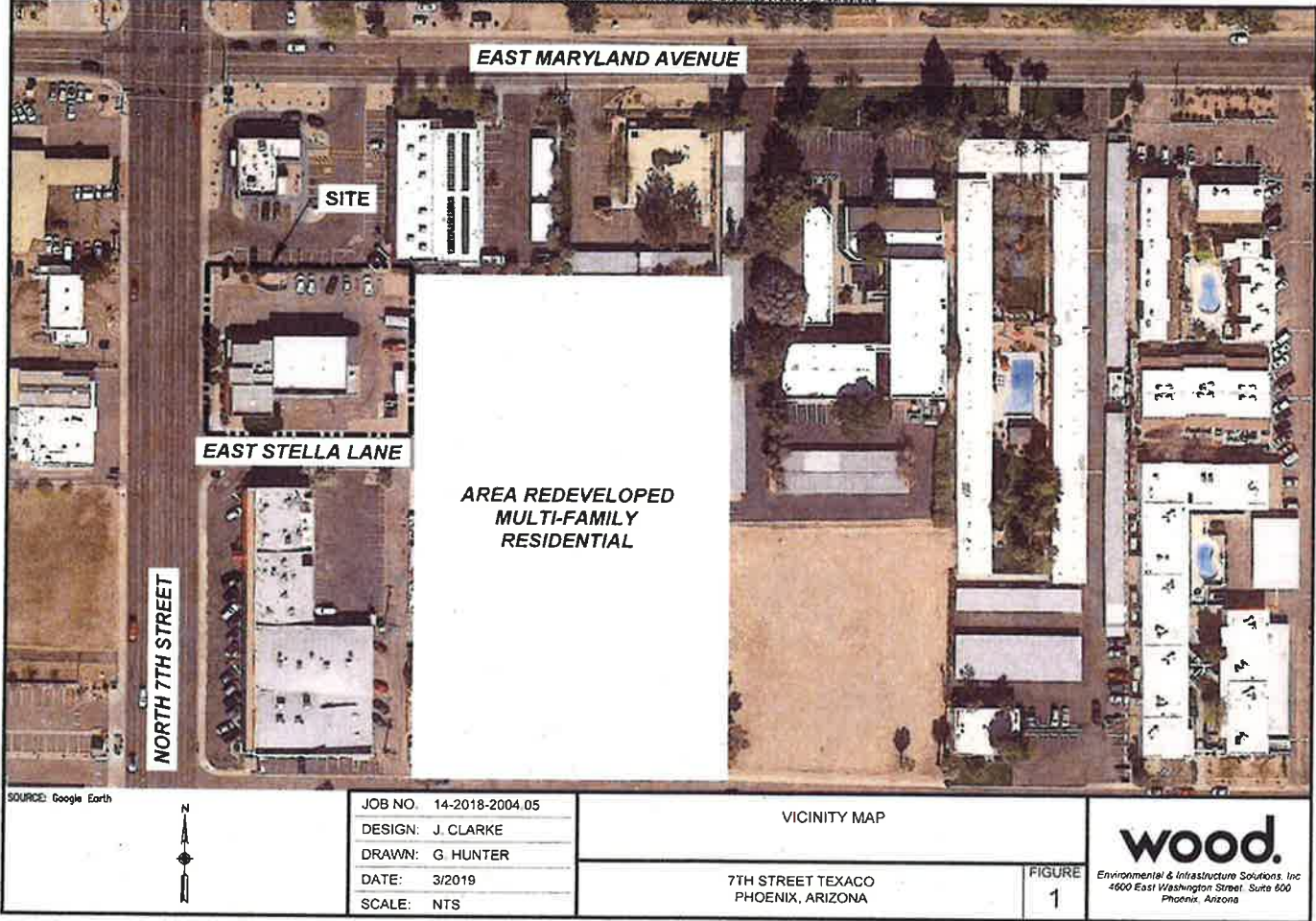
Groundwater well MW-9 (down gradient of MW-5 off site) installed in July/August 2007
Total Depth: 150.72 feet. Screened 110-150 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS 5.0 µg/L	Depth to Water (feet)
August 2007	<1.0	5.1	130.52
September 2008	<2.0	<2.0	127.77
March 2009	2.7	3.8	126.20
August 2010	<1.0	<1.0	124.88
September 2011	<1.0	<1.0	123.80
September 2014	NS	NS	131.26
January 2015	NS	NS	130.38
June 2015	<0.50	2.8	131.40
August 2016	<0.50	<0.50	132.77
June 2017	<0.50	<0.50	132.70
August 2017	<0.50	<0.50	133.09
August 2018	<0.50	<0.50	133.75
February 2019	<0.50	<0.50	133.13
July 2019	<0.50	<0.50	133.34

Groundwater well MW-11 (down gradient to cross gradient off site) installed in November 2011
Total Depth: 150.50 feet. Screened 120-150 feet.

Date	Benzene (µg/L) AWQS 5.0 µg/L	1,2-DCA (µg/L) AWQS 5.0 µg/L	Depth to Water (feet)
December 2007	<1.0	100	129.04
September 2008	<2.0	89	127.04
March 2009	<1.0	21	125.47
August 2010	<1.0	8.0	124.10
September 2011	<1.0	2.9	123.10
September 2014	<0.50	1.0	130.59
January 2015	<0.50	<0.50	129.73
June 2015	<0.50	0.64	130.69
August 2016	<0.50	<0.50	132.00
June 2017	<0.50	2.2	131.96
August 2017	<0.50	2.2	132.29
August 2018	<0.50	1.3	133.06
February 2019	<0.50	2.7	132.45
July 2019	<0.50	7.2	132.62
November 2019	<0.50	1.2	131.76

Plotted By: gory.hunter Date: 11-Mar-19-08:59
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SOURCE: Google Earth



JOB NO.	14-2018-2004.05
DESIGN:	J. CLARKE
DRAWN:	G. HUNTER
DATE:	3/2019
SCALE:	NTS

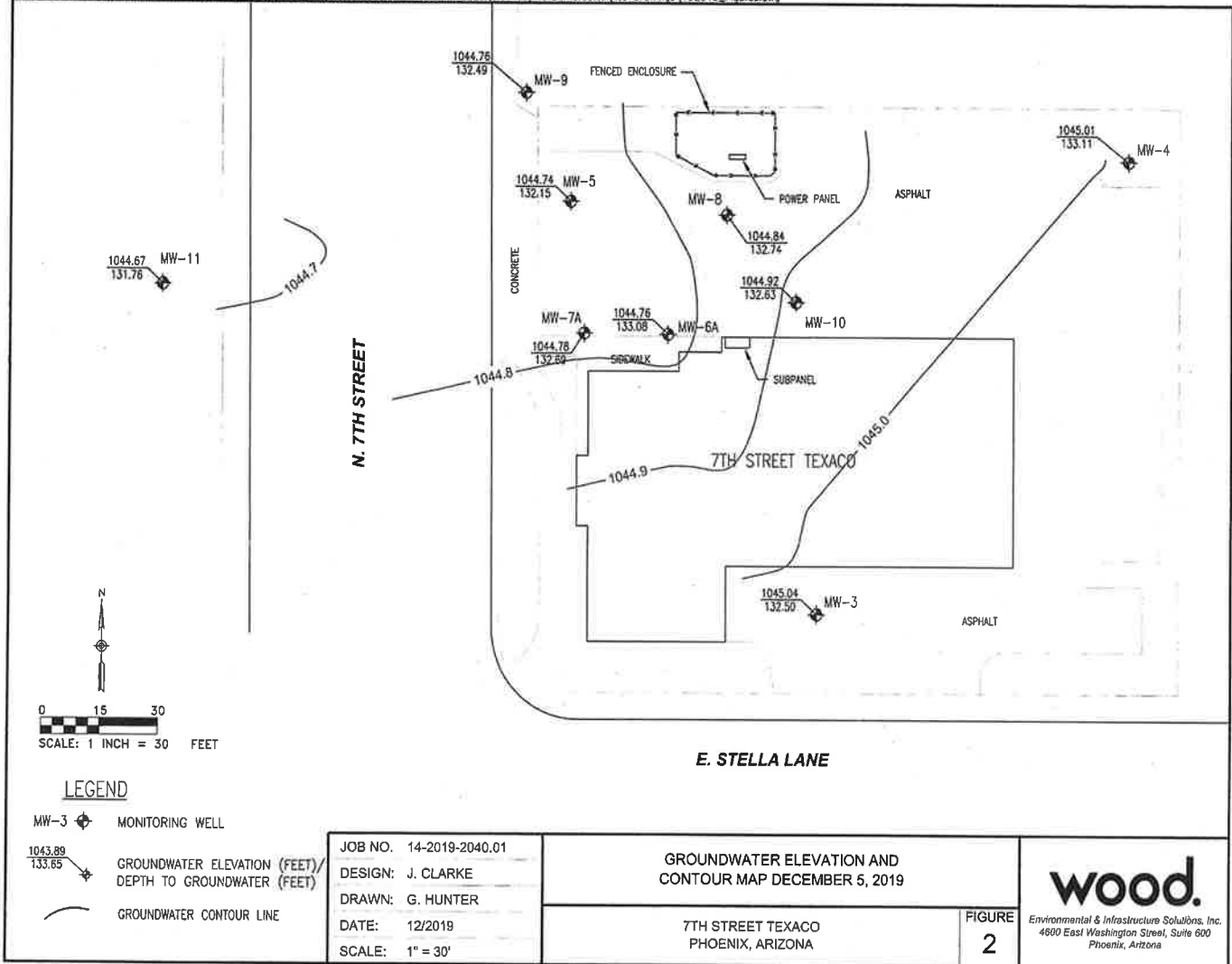
VICINITY MAP

7TH STREET TEXACO
 PHOENIX, ARIZONA

FIGURE
 1

wood.
 Environmental & Infrastructure Solutions, Inc.
 4600 East Washington Street, Suite 600
 Phoenix, Arizona

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