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April 17, 2018
PBW Project No. 1358

VIA EMAIL

Ms. Maureen Hatfield
MC-127
VCP-CA Section, Remediation Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Re: DNAPL Recovery Activities Quarterly Report – 1st Quarter 2018
Union Pacific Railroad Houston Wood Preserving Works Facility
4910 Liberty Road Facility, Houston, Texas
Post-Closure Care Permit No. HW-50343; Industrial SWR No. 31547

Dear Ms. Hatfield:

Pastor, Behling & Wheeler, LLC (PBW), on behalf of Union Pacific Railroad Company (UPRR), is pleased to provide this 1st Quarter 2018 summary report for the dense non-aqueous phase liquid (DNAPL) recovery activities conducted at the UPRR Houston Wood Preserving Works Facility (the Site). As detailed in the Response Action Plan (RAP) dated November 24, 2014, a 24-month DNAPL recovery pilot test was conducted at the Site that consisted of manual DNAPL recovery on a monthly basis of selected wells. Following the 24-month testing period, the DNAPL recovery activities have continued monthly, and will continue monthly following the same procedures detailed in the RAP. The following monitoring wells are included as part of the DNAPL recovery activities:

Well Name	Zone
MW-57A	A-TZ
MW-78A	A-TZ
MW-12B	B-TZ
MW-32B	B-CZ
MW-41B	B-TZ
MW-57B	B-CZ
MW-70B	B-CZ
MW-75B	B-CZ
MW-23C	C-TZ
MW-34CR	C-TZ
MW-44C	C-TZ
MW-45C	C-TZ
MW-46C	C-TZ

Figure 1 shows the location of the DNAPL recovery wells.

The DNAPL recovery activities consist of measuring the depth to groundwater surface, the depth to the groundwater/DNAPL interface, and the total depth of the well relative to the top of well casing prior to

DNAPL recovery. Using a peristaltic pump or submersible pump, DNAPL is pumped from the bottom of the well until groundwater returns in the pump discharge. The volume of recovered DNAPL is estimated from each well based on the volume pumped, and the well is gauged to measure the total depth of the well and depth to residual DNAPL following pumping. Recovered DNAPL is temporarily stored at the Containment Storage Area. The most recent waste manifests for the recovered DNAPL and groundwater are provided in Attachment A.

A summary of the DNAPL recovery measurements for the DNAPL activities from February 2013 through February 2018 is provided on Table 1. A graph of DNAPL thicknesses prior to each monthly recovery efforts over time is presented on Figure 2. Observations from the recovery activities are provided below:

- A-TZ Wells: Initially, MW-57A was the only well completed in the A-TZ Unit that contained DNAPL. DNAPL thickness decreased from 4.78 feet in February 2013 to less than 1 foot thick from October 2013 through January 2015 in MW-57A. DNAPL thickness decreased in MW-57A in January 2015 from 0.39 feet to not detected in August 2015. No DNAPL has been detected in MW-57A since August 2015 (approximately 29 months). Following installation of MW-78A in May 2014 in the Englewood Intermodal Yard and detection of DNAPL in the well, MW-78A was incorporated into the recovery program starting in early November 2014. DNAPL thickness in MW-78A was measured at 4.06 feet (late January 2015), increased to 5.38 feet (late February 2015), and has steadily decreased to 1.38 feet (February 2018).
- B-TZ/B-CZ Wells: At the beginning of the recovery activities, monitoring wells with the thickest DNAPL measurements included MW-12B and MW-41B on the west side of the Site (Figure 1). DNAPL thicknesses increased following the February 2013 recovery event in MW-12B (May 2013) and in MW-41B (June 2013). However, DNAPL thickness in well MW-12B gradually decreased from 8.18 feet in May 2013 to 0.11 feet thick in August 2015, with a slight increase to 0.65 feet from August 2015 to February 2016. Since February 2016, the DNAPL thickness in MW-12B has fluctuated between 0.28 feet (November 2016) to 0.6 feet (September 2017). Since November 29, 2017 through February 7, 2018, thicknesses have decreased from 0.49 feet to 0.33 feet. DNAPL thickness in MW-41B during the first months of the recovery activities increased to 10.26 feet (August 2013). Measured thickness through May 2014 fluctuated, then began a steady decrease over time, with a slight increase from January to May 2015, and from April to May 2017. From May 2017 through February 2018, DNAPL thickness in MW-41B has decreased from 4.52 feet to 4.02 feet (Figure 2).

Monitoring well MW-32B had a DNAPL thickness of 6.23 feet at the beginning of the recovery activities in February 2013. During the first 12 months, DNAPL thicknesses in the well generally decreased to less than two-feet thick by September 2013. Over the past six months, the DNAPL thickness in this well has been stable and less than 0.2 feet thick, ranging in thickness from 0.09 feet (November 2017) to 0.19 feet (February 2018).

DNAPL thickness in well MW-57B decreased from 1.28 feet thick in July 2013 to less than measurable (DNAPL noted on end of probe) thickness in January 2014 through early October 2014. Since June 2016, no DNAPL has been detected in MW-57B.

Wells MW-70B and MW-75B had measurable DNAPL at 1.61 feet and 3.1 feet, respectively, at the beginning of the recovery activities (February 2013). During the first 12 months, DNAPL thicknesses in these wells generally decreased to less than one-foot thick, then increased to just over one foot thick in these two wells in early October 2014. Over the past six months, DNAPL thickness in MW-70B has remained relatively stable ranging from 0.26 feet (October 2017) to

0.44 feet (August 2017) thick. DNAPL thickness in MW-75B has decreased over the past six months from 0.84 feet (August 2017) to 0.24 feet (February 2018).

- C-TZ Wells: Similar to the other wells measured, DNAPL thicknesses in the C-TZ wells MW-44C, MW-45C, and MW-46C significantly decreased over the first two months of recovery activities, with some sporadic increases from May through August 2013 (Figure 2). From December 2013 through early October 2014, C-TZ wells MW-44C, MW-45C, and MW-46C showed increasing DNAPL thicknesses with the largest increase at MW-44C increasing about 1.57 feet. Since August 2015, no DNAPL has been detected in MW-45C. Over the past six months, the DNAPL thickness in MW44C has remained relatively stable ranging from 0.37 feet (September 2017) to 0.49 feet (January 2018). There has been a slight decrease in measured DNAPL thickness over the past seven months at MW-46C from 0.63 feet (August 2017) to 0.44 feet (February 2018). Well MW-34C was gauged in October 2013, and no DNAPL was measured in the well (the well historically had DNAPL sporadically present). In May 2014, replacement well MW-34CR was installed and is now gauged as part of the recovery program. However, no DNAPL has been detected in the well.

Monitoring well MW-23C was added to the pilot test program in early November 2014. The initial DNAPL thickness in the well in November 2014 was 2.09 feet. Through October 2016, the DNAPL thickness has steadily decreased to less than one foot in the well, with a slight increase from October 2016 to February 2017. Since February 2017, there has been a steady decrease in DNAPL thickness from 1.06 feet to 0.34 feet (February 2018).

- DNAPL Recovery: From February 2013 through February 2018, an estimated 450 gallons of creosote DNAPL have been recovered from the wells, with monthly DNAPL recovery volumes increased after the January 2015 event (changed pumping techniques). Over the past six months, recovery has been approximately 8 gallons per month (Table 1).

With the on-going monthly DNAPL recovery activities, the overall trend in DNAPL thicknesses over the past six months has been either 1) a decreasing trend in the wells with a significant DNAPL thickness (MW-41B and MW-78A) or 2) a relatively stable trend for the wells with less than a foot of measurable DNAPL thickness. Based on the overall observations, the current recovery procedures are achieving the response action objective of removing the readily recoverable DNAPL from the wells as well as reducing the overall thicknesses. Therefore, there are no proposed changes to the recovery activities at this time.

If you have any questions or need additional information, please feel free to call me at (512) 671-3434 or Mr. Kevin Peterburs of UPRR at (414) 267-4164.

Sincerely,

PASTOR, BEHLING & WHEELER, LLC



Eric C. Matzner, P.G.

Associate Hydrogeologist



Texas Geosciences Firm No. 50248

cc: Waste Program Manager, TCEQ Region 12, Houston
Mr. Kevin Peterburs, UPRR – Milwaukee, WI

TABLES

TABLE 1

**SUMMARY OF DNAPL RECOVERY MEASUREMENTS
UPRR HOUSTON, TX - WOOD PRESERVING WORKS**

DNAPL Recovery Date	MW-12B				MW-23C				MW-32B				MW-33BR				MW-34C/MW-34CR (July 2014)						
	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)			
2/14/2013	9.06	39.87	5.93	2.5	NM	NM	NM	0	6.01	30.06	6.23	2	3.72	ND	0	0	NM	NM	NM	0			
4/3/2013	9.41	39.95	5.85	1	NM	NM	NM	0	4.86	33.61	2.68	1	4.02	Pop	0	0	NM	NM	NM	0			
4/22/2013	8.61	31.64	14.16	0.5*	NM	NM	NM	0	5.62	36.08	0.21	0.25	3.63	ND	0	0	NM	NM	NM	0			
5/30/2013	8.47	37.62	8.18	1.5*	NM	NM	NM	0	5.86	32.21	4.08	2	3.59	ND	0	0	NM	NM	NM	0			
6/29/2013	9.62	38.22	7.58	1.5	NM	NM	NM	0	6.79	33.59	2.7	1.5	6.07	ND	0	0	NM	NM	NM	0			
7/22/2013	11.16	39.04	6.76	1	NM	NM	NM	0	7.14	33.91	2.38	1.5	9.68	ND	0	0	NM	NM	NM	0			
8/26/2013	11.31	39.61	6.19	1	NM	NM	NM	0	7.48	33.83	2.46	1	9.86	ND	0	0	NM	NM	NM	0			
9/27/2013	11.17	40.63	5.17	1	NM	NM	NM	0	7.23	34.39	1.9	1	9.57	ND	0	0	NM	NM	NM	0			
10/31/2013	11.09	43.71	2.09	1	NM	NM	NM	0	7.16	34.96	1.33	0.53	9.32	ND	0	0	21.63	NM	NM	0			
11/27/2013	11.17	44.06	1.74	1	NM	NM	NM	0	7.29	35.03	1.26	0.53	9.16	ND	0	0	NM	NM	NM	0			
12/31/2013	11.02	44.62	1.18	1	NM	NM	NM	0	7.16	35.16	1.13	0.5	8.97	ND	0	0	NM	NM	NM	0			
1/30/2014	11.34	45.12	0.68	1	NM	NM	NM	0	6.72	34.82	1.47	0.53	7.41	ND	0	0	NM	NM	NM	0			
3/3/2014	11.17	44.32	1.48	1	NM	NM	NM	0	6.53	34.52	1.77	0.53	7.16	ND	0	0	NM	NM	NM	0			
3/31/2014	11.03	44.53	1.27	1	NM	NM	NM	0	6.29	34.21	2.08	0.53	7.04	ND	0	0	NM	NM	NM	0			
4/30/2014	10.92	44.26	1.54	1	NM	NM	NM	0	6.42	34.67	1.62	0.53	6.88	ND	0	0	NM	NM	NM	0			
5/27/2014	10.81	44.34	1.46	1	NM	NM	NM	0	6.36	34.72	1.57	0.53	6.72	ND	0	0	NM	NM	NM	0			
6/26/2014	10.72	44.61	1.19	1	NM	NM	NM	0	6.21	34.61	1.68	0.53	6.52	ND	0	0	NM	NM	NM	0			
7/31/2014	10.13	44.96	0.84	1	NM	NM	NM	0	6.06	34.33	1.96	0.25	6.29	ND	0	0	19.06	ND	0	0			
8/27/2014	10.26	45.12	0.68	1	NM	NM	NM	0	6.18	34.98	1.31	0.25	6.47	ND	0	0	18.96	ND	0	0			
10/3/2014	10.17	44.91	0.89	1	NM	NM	NM	0	6.06	34.72	1.57	0.25	6.32	ND	0	0	18.81	ND	0	0			
11/3/2014	10.29	44.97	0.83	1	22.51	70.71	2.09	0.25	6.18	34.91	1.38	0.25	NM	NM	NM	0	19.06	ND	0	0			
11/24/2014	10.27	44.99	0.81	1	22.56	70.92	1.88	0.5	6.21	35.16	1.13	0.5	NM	NM	NM	0	19.11	ND	0	0			
12/22/2014	10.23	44.71	1.09	1	22.47	70.81	1.99	0.5	6.14	35.02	1.27	0.75	NM	NM	NM	0	19.06	ND	0	0			
1/29/2015	10.16	44.96	0.84	1	22.26	71.04	1.76	0.5	5.71	35.29	1	0.75	NM	NM	NM	0	18.79	ND	0	0			
2/26/2015	10.12	44.96	0.84	1.5	22.06	71.09	1.71	0.5	6.02	35.29	1	1	NM	NM	NM	0	18.71	ND	0	0			
3/26/2015	9.96	45.21	0.59	1.5	22.17	71.12	1.68	0.25	5.46	35.36	0.93	1	NM	NM	NM	0	18.67	ND	0	0			
4/27/2015	9.89	45.37	0.43	1.5	22.23	71.06	1.74	0.5	5.21	35.29	1	1	NM	NM	NM	0	18.79	ND	0	0			
5/26/2015	9.72	45.61	0.19	2	22.17	71.14	1.66	0.5	5.07	35.46	0.83	1	NM	NM	NM	0	18.63	ND	0	0			
7/6/2015	7.12	45.96	0.24	2	19.01	71.39	1.41	0.5	4.06	35.66	0.63	1	NM	NM	NM	0	17.29	ND	0	0			
8/3/2015	7.26	46.09	0.11	2	19.16	71.46	1.34	0.75	4.29	35.71	0.58	1	NM	NM	NM	0	17.21	ND	0	0			
8/27/2015	8.09	46.01	0.19	1	20.34	71.51	1.29	0.75	5.05	35.77	0.52	1	NM	NM	NM	0	18.46	ND	0	0			
10/5/2015	7.12	45.86	0.34	1	19.02	71.57	1.23	0.5	4.31	35.96	0.33	1	NM	NM	NM	0	17.29	ND	0	0			
11/5/2015	6.86	45.81	0.39	1	18.59	71.59	1.21	0.5	4.02	35.91	0.38	1	NM	NM	NM	0	16.78	ND	0	0			
12/3/2015	6.46	45.79	0.41	1	18.33	71.67	1.13	0.5	3.92	35.96	0.33	1	NM	NM	NM	0	16.44	ND	0	0			
12/28/2015	6.23	45.62	0.58	1.25	23.21	71.61	1.19	0.75	3.73	35.91	0.38	1	NM	NM	NM	0	16.16	ND	0	0			
2/3/2016	6.04	45.55	0.65	1.5	17.96	71.64	1.16	0.5	3.61	35.87	0.42	1	NM	NM	NM	0	15.98	ND	0	0			
3/3/2016	5.96	45.61	0.59	1.5	17.92	71.71	1.09	0.5	3.51	35.91	0.38	1	NM	NM	NM	0	15.98	ND	0	0			
3/31/2016	6.06	45.72	0.48	1.5	17.86	71.79	1.01	0.5	3.56	35.92	0.37	1	NM	NM	NM	0	15.98	ND	0	0			
5/3/2016	6.13	45.66	0.54	1	NM	NM	NM	0	3.67	35.87	0.53	0.5	NM	NM	NM	0	15.79	ND	0	0			
6/2/2016	6.21	45.61	0.59	1	22.9	71.51	1.29	0.5	3.74	35.92	0.48	0.5	NM	NM	NM	0	15.97	ND	0	0			
7/8/2016	6.29	45.72	0.48	1	23.09	71.52	1.28	0.25	3.91	35.96	0.44	0.5	NM	NM	NM	0	16.06	ND	0	0			
8/3/2016	6.34	45.77	0.43	1	23.16	71.66	1.14	0.25	4.03	35.49	0.91	0.5	NM	NM	NM	0	16.17	ND	0	0			
8/30/2016	6.47	45.69	0.51	1	23.31	71.61	1.19	0.5	4.22	36.09	0.31	0.5	NM	NM	NM	0	16.31	ND	0	0			
9/30/2016	6.59	45.81	0.39	1	23.39	71.81	0.99	0.5	4.33	35.91	0.49	0.5	NM	NM	NM	0	16.42	ND	0	0			
11/3/2016	6.64	45.92	0.28	1	23.41	71.98	0.82	0.5	4.47	35.99	0.41	0.5	NM	NM	NM	0	16.51	ND	0	0			
11/30/2016	6.86	45.86	0.34	0.5	23.59	71.91	0.89	0.75	4.62	35.91	0.49	0.5	NM	NM	NM	0	16.72	ND	0	0			
1/4/2017	7.02	45.81	0.39	0.5	23.74	71.82	0.98	0.75	4.83	36.02	0.38	0.25	NM	NM	NM	0	16.94	ND	0	0			
2/7/2017	6.97	45.69	0.51	0.5	23.67	71.74	1.06	0.75	4.81	35.91	0.49	0.25	NM	NM	NM	0	16.91	ND	0	0			
3/2/2017	6.91	45.64	0.56	0.5	23.54	76.82	0.98	0.75	4.66	35.97	0.43	0.25	NM	NM	NM	0	16.78	ND	0	0			
4/3/2017	6.82	45.71	0.49	0.5	23.46	76.96	0.84	0.75	4.57	36.01	0.39	0.25	NM	NM	NM	0	16.71	ND	0	0			
4/27/2017	6.74	45.64	0.56	0.5	23.21	77.04	0.76	0.5	4.51	36.06	0.34	0.25	NM	NM	NM	0	16.61	ND	0	0			
5/29/2017	6.89	45.77	0.43	0.5	23.49	77.21	0.59	0.25	4.74	36.03	0.37	0.25	NM	NM	NM	0	16.84	ND	0	0			
7/5/2017	7.01	45.71	0.49	0.5	23.61	77.27	0.53	0.25	4.86	36.13	0.27	0.25	NM	NM	NM	0	17.01	ND	0	0			
8/1/2017	7.14	45.63	0.57	0.75	23.79	77.17	0.63	0.25	4.99	36.24	0.16	0.25	NM	NM	NM	0	17.17	ND	0	0			
9/5/2017	7.03	45.6	0.6	1	23.67	77.29	0.51	0.25	4.78	36.24	0.16	0.25	NM	NM	NM	0	17.11	ND	0	0			
10/4/2017	7.07	45.69	0.51	1	23.61	77.36	0.44	0.25	4.89	36.29	0.11	0.25	NM	NM	NM	0	17.06	ND	0	0			
11/2/2017	7.11	45.76	0.44	1	23.74	77.42	0.38	0.25	4.96	36.26	0.14	0.25	NM	NM	NM	0	17.17	ND	0	0			
11/29/2017	7.16	45.71	0.49	1	23.81	77.4	0.40	0.25	5.06	36.31	0.09	0.25	NM	NM	NM	0	17.29	ND	0	0			
1/2/2018	6.96	45.82	0.38	1	23.67	77.43	0.37	0.25	4.93	36.27	0.13	0.25	NM	NM	NM	0	17.52	ND	0	0			
2/7/2018	7.13	45.87	0.33	1	23.86	77.46	0.34	0.25	5.16	36.21	0.19	0.25	NM	NM	NM	0	18.11	ND	0	0			
Total DNAPL Pumped (gal)				64					18					39.49					0				

Notes:

* - indicates DNAPL and groundwater mixture

--- - No DNAPL pumped

DTW - Depth to water (feet Below Top of Casing (BTOC))

DTD - Depth to DNAPL (feet BTOC)

ND - Not detected

NM - Not measured

PoP - Product on probe, not measurable

TR- Trace amount of DNALP Extracted

MW-12B- TD Measured at 46.2 instead of 45.8, August 28, 2015.

MW-23C- Added 5 feet to TOC due to capping after 2/3/2016

TABLE 1

**SUMMARY OF DNAPL RECOVERY MEASUREMENTS
UPRR HOUSTON, TX - WOOD PRESERVING WORKS**

DNAPL Recovery Date	MW-41B				MW-44C				MW-45C				MW-46C				MW-57A			
	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)
2/14/2013	8.91	41.1	3.71	3	18.96	62.95	7.85	1	21.26	69.9	0.7	0.25	21.07	71.3	1.6	0.25	10.56	22.12	4.78	0.5
4/3/2013	9.37	41.6	3.21	1.5	19.34	70.47	0.33	0.25*	21.39	70.39	0.21	0.25*	20.61	72.36	0.54	0.25*	10.32	24.79	2.11	0.5
4/22/2013	8.62	41.6	3.21	0.5*	18.62	70.64	0.16	0.25*	21.03	70.47	0.13	0.25*	20.61	72.61	0.29	0.25*	10.71	25.85	1.05	0.5
5/30/2013	8.73	34.16	10.65	2	18.43	70.01	0.79	0.25*	21.16	70.25	0.35	0.25*	20.59	71.61	1.29	0.25*	10.63	24.16	2.74	0.5
6/29/2013	9.72	37.12	7.69	2	19.34	70.32	0.48	0.25	21.93	70.32	0.28	0.25*	21.09	72.34	0.56	0.25*	12.16	23.82	3.08	2
7/22/2013	10.31	39.29	5.52	1.5	20.36	70.26	0.54	0.25	22.72	70.39	0.21	0.25*	21.96	72.16	0.74	0.25*	13.21	23.05	3.85	2
8/26/2013	10.09	34.55	10.26	2.5	20.62	70.39	0.41	0.25	22.86	70.31	0.29	0.25	22.23	72.32	0.58	0.25	12.91	25.32	1.58	1
9/27/2013	9.63	37.29	7.52	2	20.39	70.61	0.19	0.25	22.66	70.17	0.43	0.25	22.09	72.09	0.81	0.25	12.72	25.71	1.19	0.75
10/31/2013	9.52	38.16	6.65	2	20.17	70.75	0.05	0.07	22.59	70.42	0.18	0.13	22.41	72.34	0.56	0.2	12.72	25.92	0.98	1
11/27/2013	9.57	38.39	6.42	2	20.09	70.78	0.02	0.00	22.52	70.49	0.11	0	22.31	72.47	0.43	0.07	12.61	25.98	0.92	1
12/31/2013	9.42	39.36	5.45	2	20.01	70.8	PoP	0.00	22.39	70.46	0.14	0	22.03	72.53	0.37	0.07	12.46	26.09	0.81	1
1/30/2014	9.06	39.17	5.64	2	19.67	70.42	0.38	0.25	22.13	70.35	0.25	0	21.81	72.55	0.35	0.07	11.79	26.15	0.75	0.25
3/3/2014	8.62	38.06	6.75	2	19.29	70.17	0.63	0.25	21.86	70.09	0.51	0	21.57	72.05	0.85	0.25	11.02	26.25	0.65	0.25
3/31/2014	8.52	37.74	7.07	2	19.17	70.02	0.78	0.25	21.71	69.63	0.97	0.25	21.43	72.12	0.78	0.13	10.83	26.41	0.49	0.25
4/30/2014	8.36	37.21	7.6	2	19.02	69.81	0.99	0.25	21.59	69.74	0.86	0.25	21.27	71.81	1.09	0.25	10.71	26.31	0.59	0.25
5/27/2014	8.26	37.29	7.52	2	18.92	69.71	1.09	0.00	21.52	69.67	0.93	0.25	21.34	71.71	1.19	0.25	10.74	26.16	0.74	0.25
6/26/2014	8.02	37.47	7.34	2	18.81	69.52	1.28	0.25	21.59	69.77	0.83	0.25	21.17	71.6	1.3	0.25	10.61	26.29	0.61	0.25
7/31/2014	8.21	37.92	6.89	2	18.66	69.37	1.43	0.25	21.21	69.96	0.64	0.25	20.39	71.43	1.47	0.25	10.35	26.18	0.72	0.25
8/27/2014	8.07	38.29	6.52	1.5	18.53	69.47	1.33	0.25	21.13	70.12	0.48	0.25	20.22	71.61	1.29	0.25	10.22	26.26	0.64	0.25
10/3/2014	8.02	38.13	6.68	2	18.41	69.23	1.57	0.25	20.13	70.41	0.19	0.25	20.14	71.39	1.51	0.25	10.09	26.04	0.86	0.25
11/3/2014	8.22	38.29	6.52	2	18.52	69.37	1.43	0.25	20.29	70.36	0.24	0.25	20.27	71.47	1.43	0.25	10.17	26.16	0.74	0.25
11/24/2014	8.27	38.47	6.34	2	18.57	69.49	1.31	0.5	20.34	70.48	0.12	0.25	20.38	71.53	1.37	0.5	10.13	26.29	0.61	0.25
12/22/2014	8.16	38.39	6.42	2	18.51	69.31	1.49	0.5	20.31	70.41	0.19	0.25	20.37	71.42	1.48	0.5	10.06	26.34	0.56	0.25
1/29/2015	8.02	39.16	5.65	1.5	18.39	69.39	1.41	0.5	20.17	70.51	0.09	0.25	20.13	71.48	1.42	0.5	9.73	26.51	0.39	0.25
2/26/2015	7.92	39.06	5.75	2.5	18.42	69.51	1.29	0.5	20.11	70.59	0.01	0	20.09	71.38	1.52	0.5	9.87	26.42	0.48	0.25
3/26/2015	7.83	38.74	6.07	2.5	18.39	69.42	1.38	0.25	19.26	70.52	0.08	0	20.17	71.02	1.88	0.25	9.81	26.32	0.58	0.25
4/27/2015	8.02	38.61	6.20	3	18.29	69.52	1.28	0.5	20.17	70.48	0.12	0.25	20.22	71.56	1.34	1	9.82	26.47	0.43	0.5
5/26/2015	7.91	38.72	6.09	3	18.17	69.57	1.23	0.75	20.12	70.41	0.19	0.25	20.12	71.61	1.29	1	9.71	26.56	0.34	0.5
7/6/2015	6.03	38.96	5.85	2.5	16.29	69.86	0.94	0.5	18.07	70.49	0.11	0.25	18.17	71.93	0.97	0.75	7.41	26.82	0.08	TR*
8/3/2015	6.09	39.01	5.80	2.5	16.18	69.82	0.98	0.5	18.16	70.56	0.04	TR*	18.24	71.98	0.92	0.75	7.29	26.86	0.04	TR*
8/27/2015	7.39	39.14	5.67	2	17.46	69.74	1.06	0.25	19.03	70.54	0.06	TR*	19.39	72.03	0.87	0.5	8.11	26.90	0	TR*
10/5/2015	6.32	39.34	5.47	2	16.83	69.86	0.94	0.25	18.39	70.60	0	0	18.72	72.34	0.56	0.5	7.72	26.90	0	0
11/5/2015	6.01	39.51	5.30	2	16.62	69.79	1.01	0.25	17.96	70.60	0	0	18.51	72.26	0.64	0.5	7.39	26.90	0	0
12/3/2015	5.76	39.56	5.25	2	16.46	69.73	1.07	0.25	17.72	70.60	0	0	18.62	72.36	0.54	0.5	7.13	26.90	0	0
12/28/2015	5.62	39.63	5.18	2.25	16.32	69.77	1.03	0.25	17.62	70.60	0	0	18.42	72.31	0.59	0.5	NM	NM	NM	0
2/3/2016	5.32	39.72	5.09	3	16.17	69.74	1.06	0.25	17.42	70.60	0	0	18.29	72.46	0.44	0.25	NM	NM	NM	0
3/3/2016	5.17	39.81	5.00	3	16.12	69.79	1.01	0.25	17.39	70.60	0	0	18.23	72.49	0.41	0.25	NM	NM	NM	0
3/31/2016	5.26	39.77	5.04	3	16.06	69.71	1.09	0.25	17.33	70.6	0	0	18.24	72.54	0.36	0.25	NM	NM	NM	0
5/3/2016	5.52	39.96	4.85	3	16.27	69.59	1.21	0.25	17.47	70.6	0	0	18.39	72.39	0.51	0.25	NM	NM	NM	0
6/2/2016	5.67	40.07	4.74	3	16.38	69.63	1.17	0.25	17.52	70.6	0	0	18.43	72.43	0.47	0.25	7.26	26.9	0	0
7/8/2016	5.72	40.01	4.8	3	16.47	69.71	1.09	0.25	17.62	70.6	0	0	18.54	72.49	0.41	0.25	7.39	26.9	0	0
8/3/2016	5.79	40.09	4.72	3	16.59	69.7	1.1	0.25	17.69	70.6	0	0	18.51	72.53	0.37	0.25	7.46	26.9	0	0
8/30/2016	5.91	40.26	4.55	3	16.67	69.58	1.22	0.25	17.76	70.6	0	0	18.72	72.57	0.33	0.25	7.58	26.9	0	0
9/30/2016	6.06	40.13	4.68	3	16.79	69.49	1.31	0.5	17.86	70.6	0	0	18.83	72.46	0.44	0.25	7.69	26.9	0	0
11/3/2016	6.11	40.29	4.52	3	16.86	69.71	1.09	0.5	17.92	70.6	0	0	18.89	72.41	0.49	0.25	7.77	26.9	0	0
11/30/2016	6.26	40.42	4.39	3	17.03	69.94	0.86	0.75	18.09	70.6	0	0	19.12	72.32	0.58	0.25	7.92	26.9	0	0
1/4/2017	6.39	40.56	4.25	3	17.22	70.11	0.69	0.75	18.22	70.6	0	0	19.27	72.46	0.44	0.25	8.07	26.9	0	0
2/7/2017	6.44	40.51	4.3	3	17.29	70.01	0.79	0.5	18.17	70.6	0	0	19.19	72.39	0.51	0.25	8.18	26.9	0	0
3/2/2017	6.29	40.76	4.05	3	17.17	70.16	0.64	0.5	17.96	70.6	0	0	19.03	72.31	0.59	0.25	8.02	26.9	0	0
4/3/2017	6.21	40.67	4.14	2.5	17.06	70.21	0.59	0	17.89	70.6	0	0	18.97	72.39	0.51	0.25	8.06	26.9	0	0
4/27/2017	6.19	40.87	3.94	3	17.01	70.29	0.51	0	17.67	70.6	0	0	18.84	72.31	0.59	0.5	8.01	26.9	0	0
5/29/2017	6.14	40.29	4.52	3	17.23	70.24	0.56	0.25	17.84	70.6	0	0	18.94	72.47	0.43	0.25	8.34	26.9	0	0
7/5/2017	6.34	40.57	4.24	2.5	17.33	70.34	0.46	0.25	17.96	70.6	0	0	19.12	72.34	0.56	0.5	8.41	26.9	0	0
8/1/2017	6.42	40.79	4.02	3	17.39	70.39	0.41	0.25	18.09	70.6</										

TABLE 1

**SUMMARY OF DNAPL RECOVERY MEASUREMENTS
UPRR HOUSTON, TX - WOOD PRESERVING WORKS**

DNAPL Recovery Date	MW-57B				MW-70B				MW-75B				MW-78A				Approx DNAPL Recovered (gal)			
	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)	DTW (ft BTOC)	DTD (ft BTOC)	DNAPL Thickness (ft)	DNAPL Pumped (gal)				
2/14/2013	28.56	41.41	1.54	0.25	6.57	34.09	1.61	0.25	10.01	34.1	3.1	0.25	NM	NM	NM	0	9.75			
4/3/2013	28.09	42.36	0.59	0.25*	6.79	35.26	0.44	0.25	13.71	36.47	0.73	0.25	NM	NM	NM	0	5.00			
4/22/2013	27.06	42.17	0.78	0.25	6.06	35.12	0.58	0.25	9.72	36.72	0.48	0.25	NM	NM	NM	0	2.75			
5/30/2013	27.13	41.63	1.32	0.25	6.19	34.67	1.03	0.25	9.61	35.09	2.11	0.75	NM	NM	NM	0	7.50			
6/29/2013	18.26	42.07	0.88	0.25	8.01	34.92	0.78	0.25*	10.61	35.61	1.59	0.75	NM	NM	NM	0	7.00			
7/22/2013	16.34	41.67	1.28	0.75	8.22	34.07	1.63	0.25*	9.74	35.71	1.49	0.75	NM	NM	NM	0	6.50			
8/26/2013	18.01	42.31	0.64	0.25	8.17	35.09	0.61	0.25	10.76	35.93	1.27	0.75	NM	NM	NM	0	6.50			
9/27/2013	17.74	42.51	0.39	0.25	8.32	35.34	0.36	0.25	10.52	36.39	0.81	0.5	NM	NM	NM	0	5.75			
10/31/2013	17.61	42.61	0.29	0.07	8.26	35.39	0.31	0.07	10.31	36.47	0.73	1	NM	NM	NM	0	5.07			
11/27/2013	17.54	42.67	0.23	0.07	8.12	35.42	0.28	0.07	10.39	36.51	0.69	1	NM	NM	NM	0	4.74			
12/31/2013	17.36	42.74	0.16	0.07	7.89	35.51	0.19	0.07	10.13	36.72	0.48	1	NM	NM	NM	0	4.71			
1/30/2014	17.04	ND	PoP	0.00	7.84	35.06	0.64	0.07	12.62	36.49	0.71	0.75	NM	NM	NM	0	4.67			
3/3/2014	16.51	ND	PoP	0.00	7.09	35.05	0.65	0.13	12.12	36.35	0.85	0.75	NM	NM	NM	0	4.91			
3/31/2014	16.41	ND	PoP	0.00	6.87	35.17	0.53	0.07	12.01	36.27	0.93	0.75	NM	NM	NM	0	4.98			
4/30/2014	16.29	ND	PoP	0.00	6.72	35.01	0.69	0.07	11.84	36.02	1.18	0.75	NM	NM	NM	0	5.10			
5/27/2014	16.13	ND	PoP	0.00	6.64	34.86	0.84	0.07	11.71	35.79	1.41	0.75	NM	NM	NM	0	4.85			
6/26/2014	16.02	ND	PoP	0.00	6.52	34.97	0.73	0.25	11.58	35.91	1.29	0.5	NM	NM	NM	0	5.03			
7/31/2014	15.84	ND	PoP	0.00	6.26	34.76	0.94	0.25	11.32	35.82	1.38	0.5	NM	NM	NM	0	4.75			
8/27/2014	15.71	ND	PoP	0.00	6.84	34.86	0.84	0.25	11.19	36.09	1.11	0.5	NM	NM	NM	0	4.25			
10/3/2014	15.61	ND	PoP	0.00	6.71	34.61	1.09	0.25	11.09	36.01	1.19	0.5	NM	NM	NM	0	4.75			
11/3/2014	NM	NM	NM	0.00	6.79	34.79	0.91	0.25	11.16	36.19	1.01	0.75	9.31	19.12	6.23	2.00	7.25			
11/24/2014	NM	NM	NM	0.00	6.77	34.93	0.77	0.25	11.21	36.27	0.93	0.5	9.39	19.62	5.73	2.00	8.00			
12/22/2014	NM	NM	NM	0.00	6.69	34.86	0.84	0.25	11.26	36.19	1.01	0.5	9.34	19.86	5.49	2.00	8.25			
1/29/2015	NM	NM	NM	0.00	6.48	34.92	0.78	0.25	11.06	36.34	0.86	0.5	9.14	21.29	4.06	2.00	7.75			
2/26/2015	NM	NM	NM	0.00	6.39	34.81	0.89	0.5	11.09	36.34	0.86	0.5	9.17	19.97	5.38	2.5	10.00			
3/26/2015	NM	NM	NM	0.00	6.27	34.91	0.79	0.25	10.93	36.42	0.78	0.5	9.12	20.31	5.04	0.75	7.25			
4/27/2015	NM	NM	NM	0.00	6.19	34.99	0.71	0.25	10.78	36.52	0.68	0.5	9.17	20.46	4.89	2	10.50			
5/26/2015	NM	NM	NM	0.00	6.07	35.11	0.59	0.5	10.61	36.72	0.48	0.75	9.09	20.59	4.76	2.5	12.25			
7/6/2015	NM	NM	NM	0.00	5.03	35.32	0.38	0.25	8.52	36.91	0.29	0.75	7.01	21.16	4.19	2	10.50			
8/3/2015	12.32	ND	PoP	0.00	5.12	35.37	0.33	TR*	8.66	36.96	0.24	0.75	7.12	21.39	3.96	2.5	10.75			
8/27/2015	13.04	ND	0.00	0.00	6.31	35.41	0.29	TR*	9.31	36.91	0.29	0.75	7.96	21.51	3.84	2	8.25			
10/5/2015	12.62	ND	0.00	0.00	5.72	35.47	0.23	0.25	8.62	37.02	0.18	0.5	7.23	21.67	3.68	2	8.00			
11/5/2015	12.27	ND	0.00	0.00	5.41	35.42	0.28	0.25	8.34	36.93	0.27	0.5	7.02	21.56	3.79	2	8.00			
12/3/2015	12.02	ND	0.00	0.00	5.13	35.63	0.07	0.25	8.12	36.81	0.39	0.5	6.83	21.67	3.68	2	8.00			
12/28/2015	NM	NM	NM	0.00	5.02	35.26	0.44	0.25	8.01	36.72	0.48	0.5	6.71	21.52	3.83	2.25	9.00			
2/3/2016	NM	NM	NM	0.00	4.86	35.21	0.49	0.25	7.82	36.19	1.01	0.25	6.52	21.67	3.68	2	9.00			
3/3/2016	NM	NM	NM	0.00	4.92	35.17	0.53	0.25	7.74	36.27	0.93	0.5	6.46	21.72	3.63	2	9.25			
3/31/2016	NM	NM	NM	0.00	4.91	35.24	0.46	0.25	7.67	36.39	0.81	0.5	6.49	21.86	3.49	2	9.25			
5/3/2016	NM	NM	NM	0.00	5.13	35.29	0.36	0.25	7.79	36.47	0.68	0.5	6.57	21.94	3.41	2	7.75			
6/2/2016	12.32	ND	0.00	0.00	5.26	35.36	0.29	0.25	7.71	36.42	0.73	0.5	6.65	21.91	3.44	2	8.25			
7/8/2016	12.44	ND	0.00	0.00	5.34	35.31	0.34	0.25	7.8	36.53	0.62	0.5	6.71	21.97	3.38	2	8.00			
8/3/2016	12.52	ND	0.00	0.00	5.42	35.39	0.26	0.25	7.89	36.59	0.56	0.5	6.82	22.04	3.31	2	8.00			
8/30/2016	12.67	ND	0.00	0.00	5.61	35.21	0.44	0.25	7.96	36.64	0.51	0.5	6.94	22.21	3.14	2	8.25			
9/30/2016	12.81	ND	0.00	0.00	5.74	35.03	0.62	0.25	7.91	36.51	0.64	0.5	7.04	22.39	2.96	2	8.50			
11/3/2016	12.92	ND	0.00	0.00	5.79	35.11	0.54	0.25	7.86	36.36	0.79	0.5	7.11	22.49	2.86	2	8.50			
11/30/2016	13.16	ND	0.00	0.00	6.03	35.23	0.42	0.25	7.97	36.47	0.68	0.75	7.29	22.67	2.68	2	8.75			
1/4/2017	13.24	ND	0.00	0.00	6.17	35.09	0.56	0.5	8.04	36.36	0.79	0.75	7.42	22.74	2.61	2	8.75			
2/7/2017	13.29	ND	0.00	0.00	6.26	35.01	0.64	0.5	8.12	36.21	0.94	0.75	7.48	22.93	2.42	2.5	9.00			
3/2/2017	13.17	ND	0.00	0.00	6.16	35.09	0.56	0.5	8.01	36.26	0.89	0.75	7.36	23.26	2.09	2	8.50			
4/3/2017	13.04	ND	0.00	0.00	6.09	35.13	0.52	0.5	7.93	36.43	0.72	0.75	7.29	23.34	2.01	2	7.50			
4/27/2017	13.14	ND	0.00	0.00	6.12	35.2	0.45	0.5	7.86	36.52	0.63	0.75	7.36	23.42	1.93	2	8.00			
5/29/2017	13.41	ND	0.00	0.00	6.29	35.06	0.59	0.5	7.94	36.41	0.74	0.75	7.51	23.51	1.84	2	7.75			
7/5/2017	13.57	ND	0.00	0.00	6.39	35.14	0.51	0.25	8.04	36.36	0.79	0.75	7.79	23.59	1.76	2	7.25			
8/1/2017	13.69	ND	0.00	0.00	6.47	35.21	0.44	0.25	8.16	36.31	0.84	0.75	7.89	23.51	1.84	2	8.00			
9/5/2017	13.79	ND	0.00	0.00	6.56	35.34	0.31	0.25	8.22	36.47	0.68	0.75	7.81	23.48	1.87	2	8.25			
10/4/2017	13.71	ND	0.00	0.00	6.63	35.39	0.26	0.25	8.29	36.56	0.59	0.75	7.89	23.51	1.84	2	7.75			
11/2/2017	13.91	ND	0.00	0.00	6.74	35.31	0.34	0.25	8.37	36.51	0.64	1	7.97	23.59	1.76	2	8.50			
11/29/2017	14.02	ND	0.00	0.00	6.79	35.29	0.36	0.25	8.33	36.59	0.56	1	8.02	23.67	1.68	2	8.00			
1/2/2017	13.06	ND	0.00	0.00	6.34	35.34	0.31	0.25	8.07	36.72	0.43	1	8.17	23.82	1.53	2	8.25			
2/7/2018	12.42	ND	0.00	0.00	6.42	35.31	0.34	0.25	8.17	36.91	0.24	1	8.29	23.97	1.38	2	8.25			
Total DNAPL Pumped (gal)				2.71					15.12					38.75					81	449.56

Notes:

* - indicates DNAPL and groundwater mixture

--- - No DNAPL pumped

DTW - Depth to water (feet Below Top of Casing (BTOC))

DTD - Depth to DNAPL (feet BTOC)

ND - Not detected

NM - Not measured

PoP - Product on probe, not measurable

TR- Trace amount of DNALP Extracted

FIGURES

EXPLANATION

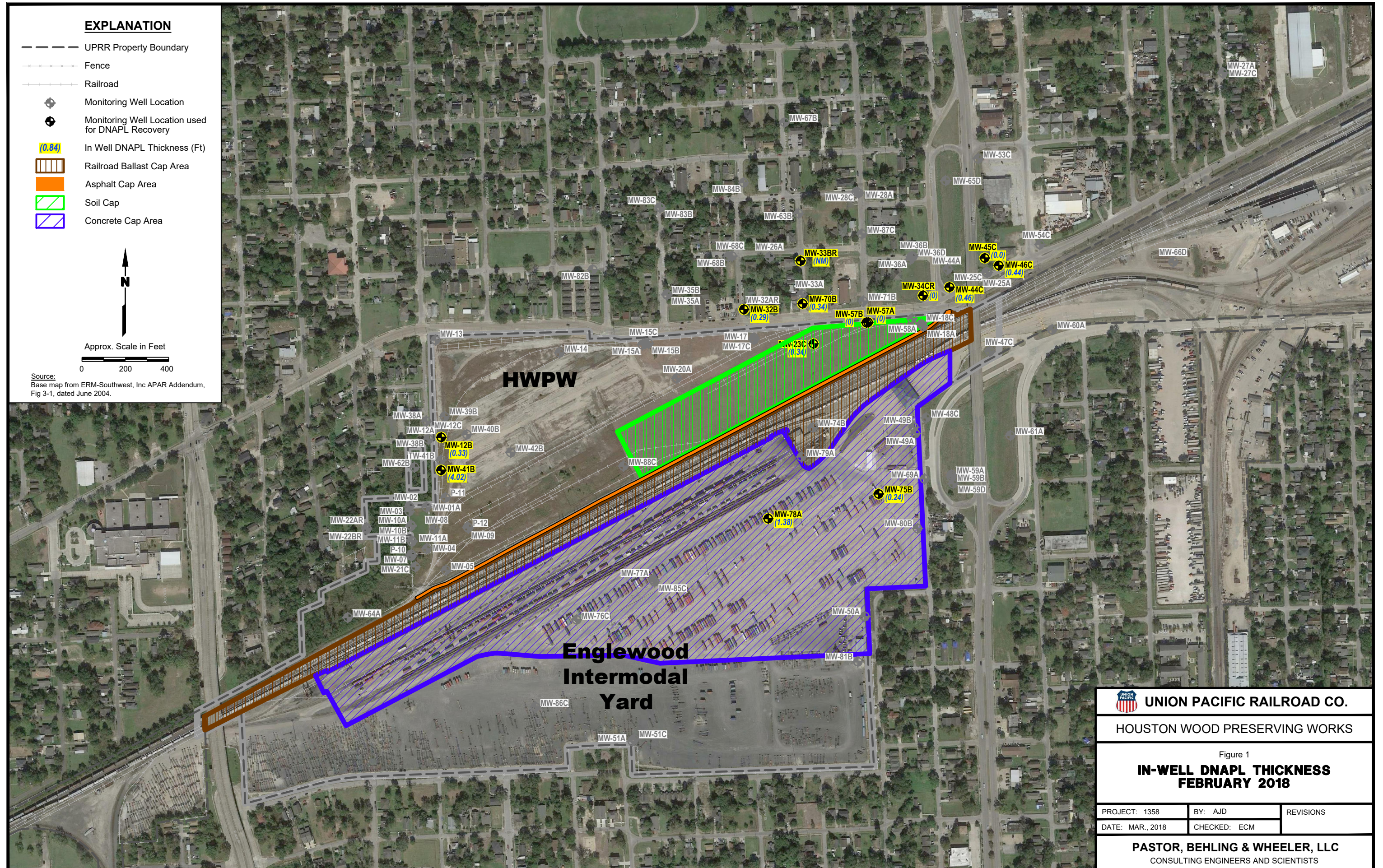
- UPRR Property Boundary
- Fence
- Railroad
- ⊕ Monitoring Well Location
- ⊕ Monitoring Well Location used for DNAPL Recovery
- (0.84) In Well DNAPL Thickness (Ft)
- ▨ Railroad Ballast Cap Area
- ▨ Asphalt Cap Area
- ▨ Soil Cap
- ▨ Concrete Cap Area



Approx. Scale in Feet

0 200 400

Source:
Base map from ERM-Southwest, Inc APAR Addendum,
Fig 3-1, dated June 2004.



 **UNION PACIFIC RAILROAD CO.**

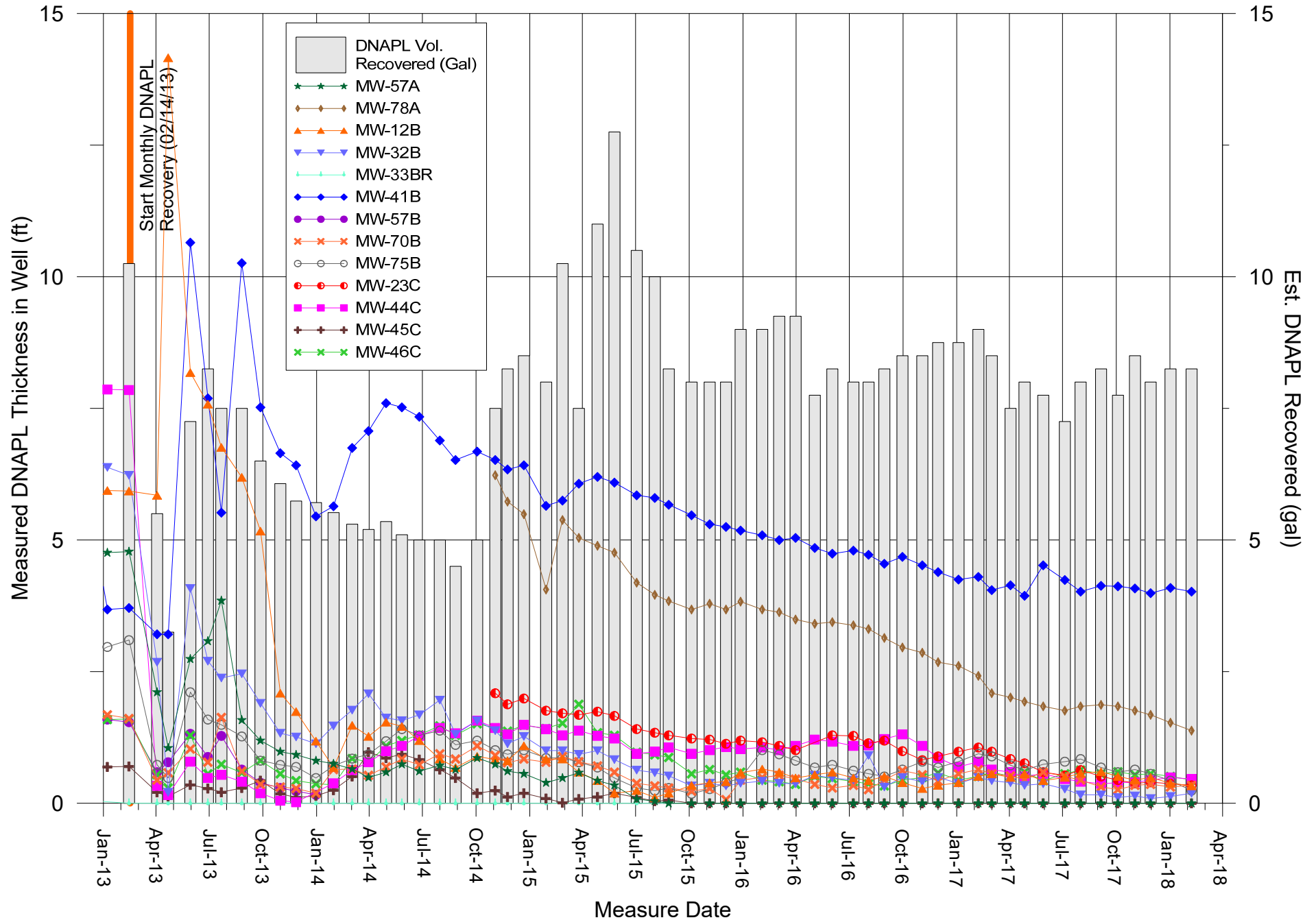
HOUSTON WOOD PRESERVING WORKS

Figure 1
**IN-WELL DNAPL THICKNESS
FEBRUARY 2018**

PROJECT: 1358	BY: AJD	REVISIONS
DATE: MAR., 2018	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Figure 2
DNAPL Recovery Activities February 2013 - February 2018
UPRR Houston Wood Preserving Works



ATTACHMENT A
WASTE MANIFEST

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number: TXD000820266 / 31547

2. Page 1 of 1

3. Emergency Response Phone: 877-577-2669

4. Manifest Tracking Number: 003619250 GBF

5. Generator's Name and Mailing Address: Union Pacific Railroad, 301 NE 2nd Ave., ATTN: Traci Rhode, Portland, OR 97232

Generator's Phone: 414-267-4164 ATTN: Kevin Peterburs

Generator's Site Address (if different than mailing address): UP Railroad Houston Wood Preserving Works, 4910 Liberty Rd, Houston, TX 77028 ATTN: Kevin Peterburs

6. Transporter 1 Company Name: Stericycle Specialty Waste Solutions Inc

Phone: 972-328-1280

State ID: 88922 / H-1485

U.S. EPA ID Number: MNS000110924

7. Transporter 2 Company Name: Clean Harbors Enviro Serv Inc

U.S. EPA ID Number: MAD039319250

8. Designated Facility Name and Site Address: Clean Harbors Deer Park, L.P., 2027 Independence Pkwy South, La Porte, TX 77571

State ID: 50889

TXD055141378

Facility's Phone: 281-930-2300

9a. HM

9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))

10. Containers

11. Total Quantity

12. Unit Wt./Vol.

13. Waste Codes

1. RQ, NA3082, Hazardous waste, liquid, n.o.s. (creosote), 9, PG III, ERG 171

001 DM 55 G 0918219H F034

14. Special Handling Instructions and Additional Information: 01: Recovered creosote WR #42672 (PF: CH1289245) 55G 12672

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Officer's Printed/Typed Name: Kevin Peterburs

Signature: [Signature]

Month: 12 Day: 01 Year: 17

16. International Shipments

Import to U.S. ☐ Export from U.S. ☐ Port of entry/exit: Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Joe Parrillo

Signature: [Signature]

Month: 12 Day: 01 Year: 17

Transporter 2 Printed/Typed Name: Lauren Piwonka

Signature: [Signature]

Month: 12 Day: 01 Year: 17

18. Discrepancy

18a. Discrepancy Indication Space

Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator)

U.S. EPA ID Number:

Facility's Phone:

18c. Signature of Alternate Facility (or Generator)

Month: Day: Year:

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1. 01: H040

2. 3. 4.

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Chelsea Gray

Signature: [Signature]

Month: 12 Day: 01 Year: 17