PBW

Consulting Engineers
and Scientists

PASTOR, BEHLING & WHEELER, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, TX 78664

Tel (512) 671-3434
Fax (512) 671-3446

September 25, 2014
PBW Project No. 1358

VIA EMAIL

Mr. Michael Kuitu
MC-127
Environmental Cleanup Section I, Team 3, Remediation Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Re: DNAPL Recovery Pilot Test – 18-Month Status Update (February 2013 – July 2014)
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 Mr. Kuitu:

Pastor, Behling & Wheeler, LLC (PBW), on behalf of Union Pacific Railroad Company, is providing this status update for the dense non-aqueous phase liquid (DNAPL) recovery pilot test being conducted at the Houston Wood Preserving Works Facility (the Site). As detailed in the PBW letter dated February 5, 2013, PBW proposed to conduct a 24-month DNAPL recovery pilot test at the Site consisting of monthly manual DNAPL recovery. This letter discusses the DNAPL recovery pilot test activities and results for the first 18 months of the study (February 2013 through July 2014).

The following monitoring wells were selected to be included in the DNAPL recovery test based on the amount of DNAPL historically observed in the wells:

Well Name	Zone	Min. DNAPL Thickness (ft.)	Max DNAPL Thickness (ft.)
MW-57A	A-TZ	4.11	4.25
MW-12B	B-TZ	0.41	5.70
MW-41B	B-TZ	5.06	24.14
MW-57B	B-CZ	0.44	0.50
MW-32B	B-CZ	5.77	6.13
MW-33BR	B-CZ	0.30	0.30
MW-70B	B-CZ	1.44	1.53
MW-75B	B-CZ	1.84	1.90
MW-34C	C-TZ	7.24	7.60
MW-44C	C-TZ	0.75	7.10
MW-45C	C-TZ	0.39	1.50
MW-46C	C-TZ	0.10	1.25

Notes:
Average depth to water values, minimum and maximum DNAPL thicknesses based on data collected between January 2011 and December 2012.

Figure 1 shows the location of the wells used in the pilot study.

The pilot test procedures consisted 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, DNAPL was pumped from the bottom of the well until groundwater is returned in the pump discharge. The volume of recovered DNAPL was estimated from each well, and the well was gauged to measure the total depth of the well and depth to residual DNAPL following pumping. Recovered DNAPL was temporarily stored at the Containment Storage Area. Waste manifests for the recovered DNAPL and groundwater are provided in Attachment A.

A summary of the DNAPL recovery measurements from February 2013 through July 2014 is provided on Table 1. A graph of DNAPL thicknesses prior to each month recovery efforts over time is presented on Figure 2. Observations from the recovery testing through July 2014 are provided below:

- 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 gradual decreased from 8.18 feet in May 2013 to less than a foot thick measured in the well in January 2014. The thickness in MW-12B slightly increased to about 1.54 feet in April 2014, and decreased to less than 1 foot thick in July 2014. DNAPL thickness in MW-41B decreased from the August 2013 event (measured at 10.26 feet) to about 5.5 feet thick in December 2013, but increased in March 2014 and then leveled off ranging from 6.89 feet to 7.6 feet thick from March to July 2014 (Figure 2).
- The other DNAPL wells tested showed significant decreases in DNAPL thicknesses over the first two months of testing, with some sporadic increases from May through August 2013 (Figure 2). During the first 12 months DNAPL thicknesses in the wells generally decreased to less than one-foot thick, except in MW-32B. However, since December 2013, three of the C-TZ wells (MW44C, MW-45C, and MW-46C) have had increasing DNAPL thicknesses with the largest increase at MW-44C increasing about 1.4 feet. Except for MW45C, DNAPL thicknesses are still less than what was measured prior to beginning the pilot test. DNAPL thickness in MW-32B has also shown a slight increase since December 2013.
- DNAPL thickness in well MW-57B decreased from 1.28 feet thick in July 2013 to less than measureable (DNAPL noted on end of probe) thickness in January 2014 through July 2014.
- Of the 12 wells tested as part of the pilot test, well MW-33BR did not have any measureable DNAPL during the 18-month period. Well MW-34C was gauged in October 2013, and no DNAPL was measured in the well. Since a street lane closure permit through the City of Houston is required for this well for the testing and no DNAPL was measured during the October 2013 event, this well was removed from the list of wells tested and was plugged and abandoned. In May 2014, replacement well MW-34CR was installed and is now gauged as part of the pilot test program. No DNAPL has been detected in the well.
- An estimated total of 110 gallons of DNAPL have been recovered during the 18-month period, with monthly DNAPL recovery volumes slightly decreasing over the past six months to around 5 gallons per month (Figure 2). Approximately 50% of the DNAPL recovered is from wells MW-12B and MW-41B.

The preliminary results from the DNAPL recovery pilot test after the first 18 months indicate the following:

- Once per month DNAPL recovery activities are resulting in an overall stable DNAPL thickness trend in the wells tested. Wells showing increasing trends will continue to be evaluated over the next six months of the pilot test program.
- The current monthly recovery frequency appears to be effective with total DNAPL volume recovered becoming stable in the wells over time.

UPRR plans to continue the monthly DNAPL pilot test recovery efforts, and will submit the next status report following the January 2015 recovery event. Concurrently with the pilot test, PBW is assessing the recovery data for evaluating more effective DNAPL recovery efforts.

If you have any questions or need additional information, please feel free to call me at (512) 671-3434 or Mr. Geoffrey Reeder of UPRR at (281) 350-7197.

Sincerely,

PASTOR, BEHLING & WHEELER, LLC

Eric C. Matzner, P.G.
Associate Hydrogeologist

cc: Waste Program Manager, TCEQ Region 12, Houston
Mr. Geoffrey Reeder, P.G., UPRR – Spring, TX

TABLES

TABLE 1

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

	MW-12B				MW-32B				MW-33BR				MW-34C/MW-34CR (July 2014)			
DNAPL Recovery Date	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	6.01	30.06	6.23	2	3.72	ND	0	---	NM	NM	NM	---
4/3/2013	9.41	39.95	5.85	1	4.86	33.61	2.68	1	4.02	PoP	0	---	NM	NM	NM	---
4/22/2013	8.61	31.64	14.16	0.5*	5.62	36.08	0.21	0.25	3.63	ND	0	---	NM	NM	NM	---
5/30/2013	8.47	37.62	8.18	1.5*	5.86	32.21	4.08	2	3.59	ND	0	---	NM	NM	NM	---
6/29/2013	9.62	38.22	7.58	1.5	6.79	33.59	2.7	1.5	6.07	ND	0	---	NM	NM	NM	---
7/22/2013	11.16	39.04	6.76	1	7.14	33.91	2.38	1.5	9.68	ND	0	---	NM	NM	NM	---
8/26/2013	11.31	39.61	6.19	1	7.48	33.83	2.46	1	9.86	ND	0	---	NM	NM	NM	---
9/27/2013	11.17	40.63	5.17	1	7.23	34.39	1.9	1	9.57	ND	0	---	NM	NM	NM	---
10/31/2013	11.09	43.71	2.09	1	7.16	34.96	1.33	0.53	9.32	ND	0	---	21.63	NM	NM	---
11/27/2013	11.17	44.06	1.74	1	7.29	35.03	1.26	0.53	9.16	ND	0	---	NM	NM	NM	---
12/31/2013	11.02	44.62	1.18	1	7.16	35.16	1.13	0.5	8.97	ND	0	---	NM	NM	NM	---
1/30/2014	11.34	45.12	0.68	1	6.72	34.82	1.47	0.53	7.41	ND	0	---	NM	NM	NM	---
3/3/2014	11.17	44.32	1.48	1	6.53	34.52	1.77	0.53	7.16	ND	0	---	NM	NM	NM	---
3/31/2014	11.03	44.53	1.27	1	6.29	34.21	2.08	0.53	7.04	ND	0	---	NM	NM	NM	---
4/30/2014	10.92	44.26	1.54	1	6.42	34.67	1.62	0.53	6.88	ND	0	---	NM	NM	NM	---
5/27/2014	10.81	44.34	1.46	1	6.36	34.72	1.57	0.53	6.72	ND	0	---	NM	NM	NM	---
6/26/2014	10.72	44.61	1.19	1	6.21	34.61	1.68	0.53	6.52	ND	0	---	NM	NM	NM	---
7/31/2014	10.13	44.96	0.84	1	6.06	34.33	1.96	0.25	6.29	ND	0	---	19.06	ND	ND	---
Total DNAPL Pumped (gal)				***20***				***15.24***				***0***				***0***

	MW-41B				MW-44C				MW-45C				MW-46C			
DNAPL Recovery Date	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
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*
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*
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*
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*
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*
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
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
10/31/2013	9.52	38.16	6.65	2	20.17	70.75	0.05	0.066	22.59	70.42	0.18	0.13	22.41	72.34	0.56	0.2
11/27/2013	9.57	38.39	6.42	2	20.09	70.78	0.02	---	22.52	70.49	0.11	---	22.31	72.47	0.43	0.07
12/31/2013	9.42	39.36	5.45	2	20.01	70.8	PoP	---	22.39	70.46	0.14	---	22.03	72.53	0.37	0.07
1/30/2014	9.06	39.17	5.64	2	19.67	70.42	0.38	0.25	22.13	70.35	0.25	---	21.81	72.55	0.35	0.07
3/3/2014	8.62	38.06	6.75	2	19.29	70.17	0.63	0.25	21.86	70.09	0.51	---	21.57	72.05	0.85	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
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
5/27/2014	8.26	37.29	7.52	2	18.92	69.71	1.09	---	21.52	69.67	0.93	0.25	21.34	71.71	1.19	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
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
Total DNAPL Pumped (gal)				***35***				***4.316***				***3.38***				***3.79***

TABLE 1

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

	MW-57A				MW-57B				MW-70B				MW-75B				Approx
DNAPL Recovery Date	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)	DNAPL Recovered (gal)
2/14/2013	10.56	22.12	4.78	0.5	28.56	41.41	1.54	0.25	6.57	34.09	1.61	0.25	10.01	34.1	3.1	0.25	10.25
4/3/2013	10.32	24.79	2.11	0.5	28.09	42.36	0.59	0.25*	6.79	35.26	0.44	0.25	13.71	36.47	0.73	0.25	5.5
4/22/2013	10.71	25.85	1.05	0.5	27.06	42.17	0.78	0.25	6.06	35.12	0.58	0.25	9.72	36.72	0.48	0.25	3.25
5/30/2013	10.63	24.16	2.74	0.5	27.13	41.63	1.32	0.25	6.19	34.67	1.03	0.25	9.61	35.09	2.11	*0.75*	7.25
6/29/2013	12.16	23.82	3.08	2	18.26	42.07	0.88	0.25	8.01	34.92	0.78	0.25*	10.61	35.61	1.59	*0.75*	8.25
7/22/2013	13.21	23.05	3.85	2	16.34	41.67	1.28	0.75	8.22	34.07	1.63	0.25*	9.74	35.71	1.49	*0.75*	7.5
8/26/2013	12.91	25.32	1.58	1	18.01	42.31	0.64	0.25	8.17	35.09	0.61	0.25	10.76	35.93	1.27	0.75	7.5
9/27/2013	12.72	25.71	1.19	0.75	17.74	42.51	0.39	0.25	8.32	35.34	0.36	0.25	10.52	36.39	0.81	0.5	6.5
10/31/2013	12.72	25.92	0.98	1	17.61	42.61	0.29	0.07	8.26	35.39	0.31	0.07	10.31	36.47	0.73	1	6.07
11/27/2013	12.61	25.98	0.92	1	17.54	42.67	0.23	0.07	8.12	35.42	0.28	0.07	10.39	36.51	0.69	1	5.74
12/31/2013	12.46	26.09	0.81	1	17.36	42.74	0.16	0.07	7.89	35.51	0.19	0.07	10.13	36.72	0.48	1	5.71
1/30/2014	11.79	26.15	0.75	0.25	17.04	NM	PoP	---	7.84	35.06	0.64	0.07	12.62	36.49	0.71	0.75	5.52
3/3/2014	11.02	26.25	0.65	0.25	16.51	NM	PoP	---	7.09	35.05	0.65	0.13	12.12	36.35	0.85	0.75	5.16
3/31/2014	10.83	26.41	0.49	0.25	16.41	NM	PoP	---	6.87	35.17	0.53	0.07	12.01	36.27	0.93	0.75	5.23
4/30/2014	10.71	26.31	0.59	0.25	16.29	NM	PoP	---	6.72	35.01	0.69	0.07	11.84	36.02	1.18	0.75	5.35
5/27/2014	10.74	26.16	0.74	0.25	16.13	NM	PoP	---	6.64	34.86	0.84	0.07	11.71	35.79	1.41	0.75	4.85
6/26/2014	10.61	26.29	0.61	0.25	16.02	NM	PoP	---	6.52	34.97	0.73	0.25	11.58	35.91	1.29	0.5	5.28
7/31/2014	10.35	26.18	0.72	0.25	15.84	NM	PoP	---	6.26	34.76	0.94	0.25	11.32	35.82	1.38	0.5	5
Total DNAPL Pumped (gal)				***12.5***				***2.71***				***3.12***				***12***	***109.91***

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 measureable

FIGURES

EXPLANATION

- UPRR Property Boundary
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- B-TZ/B-CZ Monitoring Well Location
- C-TZ Monitoring Well Location
- D-TZ Monitoring Well Location
- Plugged and Abandoned Monitoring Well Location (May 2014)
- (0.84) In Well DNAPL Thickness (Ft)

N

Approx. Scale in Feet

0 200 400

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

HWPW

Englewood Intermodal Yard

MW-27A MW-27C MW-67B MW-53C MW-65D MW-28C MW-28A MW-63B MW-54C MW-66D MW-68C MW-26A MW-33BR (0) MW-36B MW-36D MW-45C (0.64) MW-68B MW-36A MW-44A MW-46C (1.47) MW-25C MW-25A MW-44C (1.43) MW-34CR (0) MW-33A MW-35B MW-35A MW-32AR MW-32B (1.96) MW-70B (0.94) MW-71B MW-34C MW-57A (0.72) MW-57B (0) MW-18C MW-58A MW-18A MW-60A MW-13 MW-15C MW-17 MW-30A MW-23C (2.14) MW-72B MW-47C MW-14 MW-15A MW-15B MW-17C MW-52A TW-56A MW-20A MW-31A MW-19C MW-55B MW-55A MW-73B MW-48C MW-38A MW-39B MW-74B MW-49B MW-12A MW-12C MW-40B MW-61A MW-16 MW-49A MW-38B MW-12B (0.84) MW-42B MW-79A TW-41B MW-62B MW-41B (6.89) MW-59A MW-59B MW-59D MW-69A MW-75B (1.38) P-11 MW-02 MW-01A MW-03 MW-10A MW-08 P-12 MW-78A (1.38) MW-80B MW-22A MW-10B MW-09 MW-22B MW-11B MW-11A P-10 MW-04 MW-07 MW-21C MW-05 MW-77A MW-24C MW-24B MW-24AR MW-64A MW-76C MW-50A MW-81B MW-51A MW-51C

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

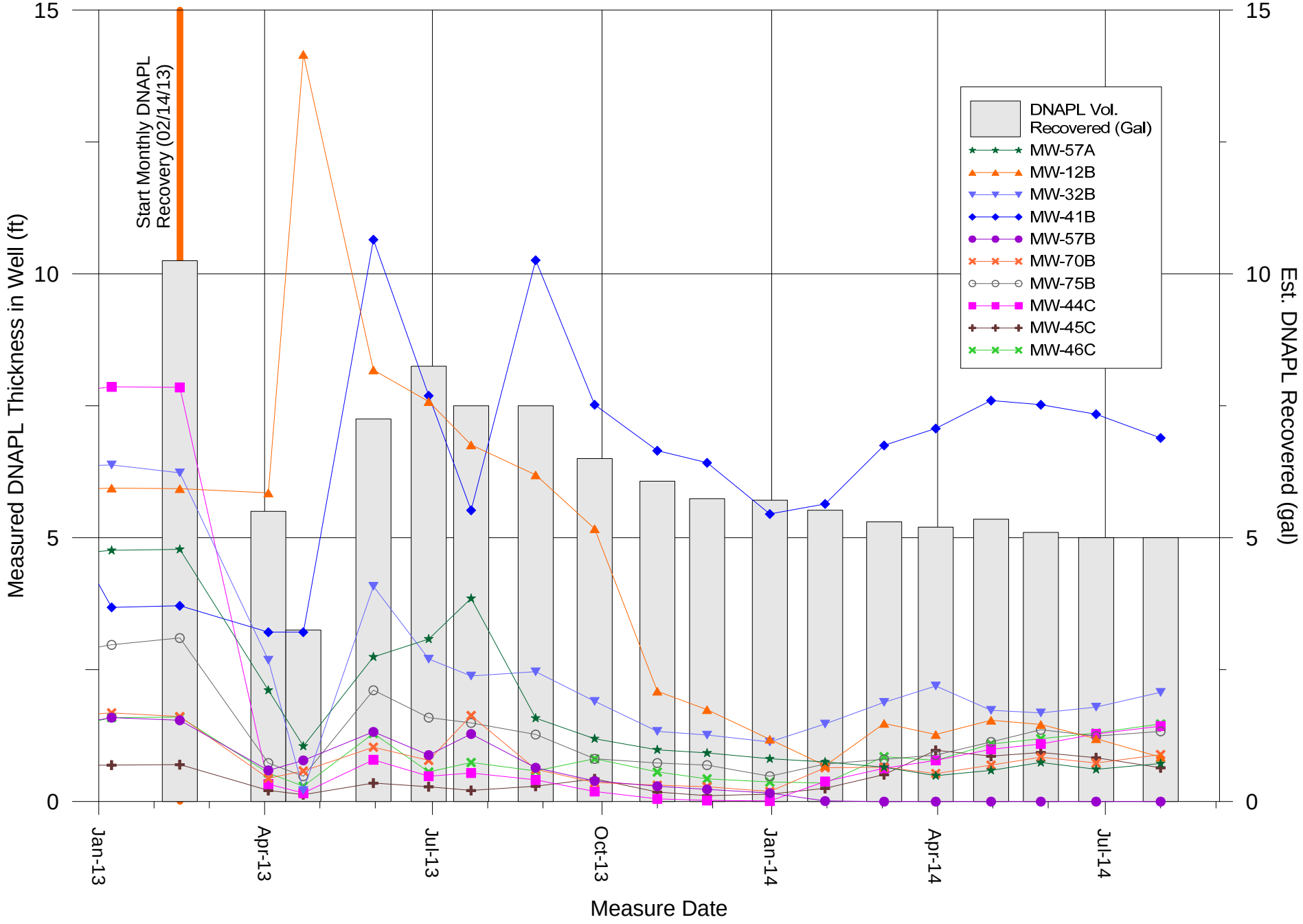
Figure 1

IN-WELL DNAPL THICKNESS JULY 2014

PROJECT: 1358	BY: ZGK	REVISIONS
DATE: SEPT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Figure 2
DNAPL Recovery Pilot Test February 2013 - July 2014
UPRR Houston Wood Preserving Works



ATTACHMENT A

WASTE MANIFESTS

#140113649O

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	TXD000820266 St ID	1	866.780.3116	012994934 JJK

GENERATOR

5. Generator's Name and Mailing Address
UNION PACIFIC RAILROAD
24125 ALDINE WESTFIELD ROAD
SPRING, TX 77373
Generator's Phone: 281.350.7197

Generator's Site Address (if different than mailing address)
UNION PACIFIC RAILROAD
4910 LIBERTY ROAD
HOUSTON, TX 77287

6. Transporter 1 Company Name
USA Waste Transportation Services
U.S. EPA ID Number
TXR000032045 St ID 86133

7. Transporter 2 Company Name
Clean Harbors Env. Services Inc
U.S. EPA ID Number
NJD039322270

8. Designated Facility Name and Site Address
Clean Harbors
2027 Battleground Road
Deer Park, TX 77571
Facility's Phone: 281-930-2300
U.S. EPA ID Number
TXD055141378 St ID 50089

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. NA3082, Environmentally Hazardous substances, liquid, n.o.s., 9, III, RQ (Creosote)	1	DM	200	P	0918 219H F034
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information USA Job/PO # 2469-TD-H156
.) CH629200; ERG#: 171;
1 X 55gl

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/Offeror's Printed/Typed Name: GEOFFREY REEDER
Signature: Geoffrey Reeder
Month 7 Day 7 Year 14

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Date leaving U.S.:
Transporter signature (for exports only):

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: L. DE. MONE' HATCH
Signature
Month 7 Day 7 Year 14

Transporter 2 Printed/Typed Name: Ben Shotts
Signature
Month 7 Day 5 Year 14

DESIGNATED FACILITY

18. Discrepancy
18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
U.S. EPA ID Number
18b. Alternate Facility (or Generator)
Facility's Phone:
Month Day Year
18c. Signature of Alternate Facility (or Generator)

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

1.	2.	3.	4.
H040			

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: Kirstin Hoffman
Signature
Month 07 Day 13 Year 14

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO DESTINATION STATE (IF REQUIRED)