PBW

Consulting Engineers
and Scientists

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March 29, 2011
PBW Project No. 1358

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

Re: Revised Updated Affected Property Assessment Report (APAR) Addendum
Union Pacific Railroad Company, Houston Wood Preserving Works
4910 Liberty Road, Houston, Texas
TCEQ SWR No. 31547; Hazardous Waste Permit and Compliance Plan No. 50343; EPA ID TXD000820266; CN No. CN600131098; RN No. RN100674613

Dear Mr. Arthur:

Pastor, Behling & Wheeler, LLC (PBW), on behalf of Union Pacific Railroad Company (UPRR), is pleased to provide an original and one copy of the Revised Updated Affected Property Assessment Report (APAR) Addendum for the UPRR Houston Wood Preserving Works Facility (the Site). The revised APAR Addendum was prepared in response to Texas Commission on Environmental Quality (TCEQ) comments discussed during a call on February 18, 2011. The enclosed revised APAR Addendum includes revised sections of the APAR (text changes highlighted in gray) with revised tables and figures. In addition, selected soil boring logs that had been previously submitted in the Updated APAR dated October 2010 were identified as being incomplete. The updated soil boring logs are provided in Appendix 2 of the revised APAR Addendum.

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.
Senior Hydrogeologist

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

Texas Commission on Environmental Quality

Remediation Division Correspondence Identification Form

SITE & PROGRAM AREA IDENTIFICATION			
SITE LOCATION		**REMEDIATION DIVISION PROGRAM AND FACILITY IDENTIFICATION**	
Site Name:	**Union Pacific Railroad Houston Wood Preserving Works**	Is This Site Being Managed Under A State Lead Contract? ☐ Yes ☑ No	
Address 1:	**4910 Liberty Road**	Program Area:	**IHW CORRECTIVE ACTION**
Address 2:		Mail Code:	**MC-127**
City: **Houston**	State: **Texas**	Is This A New Site To This Program Area? ☐ Yes ☑ No	
Zip Code: **77007**	County: **Harris**	**TCEQ Facility ID No.:**	**31547**
TCEQ Region:	**Region 12 - Houston**	**--Leave This Field Blank--**	**--Leave This Field Blank--**

DOCUMENT(S) IDENTIFICATION	
PHASE OF REMEDIATION	**DOCUMENT NAME**
1. ASSESSMENT	AFFECTED PROPERTY ASSESSMENT REPORT (APAR) REVISION
2.	
3.	
4.	
5.	

CONTACT INFORMATION

RESPONSIBLE PARTY/APPLICANT/CUSTOMER

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ENVIRONMENTAL CONSULTANT/REPORT PREPARER/AGENT

Name:	**Eric Matzner, P.G.**				
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TCEQ INTERNAL USE ONLY			
Document No.	TCEQ Database Term	Document No.	TCEQ Database Term
1.	**APAR REV**	4.	
2.		5.	
3.			

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Program ID No. (primary): SWR 31547 Report date: March 25, 2011

TCEQ Region No.: 12 MSD Certificate No.: NA

Additional Program ID Numbers.: SWR/Facility ID No.: SWR 31547 PST Facility ID No.: NA

DCRP ID No.: NA VCP ID No.: NA LPST ID No.: NA

MSW Tracking No.: NA HW Permit/CP No.: 50343 Enforcement ID No.: NA

Other ID Nos.: EPA ID No. TXD000820266

Reason for submittal (check all that apply):

- ☐ Initial submittal
- ☐ Revision
- ☒ Notice of Deficiency Letter
- ☐ Permit/Compliance Plan
- ☐ Voluntary response
- ☐ Enforcement/Agreed order
- ☐ Directive/NOV letter
- ☒ Other: Updated Addendum

On-Site Property Information

On-Site Property (Facility) Name: Union Pacific Railroad Houston Wood Preserving Works Site

Street no. 4910 Pre dir: ___ Street name: Liberty Street type: Rd Post dir: ___

City: Houston County: Harris County Code ___ Zip 77007

Nearest street intersection and location description: Site is located south of Liberty Rd. between Kashmere St. and Lockwood St., north of Lee St.

Latitude: Decimal Degrees (indicate one) North 29.787413 N

Longitude: Decimal Degrees (indicate one) West 95.321062 W

Contact Person for On-Site Property Information and Acknowledgment

Company Name or Person: Union Pacific Railroad

Contact Name: Mr. Geoffrey Reeder Title: Site Remediation Manager

Mailing Address: 24125 Aldine Westfield Road

City: Spring State: TX Zip: 77373 Phone: 281-350-7197

Email: GBREEDER@UP.COM Fax: (402) 233-2351

Person is: ☒ property owner ☐ property manager ☐ potential purchaser ☐ tenant ☐ operator ☐ other ___

By my signature below, I acknowledge the requirement of §350.2(a) that no person shall submit information to the executive director or to parties who are required to be provided information under this chapter which they know or reasonably should have known to be false or intentionally misleading, or fail to submit available information which is critical to the understanding of the matter at hand or to the basis of critical decisions which reasonably would have been influenced by that information. Violation of this rule may subject a person to the imposition of administrative, civil, or criminal penalties.

Signature of Person Name(print): Date:

Consultant Contact Person

Consultant Company Name: Pastor, Behling & Wheeler, LLC

Contact Person: Eric C. Matzner, P.G. Title: Senior Hydrogeologist

Mailing Address: 2201 Double Creek Drive, Suite 4004

City: Round Rock State: TX Zip: 78664

Phone: 512-671-3434 Fax: 512-671-3446 E-mail address eric.matzner@pbwllc.com

Professional Signatures and Seals

Professional Geoscientist

Eric C. Matzner, P.G.	0795	08/31/11
Professional Geoscientist	Geoscientist License number	Expiration date
Signature	Date	
512-671-3434	512-671-3446	eric.matzner@pbwllc.com
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Professional Engineer

Professional Engineer	P.E. License number	Expiration date
Signature	Date	
Telephone number	FAX number	E-mail

Registered Corrective Action Specialists (RCASs) and Corrective Action Project Managers (CAPMs)

For LPST sites only.

Registered Corrective Action Specialist	RCAS Registration number	Expiration date
Signature	Date	
Corrective Action Project Manager	CAPM Registration number	Expiration date
Signature	Date	
Telephone number	FAX number	E-mail

Seals, as applicable:

Executive Summary

Environmental Media	Actual or Probable Exposures On-Site?		Actual or Probable Exposures Off-Site?		Have notifications for actual or probable exposures been completed? (§350.55(e))		
	Yes	No	Yes	No	Yes	No	N/A
Soil	☒	☐	☒	☐	☒	☐	☐
Groundwater	☐	☒	☐	☒	☐	☐	☒
Sediment	☐	☒	☐	☒	☐	☐	☒
Surface Water	☐	☒	☐	☒	☐	☐	☒

Is there, or has there been, an affected or potentially affected water well? ☐ Yes ☒ No

If yes, what is the well used for? ______________________________

Actual land use: On-site: ☐ Res ☒ C/I Off-site affected property: ☒ Res ☐ C/I ☐ N/A

Land use for critical PCL determination: On-site: ☐ Res ☒ C/I Off-site affected property: ☒ Res ☐ C/I ☐ N/A

Did the affected property pass the Tier 1 ecological exclusion criteria checklist? ☒ Yes ☐ No

Affected groundwater-bearing unit(s) (in order from depth below ground surface), or uppermost groundwater-bearing unit if none affected

Unit No.	Name	Depth below ground surface (ft)	Resource Classification (1, 2, or 3)
1	ATZ	~4 ft to ~15 ft	Class 2
2	BTZ	~30ft to 40 ft	Class 2
3	CTZ	~60ft to 85 ft	Class 2
4	DTZ	~100ft to 125ft	Class 2

Assessment

Environmental Media		Assessment Levels Exceeded? On-Site?			Assessment Levels Exceeded? Off-Site?			Affected property defined to RAL?			Is COC extent stable or expanding?	General classes of COCs (VOCs SVOCs, metals, etc.)
		Yes	No	Not sampled	Yes	No	Not sampled	Yes	No	N/A		
Soil	Surface	☒	☐	☐	☒	☐	☐	☒	☐	☐	stable	SVOCs
	Subsurface	☒	☐	☐	☐	☒	☐	☒	☐	☐	stable	SVOCs
Groundwater		☒	☐	☐	☒	☐	☐	☒	☐	☐	stable	BTEX/SVOCs
Sediment		☐	☐	☒	☐	☐	☒	☐	☐	☒	Not Applicable	
Surface Water		☐	☐	☒	☐	☐	☒	☐	☐	☒	Not Applicable	

NAPL Occurrence Matrix

		NAPL Occurrence	***Description***
NAPL in vadose zone	☐	No NAPL in vadose zone	There is no direct or indirect evidence of NAPL in the vadose zone
	☒	NAPL in/on soil	NAPL detected in or on unsaturated, unconsolidated clay-, silt-, sand-, and/or gravel-dominated soils
	☒	NAPL in fractured clay	NAPL detected in fractures of unsaturated fine-grained soils
	☐	NAPL in fractured or porous rock	NAPL detected in unsaturated lithologic material
	☐	NAPL in karst	NAPL detected in karst environment
NAPL at capillary fringe	☐	No NAPL at capillary fringe	There is no direct or indirect evidence of NAPL at the capillary fringe
	☒	NAPL at capillary fringe	NAPL detected at vadose-saturated zone transition, capillary fringe (in contact with water table)
NAPL in saturated zone	☐	No NAPL in saturated zone	There is no direct or indirect evidence of NAPL in the saturated zone
	☒	NAPL in soil	NAPL detected in saturated unconsolidated clay-, silt-, sand-, and/or gravel-dominated soils
	☒	NAPL in fractured clay	NAPL detected in fractures of saturated fine-grained soil or other double-porosity sediments
	☐	NAPL in saturated fractured or porous rock	NAPL detected in saturated lithologic material
	☐	NAPL in saturated karst	NAPL detected in karst environment within the saturated zone
NAPL in surface water or sediment	☒	No NAPL in surface water or sediment	There is no direct or indirect evidence of NAPL in surface water or sediments
	☐	NAPL in surface water	NAPL detected in surface water at exceedance concentration levels or visual observation
	☐	NAPL in sediments	NAPL detected in sediments at exceedance concentration levels or visual observation via migration pathway or a direct release

Remedy Decision

Environmental Media		Critical PCL exceeded on-site?			Critical PCL exceeded off-site?			PCLE zones defined?			General class (VOCs, SVOCs, metals, etc.) of COCs requiring remedy
		Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	
Soil	Surface	☒	☐	☐	☒	☐	☐	☒	☐	☐	SVOCs
	Subsurface	☒	☐	☐	☐	☒	☐	☒	☐	☐	SVOCs
Groundwater		☒	☐	☐	☒	☐	☐	☒	☐	☐	BTEX/SVOCs
Sediment		☐	☐	☒	☐	☐	☒	☐	☐	☒	
Surface Water		☐	☐	☒	☐	☐	☒	☐	☐	☒	

NAPL Triggers[1]

NAPL Response Action Triggers		Description of Triggers
☐	No NAPL response action triggers	No NAPL triggers have been observed in any assessment zones (vadose, capillary fringe and saturated), nor in surface water or sediments
☐	NAPL vapor accumulation is explosive	NAPL vapors accumulate in buildings, utility and other conduits, other existing structures, or within anticipated construction areas at levels that are potentially explosive (≥ 25% LEL)
☐	NAPL zone expanding	NAPL zone is observed to be expanding using time-series data
☒	Mobile NAPL in vadose zone	NAPL zone is observably mobile, or is theoretically mobile based on COC concentrations and residual saturation
☐	NAPL creating an aesthetic impact or causing nuisance condition	NAPL is responsible for objectionable characteristics (e.g., taste, odor, color, etc.) resulting in making a natural resource or soil unfit for intended use
☐	NAPL in contact with Class 1 groundwater	NAPL has come in actual contact with saturated zone or capillary fringe of a Class 1 GWBU
☒	NAPL in contact with Class 2 or 3 groundwater	NAPL has come in actual contact with saturated zone or capillary fringe of a Class 2 or Class 3 GWBU
☐	NAPL in contact with surface water	Liquid containing COC concentrations that exceed the aqueous solubility in contact with surface water via various migration pathways or direct release to surface water
☐	NAPL in or on sediments	Liquid containing COC concentrations that exceed the aqueous solubility impact surface water sediments via migration pathway or a direct release

[1] NAPL Risk-Based Management evaluation provided in Appendix 11.

CONCLUSIONS AND RECOMMENDATIONS

Assessment Results

The following media have been evaluated for potential chemical of concern (COC) releases as part of investigations conducted at the Union Pacific Railroad (UPRR) Houston Wood Preserving Works Facility at 4910 Liberty Road, Houston, Texas, (the Site): surface soils, subsurface soils, and groundwater. Both the soil and groundwater exposure pathways were evaluated as part of the Site assessment and considered to be complete and/or anticipated to be complete.

The Site is located within unoccupied industrial land, and it is anticipated that the Site will remain commercial/industrial for the foreseeable future. The surrounding properties within a 500-foot radius of the Site, including the intermodal yard to the south of the former wood preserving works facilities, consist of residential to the northwest, north, southeast, and south. The UPRR Englewood Yard, commercial/industrial property, is located to the east of the Site. An area of undeveloped land and abandoned houses are located west of the Site. The 500-foot radius field survey demonstrated no current potential groundwater receptors within the residential neighborhood. No water wells, water tanks, cisterns, or windmills, or surface water bodies were encountered. The nearest surface water body is Buffalo Bayou, located approximately 1.6 miles southwest of the Site. The potential for lateral migration of groundwater from the Site to the southwest approximately 8,500 feet to Buffalo Bayou is not likely.

Geological logs from soil/monitoring well borings and cone penetrometer testing (CPT) borings were reviewed to evaluate the subsurface geology at the Site. The lithology at the Site is consistent with the published descriptions of the Beaumont Formation. Site stratigraphy from the ground surface to a depth of approximately 135 feet is separated into the following units: Fill Material (0-5 ft bgs), A-Cohesive Zone (A-CZ) (8 to 15 feet thick); A-Transmissive Zone (A-TZ) (4 to 21 feet thick); B-Cohesive Zone (B-CZ) (6 to 19 feet thick); B-Transmissive Zone (B-TZ) (discontinuous, where present, 3 to 10 feet thick); C-Cohesive Zone (C-CZ) (8 to 20 feet thick); C-Transmissive Zone (C-TZ) (10 to 13 feet thick); D-Cohesive Zone (D-CZ) (17 to 36 feet thick); and D-Transmissive Zone (D-TZ).

A total of 94 groundwater monitoring wells and three temporary wells have been installed on and off-site in the various transmissive zones. Groundwater in A-TZ and B-TZ generally flows across the Site to the east; groundwater flow in the C-TZ flows from northeast to southwest, and groundwater flow in the D-TZ appears to flow to the northwest.

Target COCs in soil and groundwater media were evaluated using the March 2010 TCEQ TRRP Residential PCLs, or Residential Assessment Levels (RALs) to establish the Affected Property. Surface and subsurface soil data collected from 1997 through June 2010 were evaluated to assess COC exceedances in soil. Groundwater data from the most recent sampling events (January and June/July 2010) were evaluated to assess COC exceedances in groundwater.

Comparing the surface and subsurface soil analytical data to the RALs (lowest PCL between $^{Tot}Soil_{Comb}$ and $^{GW}Soil_{Ing}$ (Tier 1 and 2)), concentrations of the following COCs exceeded their respective RALs in the surface and subsurface soils:

Surface Soils

- 1,2-Diphenylhydrazine
- 2,4-Dinitrotoluene
- 2-Methylnaphthalene
- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Dibenzofuran
- Fluoranthene
- Naphthalene
- Pentachlorophenol
- Phenanthrene

Subsurface Soils

- 2,4-Dimethylphenol
- 2-Methylnaphthalene
- Benzene
- Dibenzofuran
- Naphthalene
- Pentachlorophenol

Comparing the maximum groundwater analytical data from the 2010 groundwater sampling events to RALs, concentrations of 24 target COCs exceeded their respective RALs or had a SDL greater than the RAL (>SDL):

VOCs

- 1,2-Dichloroethane (A-TZ only)
- 1,2-Diphenylhydrazine (B-CZ, and >SDL in one C-TZ well)
- Benzene (A-TZ, B-TZ, C-TZ)
- Dichloromethane (A-TZ and C-TZ, possible lab contaminant)
- Toluene (A-TZ only)
- Vinyl Chloride (A-TZ, only one well)

SVOCs

- 2,4-Dimethylphenol (A-TZ and B-CZ)
- 2-Methylnaphthalene (A-TZ, B-TZ, C-TZ)
- 2,4-Dinitrotoluene (>SDL, only one C-TZ well)
- 2,6-Dinitrotoluene (>SDL, only one C-TZ well)
- 4,6-Dinitro-2-methylphenol (>SDL, only one C-TZ well)
- Acenaphthene (A-TZ and C-TZ only)
- Benzo(a)pyrene (A-TZ, B-TZ, C-TZ)
- Bis(2-chloroethoxy)methane (>SDL, only one C-TZ well)

SVOCs

- Bis(2-ethylhexyl)phthalate (B-CZ, possible lab contaminant)
- Chrysene (A-TZ and C-TZ)
- Dibenzofuran (A-TZ, B-TZ, C-TZ)
- Fluoranthene (A-TZ and C-TZ)
- Fluorene (A-TZ and C-TZ)
- Naphthalene (A-TZ, B-TZ, C-TZ)
- Pentachlorophenol (A-TZ and C-TZ)
- Phenanthrene (A-TZ and C-TZ)
- Phenol (A-TZ only)
- Pyrene (A-TZ and C-TZ)

For the purposes of screening COCs, the 34 site-specific COCs were retained for PCL development. An additional 28 VOCs (a total of 64 COCs) were evaluated in groundwater samples collected in January 2010 from wells MW-18A, MW-57A, MW-58A, and TW-56A near SWMU No. 8. Twenty-seven of the twenty-eight additional VOCs were screened from further PCL development because the COCs were not detected or were detected in at least one sample and the detected concentrations and reporting limits or sample detection limits (SDLs) were less than the RALs for that COC in the medium and all other sampled media. The only VOC that is not on the site-specific list that was detected in groundwater above the applicable RAL was vinyl chloride in MW-18A. Since this is the first, unverified detection of vinyl chloride in groundwater at the Site, vinyl chloride will be resampled from these four A-TZ wells during the next scheduled groundwater monitoring event to verify the PCL exceedance.

Critical soil PCLs were established for the Site by using the lowest of commercial/industrial PCLs for on-site soils and residential PCLs for off-site soils for the following pathways: ${}^{Tot}Soil_{Comb}$; ${}^{Air}Soil_{Inh\text{-}V}$ (Tier 1); and ${}^{GW}Soil_{Ing}$ (Tier 1 or 2). Comparing the maximum surface and subsurface soil analytical data to the critical commercial/industrial PCLs for on-site and residential PCLs for off-site, concentrations of the following COCs exceeded their respective critical PCLs:

On-Site

Surface Soils

- 1,2-Diphenylhydrazine
- 2,4-Dinitrotoluene
- 2-Methylnaphthalene
- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Dibenzofuran
- Naphthalene

Subsurface Soils

- 2-Methylnaphthalene
- Benzene
- Naphthalene

Surface Soils
- Pentachlorophenol

Subsurface Soils

Off-Site

Surface Soils
- Benzo(a)anthracene
- Benzo(a)pyrene

Subsurface Soils
- None

Groundwater analytical data were compared to the TCEQ TRRP Residential Groundwater PCLs, dated March 2010, assuming the source area greater than 0.5 acre in size (30-acre source area). Critical PCLs were established as the lesser value between residential ${}^{GW}GW_{Ing}$ and ${}^{Air}GW_{Inh\text{-}V}$ PCLs for both on-site and off-site. The January 2010 and June/July 2010 groundwater analytical data were evaluated for establishing the groundwater PCLE zone. Of the site-specific COCs analyzed in groundwater, concentrations of 21 target COCs exceeded their respective critical PCLs (cPCLs):

VOCs
- 1,2-Dichloroethane
- Benzene
- Dichloromethane
- Toluene
- Vinyl Chloride*

SVOCs
- 1,2-Diphenylhydrazine*
- 2,4-Dimethylphenol
- 2-Methylnaphthalene
- Acenaphthene
- Benz(a)anthracene
- Benzo(a)pyrene
- Bis(2-ethylhexyl)phthalate
- Chrysene
- Dibenzofuran
- Fluoranthene
- Fluorene
- Naphthalene
- Pentachlorophenol
- Phenanthrene
- Phenol
- Pyrene

* - first time PCL exceedance, will be resampled and verified.

Groundwater data collected from the Site monitoring wells in the four transmissive zones (A-TZ, B-TZ, C-TZ, and D-TZ) from 2008 through 2010 show that the overall groundwater PCLE plumes in each zone are relatively stable with no indication of plume expansion or migration. Additional groundwater data will need to be collected from the B-CZ monitoring wells to evaluate changes over time in the PCLE zone.

NAPL Discussion

NAPL in the Vadose Zone

The vadose zone (ground surface to 15 feet bgs, or top of the A-TZ if encountered shallower than 15 feet bgs) was evaluated using Cone Penetrometer Testing/Rapid Optical Screening Tool (CPT/ROST) data and soil boring logs at the Site to identify potential areas where NAPL may be present. To evaluate areas of elevated ROST readings (units of percent response (%RE)) in the vadose zone, ROST readings in the CPT borings greater than 25% RE were contoured. ROST readings greater than 25% RE do not necessarily indicate presence of NAPL; however, some soil borings located near CPT/ROST borings with ROST readings greater than 25% RE generally had some NAPL or staining observed in that soil boring. Most of the areas with elevated ROST/LIF readings in the vadose zone have been in around the Recent and Original Process Areas (SWMU Nos. 4 and 5), and around the AST Area (SWMU No. 8). The highest ROST readings were located near SWMU No. 8, where creosote and drying agents were stored. Soil borings where NAPL was observed were generally located in an around the Original Process Area (SMWU No. 5) and along the Southern Drainage Ditch (SWMU No. 2) (Figure 4D).

NAPL in the GWBUs

DNAPL and LNAPL are evaluated for each of the monitoring wells at the Site. During previous sampling events, light NAPL (LNAPL) was observed at A-TZ in temporary well TW-02 within the AST Area (SWMU No. 8); however, no LNAPL was observed in January or July 2010 at this location. DNAPL was encountered in wells completed in the A-TZ, B-TZ, B-CZ, and C-TZ. However, the thicknesses of DNAPL in the wells in these units do not represent actual thicknesses in the GWBU. The monitoring wells generally extend below the lower confining unit and typically have at least a 0.5-foot to 2.5-foot sump at the bottom of the well, which allows DNAPL to collect in the bottom of the well. With the well screen extending below the base of the confining unit in many cases, in-well DNAPL thicknesses are exaggerated as the bore hole and well materials below the confining layer act as a collection sump for DNAPL in the transmissive zone. Monitoring wells may also intersect DNAPL-containing fractures that have fluid pressures that indicate DNAPL at a given elevation rather than a saturated thickness in the formation.

DNAPL is present in A-TZ monitoring wells on the northern edge (MW-17) and off site to the north (MW-32A). DNAPL was measured in MW-32A at 7.14 feet and 2.95 feet thick (in-well thickness) in January and July 2010, respectively. The decrease in DNAPL thickness from January to July 2010 is a result of the monthly DNAPL recovery pilot test that began in May 2010. The DNAPL near MW-32A appears to be delineated to the north based on the ROST response for CPT-36R-08. DNAPL was measured in well MW-57A for the first time in July 2010 with an in-well thickness of 2.55 feet (Figure 5A-10).

DNAPL has been detected in the B-TZ along the western boundary of the Site at MW-12B and MW-41B. During the 2010 monitoring events, DNAPL present in the B-TZ on the west side of the Site had a maximum in-well thickness of 21.15 feet observed at MW-41B, with MW-12B having a measured thickness of 8.34 feet in January 2010. With the DNAPL recovery pilot test beginning in May 2010, the in-well DNAPL thicknesses measured in July 2010 in these two wells ranged from 4.3 feet in MW-41B to 3.85 feet in MW-12B. DNAPL has not been detected in monitoring wells MW-38B, MW-39B, MW-40B, TW-41B (located approximately 50 feet from MW-41B), and P-11, which indicates sufficient horizontal delineation of the DNAPL in the B-TZ.

DNAPL was detected in one of the wells completed in the aquitard B-CZ located off site to the north of the Recent Process Area. Approximately 7.24 feet of DNAPL (in-well thickness) was observed at MW-33B in January 2010. During the July 2010 monitoring event, an obstruction was encountered in the well that prevented access to the bottom of the well to gauge the DNAPL.

DNAPL is present in the C-TZ extending from the northeast side of the Site at MW-23C to approximately 900 feet off site to the northeast near MW-46C. During the 2010 monitoring events, DNAPL was observed in on-site monitoring well MW-23C, and off-site monitoring wells MW-25C (no DNAPL detected in July 2010), MW-34C (only gauged in January 2010), MW-44C, MW-45C, and MW-46C. Maximum DNAPL in-well thicknesses observed in the C-TZ during the 2010 sampling events was 9.29 feet at MW-45C, with the thickest DNAPL measured in on-site well MW-23C at 1.70 feet (January 2010). DNAPL thicknesses measured in the wells in July 2010 were less than the measurements in January 2010 as a result of the DNAPL recovery pilot test.

Response Actions

Based on the additional investigation activities discussed in this APAR Addendum, COCs in the affected media are delineated both on-site and off-site.

The future land use for the Site is assumed to be classified as commercial/industrial. The Site is covered with crushed gravel and concrete, but has the potential for human health exposure to COCs in the surface soils. UPRR will evaluate developing a response action to address the surface and subsurface soil PCLE zones at the Site in the Response Action Plan (RAP). To address the groundwater PCLE zone, a Plume Management Zone (PMZ) will likely be established with a demonstration of recoverability for the DNAPL that will be provided in the RAP.

UPRR is currently evaluating semi-annual groundwater monitoring for selected wells (i.e., off-site and downgradient perimeter wells) and annual groundwater monitoring to monitor geochemical trends and evaluate monitored natural attenuation of COCs in groundwater for establishing the PMZ. Details of the groundwater monitoring plan will be included in the RAP.

CHRONOLOGY

Below is a summary of the site investigation and regulatory chronology at the UPRR Former Houston Wood Preserving Works facility (the Site).

Date	Description
January 2011	Pastor, Behling & Wheeler, LLC (PBW) conducts site-wide groundwater sampling event.
October 22, 2010	PBW submits the Updated Affected Property Assessment Report (APAR) Addendum to the Texas Commission on Environmental Quality (TCEQ).
June/July 2010	PBW conducts additional soil (along northeast portion of Site) and groundwater investigation (A-TZ, B-CZ, C-TZ and D-TZ wells); including site-wide groundwater monitoring event.
February 16, 2010	UPRR Response to TCEQ Comment Letter dated November 18, 2009.
January 2010	PBW conducts site-wide groundwater sampling event; selected wells are analyzed for Volatile Organic Compounds (VOCs) by EPA Method 8620.
November 18, 2009	TCEQ Comment Letter on Revised APAR.
July 2009	PBW submits APAR Addendum to TCEQ.
January 2009	PBW conducts additional soil and groundwater investigation.
July 2008	PBW conducts additional CPT-ROST and groundwater investigation
January 2007	PBW conducts additional soil and groundwater investigation
August 2006	ERM-Southwest, Inc. (ERM) conducted additional soil and groundwater investigation
April 2006	ERM conducted additional soil and groundwater investigation
September 6, 2005	UPRR Response to TCEQ Response Letter dated August 1, 2005
August 2005	TCEQ Response to UPRR Response Letter dated June 9, 2005
June 9, 2005	UPRR Response to TCEQ Letter dated April 15, 2005
April 15, 2005	TCEQ Response to UPRR Response Letter dated November 19, 2004
November 19, 2004	UPRR Response to October 8, 2004 TCEQ Letter
October 8, 2004	TCEQ Comment Letter on Revised APAR
June 10, 2004	Revised APAR submitted to the TCEQ by ERM, Inc. on behalf of UPRR
November 7, 2001	Texas Natural Resources Conservation Commission (TNRCC) provides

Date	Description
	comments to July 5, 2001 response letter.
July 5, 2001	Follow-up response to November 6, 2000 TNRCC comment letter on the On-Site APAR submitted to TNRCC on behalf of UPRR.
January 9, 2001	Initial response to November 6, 2000 TNRCC comments.
November 6, 2000	TNRCC provides comments to On-Site APAR.
July 10, 2000	Affected Property Assessment Report for On-Site Property (On-Site APAR) submitted to TNRCC on behalf of UPRR by ERM.
February 20, 2000	Letter submitted to the TNRCC regarding proposed Phase 2-C investigation for further delineation of off-site areas
September 10, 1999	Phase 2-B RFI/EOC Investigation Report submitted to TNRCC on behalf of UPRR by ERM
April 27, 1998	Interim Stabilization Measures Report – Southern Drainage Ditch, submitted to TNRCC on behalf of UPRR by ERM.
February 13, 1998	Phase 2-A RFI/EOC Investigation Report submitted to TNRCC on behalf of UPRR by ERM.
January 13, 1997	RFI portion of the Phase 1 RFI/EOC Investigation Report approved by TNRCC
November 26, 1996	EOC portion of the Phase 1 RFI/EOC Investigation Report approved by TNRCC
May 23, 1996	Phase 1 RFI/EOC Report submitted on behalf of Southern Pacific Transportation Company (SPTCo) by Terranext
October 16, 1995	RFI Work Plan approved by TNRCC
September 29, 1995	EOC Work Plan approved by TNRCC
January 10, 1995	Operation and Maintenance Plan approved by TNRCC
November 3, 1994	Revised Compliance Schedule approved by TNRCC
October 14, 1994	RCRA Facility Investigation (RFI) Work Plan submitted on behalf of SPTCo
September 16, 1994	Extent of Contamination (EOC) Work Plan submitted on behalf of SPTCo
September 7, 1994	Revised Compliance Schedule submitted on behalf of SPTCo
August 19, 1994	Operation and Maintenance Plan and Compliance Schedule submitted on behalf of SPTCo
June 20, 1994	Permit No. HW-50343-000 and Compliance Plan CP-50343-000 issued by TNRCC.

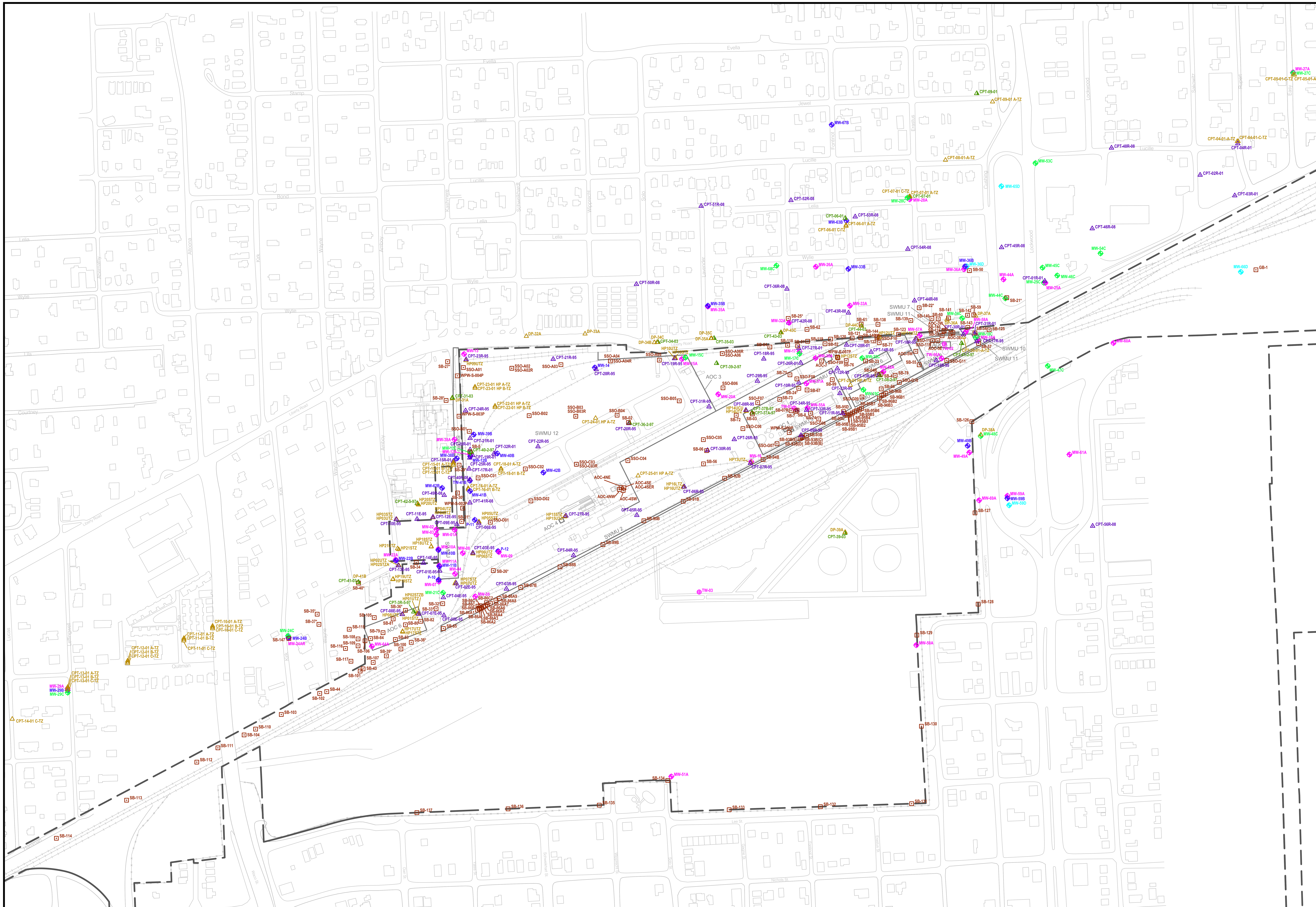
Date	Description
October 1993	RCRA Facility Assessment completed on behalf of U.S. EPA by PRC Environmental Management, Inc.
May 13, 1991	RCRA Permit Application submitted by SPTCo

NOTE: The above summary does not include routine activities such as Semiannual Ground Water Monitoring events and reporting.

AFFECTED PROPERTY ASSESSMENT REPORT ADDENDUM

UPRR Houston Wood Preserving Works
Houston, Texas

1.0 Figures



EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- B-TZ Monitoring Well Location
- C-TZ Monitoring Well Location
- D-TZ Monitoring Well Location
- A-TZ Temporary Monitoring Well Location
- CPT with Rost Location
- CPT Location
- Hydropunch Sample Location
- Soil Boring Location

Note:
* Soil analytical data rejected by validator.

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

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 1A

ON-SITE PROPERTY MAP

PROJECT: 1358	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

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

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure 1B

AFFECTED PROPERTY MAP

PROJECT: 1358	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

SECTION 4.0 SOIL ASSESSMENT

Section 4.1 Derivation of Assessment Levels

The surface soil and subsurface soil assessment levels were selected based on the current and future land use and potential receptors at the Site. To clarify the assessment of the Affected Property both on-site and off-site, surface soils were evaluated using data from samples collected within 0 to 15 feet bgs and subsurface soils were evaluated using data from samples collected from below 15 feet bgs to the top of the uppermost groundwater bearing unit (GWBU), A-TZ Unit. Since the residential properties surround the Site, RALs were used to evaluate COCs and establish the Affected Property for both on-site and off-site areas.

Based on the evaluation of potentially complete exposure pathways, the following soil-related residential pathways were assessed at the Site:

- $^{Tot}Soil_{Comb}$ (surface soils);
- $^{Air}Soil_{Inh\text{-}V}$ (subsurface soils); and
- $^{GW}Soil_{Ing}$ (Tier 1 and Tier 2) (surface and subsurface soils).

The $^{Tot}Soil_{Comb}$ pathway was evaluated as potentially complete since although the Site is partially covered with crushed gravel and soil, potential future construction activities could occur at the Site. Based on the expedited stream evaluation (ESE) discussed in the APAR Addendum and approved by the TCEQ, the ecological pathway was considered incomplete (PBW, 2009).

RALs for potential COCs in the surface and subsurface soils were developed using TCEQ TRRP Tier 1 Residential Soil PCLs dated March 2010, assuming a source area of 30 acres in size, and Tier 2 PCLs were calculated using site-specific data. Details of the Tier 2 PCLs are discussed in Section 11, with calculations, equations, and supporting documentation for Tier 2 $^{GW}Soil$ PCLs in Appendix 9. For establishing the Affected Property, RALs were selected as the lesser value between the $^{Tot}Soil_{Comb}$ PCL and the $^{GW}Soil_{Ing}$ PCL (Tier 1 or 2) for surface soils (0 to 15 feet bgs on-site and off-site), and the lesser value between the $^{Air}Soil_{Inh\text{-}V}$ PCL and the $^{GW}Soil_{Ing}$ PCL (Tiers 1 or 2) for subsurface soils (>15 feet bgs on-site and off-site). For the subsurface soil PCL evaluation, only soil samples collected below 15 feet bgs and above the saturated uppermost GWBU (A-TZ) were used in accordance with the TRRP definition for subsurface soils (30 TAC §350.4(a)(86)). Soil samples collected from the saturated GWBUs or aquitards below those units were not used for evaluating the subsurface soil Affected Property or PCLE Zone. Details of the nature and extent of the COCs in soil are discussed in the following sections.

Section 4.2 Nature and Extent of COCs and NAPL in Soil

This APAR Addendum incorporates the soil data collected during the 2010 investigation activities with data collected as part of the original APAR (ERM, 2000), Revised APAR (ERM, 2004), and APAR Addendum (PBW, 2009) into the assessment of the Affected Property. Additional surface and subsurface soils collected at the Site in 2010 were sampled and analyzed for the list of 34 site-specific COCs (Table 4A). A summary of soil analytical data from 2010 as well as previously submitted soil analytical data are presented on the following tables:

Table	Description
4D-1 & 4D-2	Summary of Surface Soil Sampling Results
4D-3	Summary of Subsurface Soil Sampling Results

Comparing the maximum concentrations detected in surface and subsurface soils to Commercial/Industrial PCLs (on-site focused assessment) and RALs (lowest PCL between $^{Tot}Soil_{Comb}$ and $^{GW}Soil_{Ing}$ (Tier 1 and 2)), concentrations of the following COCs that were not screened out (see Section 10.0 for details) exceeded their respective assessment levels in the surface and subsurface:

Surface Soils
- 1,2-Diphenylhydrazine (Figure 4A-1)
- 2,4-Dinitrotoluene (Figure 4A-2)
- 2-Methylnaphthalene (Figure 4A-3)
- Benzene (Figure 4A-4)
- Benzo(a)anthracene (Figure 4A-5)
- Benzo(a)pyrene (Figure 4A-6)
- Dibenzofuran (Figure 4A-7)
- Fluoranthene (Figure 4A-8)
- Naphthalene (Figure 4A-9)
- Pentachlorophenol (Figure 4A-10)
- Phenanthrene (Figure 4A-11)

Subsurface Soils
- 2,4-Dimethylphenol (Figure 4B-1)
- 2-Methylnaphthalene (Figure 4B-2)
- Benzene (Figure 4B-3)
- Dibenzofuran (Figure 4B-5)
- Naphthalene (Figure 4B-6)
- Pentachlorophenol (Figure 4B-7)

The figures listed above were updated for the assessment of the Affected Property to include surface soils from 0 to 15 feet and subsurface soils from 15 feet to the uppermost GWBU. Concentrations shown on these figures are based on the highest concentration detected in the media (i.e., if multiple sample collected in the surface soils (0 to 15 feet bgs), the highest concentration was used for the Affected

Property evaluation). Soil cross sections present both the lithology for the Site and the distribution of COCs in the surface and subsurface soils (Figure 11C-1 through 11C-3). Based on the additional samples collected in 2010, COCs in surface and subsurface soils were delineated on Site to the appropriate critical PCLs or RALs.

With the focus of the additional soil sampling conducted in 2010 along the northeast perimeter of the Site, extents of the COCs detected in surface and subsurface soils in that area are discussed below.

Surface Soils

The updated summary of surface soil data using data collected in June 2010 is provided on Table 4D-1. Figure 4A-12 presents COCs that exceed RALs within and along the northeast corner of the Site. As shown on Figure 4A-12, COCs were delineated to RALs along the north side of Liberty Street across from SWMU Nos. 6, 7, 8, 10 and 11. One surface soil sample, SB-60(0-0.5ft) had a benzo(a)pyrene detection at 0.733 mg/Kg above the RAL of 0.54 mg/Kg; however, the detection is likely from historical asphalting of Liberty Road and not from activities at the Site. This conclusion is further supported by the seven surface soil samples collected along the north side of Liberty Road (SB-138 through SB-142, SB-59, and SB-61) where the detections of COCs were less than RALs.

Along the Site property boundary to the north, surface soil samples from SB-123, MW-57A, SB-143, and SB-145 had benzo(a)pyrene concentrations greater than the RAL (0.56 mg/Kg), ranging from 2.6 mg/Kg (SB-123(0.5-2.5)) to 4.3 mg/Kg (SB-145(1.5-2.5)). However, based on the conceptual site model that the on-site surface soils were impacted from spills and releases from operations at the Site (PBW, 2009), surface soil impacts would not be likely have migrated across Liberty Road. Therefore, the surface soil Affected Property in this area is defined by the southern edge of Liberty Road (Figure 4A-12).

In response to the TCEQ comments (Comment No. 9, TCEQ, 2009) on the APAR Addendum (PBW, 2009), soil boring SB-147 was drilled adjacent to monitoring well MW-24AR to evaluate potential creosote impacts along Kirk Street southwest of the Site. The soil boring log describing the lithology is provided in Appendix 2. Two soil samples were collected (2 to 2.9 feet and 13 to 14.3 feet) from boring SB-147 and analyzed for the site-specific COC list. Analytical results are summarized on Table 4D-1. No COCs were detected above MQLs in these samples (except methylene chloride, which is a common laboratory contaminant (as cited in 30 TAC§350.71(k)(2)(B)).

Through an evaluation of the Site historical surface soil data for evaluating the Affected Property, surface soil samples (0-15 feet bgs) collected from temporary well points TW-01, TW-02, TW-03 in 2007 were included in the previous APAR Addendum (October 2010) in the subsurface soil evaluation (for samples collected from 5 to 15 ft bgs) instead of the surface soil evaluation for establishing the Affected Property. Therefore, Figures 4A-1 through 4A-11 and 4B-1 through 4B-7 were revised to include the deeper soil samples from these temporary well points (TW-01(10-12), TW-02(10-12.5), and TW-03(11-15)) as part of the surface soil Affected Property evaluation. As a result, the Affected Property for benzo(a)anthracene (Figure 4A-5) and benzo(a)pyrene (Figure 4A-6) was extended into the intermodal yard including the area of the former waste water lagoon and crude oil tank area to account for assessment level exceedances, specifically ${}^{Tot}Soil_{Comb}$, in the deeper surface soil sample from TW-03(11-15). The shallower soil sample from TW-03 (2-5) did not have any COCs detected above PCLs. For establishing the PCLE Zone, these three deeper samples were considered subsurface samples (>5 ft bgs) with the property considered commercial/industrial land use, and results were less than critical PCLs.

<u>Subsurface Soils</u>

Subsurface soil samples from soil borings drilled in June 2010 along the northeast portion of the Site were collected and analyzed for site-specific COCs to evaluate lateral delineation of the COCs in subsurface soils off site. Analytical data of the subsurface soils are summarized on Table 4D-2, and presented on (Figures 4B-1 through 4B-7). Of the six subsurface soil samples collected in the northeast portion of the Site (SB-138(16-16.9), SB-141(16-17.1), SB-142(16-16.9), SB-143(18-18.7), SB-144(16-16.9), and SB-145(16-17.4)), none of the site-specific COCs were detected in the samples at concentrations greater than subsurface soil RALs.

NAPL Evaluation

Since 1995, site investigations have included activities to evaluate surface and subsurface soils for the presence of NAPL. Specifically, Cone Penetrometer Testing/Rapid Optical Screen Tool (CPT/ROST) investigations were conducted in 1995, 2001, and 2008 at the Site using laser-induced fluorescence (LIF) as a tool to evaluate the presence of NAPL. A total of 75 CPT/ROST locations have been drilled at and around the Site (Figure 1A). CPT/ROST borings that intersect the geologic cross section lines are posted on Figures 4C-1 through 4C-4.

ROST/LIF method is used as qualitative screening data to estimate the approximate *in situ* distribution of petroleum hydrocarbon NAPL based on the fluorescence response induced in the PAH compounds, which are commonly found in creosote. ROST/LIF results do not conclusively indicate NAPL is present at a location given the qualitative nature of the screening tool. However, NAPL has been detected in soil borings drilled at the Site in areas where elevated ROST responses were observed, and also NAPL has been detected in monitoring wells completed in the A-TZ, B-TZ, B-CZ, and C-TZ zones where elevated ROST responses were also observed.

The vadose zone (ground surface to the top of the A-TZ (generally between 15 and 20 feet bgs)) was evaluated using ROST data and soil boring logs at the Site to identify potential areas where NAPL may be present. To evaluate areas of elevated ROST readings (units of fluorescence percent response (%RE)) in the vadose zone, ROST readings in the CPT borings greater than 25% RE were contoured, as shown on Figure 4D. ROST readings greater than 25% RE do not necessarily indicate presence of NAPL; however, some soil borings located near CPT/ROST borings with ROST readings greater than 25% RE generally had some NAPL or staining observed in that soil boring. In addition to the contoured ROST readings in the vadose zone, soil borings where NAPL was documented on the boring logs in the vadose zone are highlighted on Figure 4D. The ROST readings and NAPL observations in soil borings are also presented on the surface/subsurface cross sections (Figure 11C-1).

Most of the areas with elevated ROST/LIF readings have been in around the former process areas (SWMU Nos. 4 and 5), and around the AST Area (SWMU No. 8) (Figure 4D). The highest ROST readings were located near SWMU No. 8, where creosote and drying agents were stored. A more detailed discussion of NAPL occurrence in the groundwater-bearing zones is provided in Section 5.2. Soil borings where NAPL was observed were generally located in an around the Original Process Area (SMWU No. 5) and along the Southern Drainage Ditch (SWMU No. 2) (Figure 4D-1).

Steps 2 (Identify NAPL Response Triggers) and 3 (Determine NAPL Response Objectives and Endpoints) as part of the Risk-Based NAPL Management in accordance with TCEQ TRRP-32 Risk-Based Management guidance document are detailed in Appendix 11A.

AFFECTED PROPERTY ASSESSMENT REPORT ADDENDUM

UPRR Houston Wood Preserving Works
Houston, Texas

4.0 Tables

TABLE 4A

SURFACE SOIL RESIDENTIAL ASSESSMENT LEVELS WITH NO ECOLOGICAL COMPONENT
UPRR HOUSTON WOOD PRESERVING WORKS

COC	Source area size (acres)	$^{Tot}Soil_{comb}$ PCL[1] (mg/kg)	$^{GW}Soil_{Ing}$ PCL[2] (mg/kg)		Residential Assesment Level (mg/l)		MQL (mg/kg)	Maximum Surface Soil Concentration Sample ID	(feet bgs)	Sample Date	Concentration (mg/kg)	Notes
			(mg/kg)	Tier	(mg/l)	exposure pathway						
Site-Specific COCs												
1,2-Dichloroethane	30	6.4E+00	3.1E-02	2	3.1E-02	$^{GW}Soil_{Ing}$	0.62	HWPW-MW18-S00	1	2/26/1997	<0.62U	SQL is greater than RAL
Benzene	30	4.8E+01	1.0E-01	2	1.0E-01	$^{GW}Soil_{Ing}$	0.005	SB-93B (3.5-4')	4-4	8/25/2006	0.206	
Chlorbenzene	30	3.2E+02	6.5E+00	2	6.5E+00	$^{GW}Soil_{Ing}$	0.62	HWPW-MW18-S00	1	2/26/1997	<0.62U	
Ethylbenzene	30	4.0E+03	4.4E+01	2	4.4E+01	$^{GW}Soil_{Ing}$		TW-02(10-12.5)	10-12.5	3/12/2007	8.49	
Methylene chloride	30	2.6E+02	2.2E-02	2	2.2E-02	$^{GW}Soil_{Ing}$	0.62	HWPW-MW18-S00	1	2/26/1997	<0.625U	SQL is greater than RAL
Toluene	30	5.6E+03	4.3E+01	2	4.3E+01	$^{GW}Soil_{Ing}$		TW-02(10-12.5)	10-12.5	3/12/2007	9.02	
Xylenes (tot)	30	7.5E+02	7.3E+02	2	7.3E+02	$^{GW}Soil_{Ing}$		TW-02(10-12.5)	10-12.5	3/12/2007	54.9	
1,2-Diphenylhydrazine	30	5.4E+00	2.3E-01	2	2.3E-01	$^{GW}Soil_{Ing}$	0.00067	HWPW-SB08-S14	14	3/6/1997	<330U	
2,4-Dimethylphenol	30	8.8E+02	1.8E+01	2	1.8E+01	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<330U	SQL is greater than RAL
2,4-Dinitrotoluene	30	6.9E+00	2.2E-02	2	2.2E-02	$^{GW}Soil_{Ing}$	0.00333	HWPW-SB08-S14	14	3/6/1997	<330U	
2,6-Dinitrotoluene	30	6.9E+00	1.8E-02	2	1.8E-02	$^{GW}Soil_{Ing}$		HWPW-AOC7-S00	5	3/3/1997	<165U	SQL is greater than RAL
2-Chloronaphthalene	30	5.0E+03	5.0E+03	2	5.0E+03	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<330U	
2-Methyl-4,6-dinitrophenol	30	5.2E+00	2.3E-03	1	2.3E-03	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<1600U	SQL is greater than RAL
2-Methylnaphthalene	30	2.5E+02	1.3E+02	2	1.3E+02	$^{GW}Soil_{Ing}$		HWPW-SB07-S2.5	2.5	3/6/1997	1,300	
4-Nitrophenol	30	5.1E+01	8.9E-02	2	8.9E-02	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<1600U	SQL is greater than RAL
Acenaphthene	30	3.0E+03	1.8E+03	2	1.8E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S2.5	2.5	3/6/1997	1700	
Acenaphthylene	30	3.8E+03	3.0E+03	2	3.0E+03	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<330U	
Anthracene	30	1.8E+04	3.4E+03	1	3.4E+03	$^{GW}Soil_{Ing}$	0.00667	SB-104(1-2)	1-2	3/15/2007	669	
Benzo(a)anthracene	30	5.6E+00	1.3E+02	2	5.6E+00	$^{Tot}Soil_{Comb}$	0.00667	SB-104(1-2)	1-2	3/15/2007	401	
Benzo(a)pyrene	30	5.6E-01	5.7E+01	2	5.6E-01	$^{Tot}Soil_{Comb}$		HWPW-SB08-S14	14	3/6/1997	<330U	
bis(2-Chloroethoxy)methane	30	2.5E+00	7.7E-02	2	7.7E-02	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<330U	SQL is greater than RAL
bis(2-Ethylhexyl)phthalate	30	4.3E+01	1.2E+03	2	4.3E+01	$^{Tot}Soil_{Comb}$		HWPW-SB08-S14	14	3/6/1997	<330U	SQL is greater than RAL
Chrysene	30	5.6E+02	1.2E+04	2	5.6E+02	$^{Tot}Soil_{Comb}$	0.00667	SB-104(1-2)	1-2	3/15/2007	392	
Dibenzofuran	30	2.7E+02	2.5E+02	2	2.5E+02	$^{GW}Soil_{Ing}$		HWPW-SB07-S2.5	2.5	3/6/1997	1,100	
Di-n-butyl phthalate	30	4.4E+03	2.5E+04	2	4.4E+03	$^{Tot}Soil_{Comb}$		HWPW-SB08-S14	14	3/6/1997	<330U	
Fluoranthene	30	2.3E+03	1.4E+04	2	2.3E+03	$^{Tot}Soil_{Comb}$	0.00667	SB-104(1-2)	1-2	3/15/2007	2,990	
Fluorene	30	2.3E+03	2.2E+03	2	2.2E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S2.5	2.5	3/6/1997	1600	
Naphthalene	30	1.2E+02	2.3E+02	2	1.2E+02	$^{Tot}Soil_{Comb}$		HWPW-SB08-S14	14	3/6/1997	4,600	
Nitrobenzene	30	3.0E+01	4.9E-01	2	4.9E-01	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<330U	SQL is greater than RAL
N-Nitrosodiphenylamine	30	5.7E+02	1.9E+01	2	1.9E+01	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<330U	SQL is greater than RAL
Pentachlorophenol	30	2.4E+00	1.2E-01	2	1.2E-01	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<1600U	SQL is greater than RAL
Phenanthrene	30	1.7E+03	3.1E+03	2	1.7E+03	$^{Tot}Soil_{Comb}$		HWPW-SB07-S2.5	2.5	3/6/1997	4,100	
Phenol	30	1.6E+03	4.5E+01	2	4.5E+01	$^{GW}Soil_{Ing}$		HWPW-SB08-S14	14	3/6/1997	<330U	SQL is greater than RAL
Pyrene	30	1.7E+03	8.4E+03	2	1.7E+03	$^{Tot}Soil_{Comb}$	0.00667	SB-104(1-2)	1-2	3/15/2007	1610	

TABLE 4A

SURFACE SOIL RESIDENTIAL ASSESSMENT LEVELS WITH NO ECOLOGICAL COMPONENT
UPRR HOUSTON WOOD PRESERVING WORKS

COC	Source area size (acres)	$^{Tot}Soil_{comb}$ PCL(1) (mg/kg)	$^{GW}Soil_{Ing}$ PCL(2) (mg/kg)	Tier	Residential Assesment Level (mg/l)	exposure pathway	MQL (mg/kg)	Maximum Surface Soil Concentration Sample ID	(feet bgs)	Sample Date	Concentration (mg/kg)	Notes
Other COCs												
2,4-Dinitrophenol	30	1.3E+02	4.3E-02	2	4.3E-02	$^{GW}Soil_{Ing}$	0.0333	TW-03(11-15)	11-15	3/14/2007	<0.0666U	SQL is greater than RAL
2-Methylphenol (o-Cresol)	30	1.5E+03	3.6E+00	1	3.6E+00	$^{GW}Soil_{Ing}$	0.00667	TW-02(10-12.5)	10-12.5	3/12/2007	0.153	
4-Methylphenol (p-Cresol)	30	3.0E+02	3.2E-01	1	3.2E-01	$^{GW}Soil_{Ing}$	0.00667	TW-02(10-12.5)	10-12.5	3/12/2007	0.161	
Acetone	30	5.4E+03	2.1E+01	1	2.1E+01	$^{GW}Soil_{Ing}$	0.625	TW-02(10-12.5)	10-12.5	3/12/2007	0.711	
Acetophenone	30	1.8E+03	4.1E+00	1	4.1E+00	$^{GW}Soil_{Ing}$		SB38-00	0	10/8/1998	0.053J	
Aluminum	30	6.4E+04	8.6E+04	1	6.4E+04	$^{Tot}Soil_{Comb}$		WPW-M-001-P	0	12/13/1995	10	
Benzo(b)fluoranthene	30	5.7E+00	3.0E+01	1	5.7E+00	$^{Tot}Soil_{Comb}$	0.00667	TW-03(11-15)	11-15	3/14/2007	3.18	
Benzo(ghi)perylene	30	1.8E+03	2.3E+04	1	1.8E+03	$^{GW}Soil_{Ing}$	0.00667	TW-03(11-15)	11-15	3/14/2007	1.53	
Benzo(k)fluoranthene	30	5.7E+01	3.1E+02	1	5.7E+01	$^{Tot}Soil_{Comb}$	0.00667	TW-03(11-15)	11-15	3/14/2007	5.01	
bis(2-Chloroethyl)ether	30	1.4E+00	4.6E-03	2	4.6E-03	$^{GW}Soil_{Ing}$	0.00667	TW-03(2-5)	2-5	3/14/2007	<0.0144U	SQL is greater than RAL
Carbazole	30	2.3E+02	3.4E+01	2	3.4E+01	$^{GW}Soil_{Ing}$	0.00667	TW-02(10-12.5)	10-12.5	3/12/2007	3.14	
Dibenzo(a,h)anthracene	30	5.5E-01	7.6E+00	1	5.5E-01	$^{Tot}Soil_{Comb}$	0.00667	TW-03(11-15)	11-15	3/14/2007	0.593	
Di-n-Octylphthalate	30	1.3E+03	8.1E+05	1	1.3E+03	$^{Tot}Soil_{Comb}$		SB38-00	0	10/8/1998	0.05J	
Indeno(1,2,3-cd)pyrene	30	5.7E+00	8.7E+01	1	5.7E+00	$^{GW}Soil_{Ing}$	0.00667	TW-03(11-15)	11-15	3/14/2007	1.86	
n-Nitrosodi-n-propylamine	30	4.0E-01	8.8E-04	2	8.8E-04	$^{GW}Soil_{Ing}$	0.00667	TW-03(2-5)	2-5	3/14/2007	<0.0478U	SQL is greater than RAL
Styrene	30	6.7E+03	1.6E+00	1	1.6E+00	$^{GW}Soil_{Ing}$	0.005	TW-02(10-12.5)	10-12.5	3/12/2007	0.0373	

Explanations
1) $^{Tot}Soil_{Comb}$ PCL = TRRP Tier 1 Protective Concentration Level for total soil combined pathway (30 acre source area).
2) $^{GW}Soil_{Ing}$ PCL = TRRP Tier 1 Protective Concentration Level for soil to Class 2 groundwater ingestion pathway (30 acre source area)

Notes
1) Residential land use assumed to provide most conservative TRRP PCLs.
2) Only COCs having at least one detection and/or a non-detection with a MQL greater than the RAL are included in this table.
3) U = not detected above SQL
4) bgs = below ground surface

TABLE 4C

SUBSURFACE SOIL RESIDENTIAL ASSESSMENT LEVELS WITH NO ECOLOGICAL COMPONENT
UPRR HOUSTON WOOD PRESERVING WORKS

COC	Source area size (acres)	$^{Air}Soil_{Inh-V}$ PCL[1] (mg/kg)	$^{GW}Soil_{Ing}$ PCL[2] (mg/kg)	Tier	Residential Assesment Level (mg/l)	exposure pathway	MQL (mg/kg)	Maximum Subsurface Soil Concentration: Sample ID	Depth (feet bgs)	Sample Date	Concentration (mg/kg)	Notes
Site-Specific COCs												
1,2-Dichloroethane	30	7.1E+00	3.1E-02	2	3.1E-02	$^{GW}Soil_{Ing}$		HWPW-SB08-S18	18	3/6/1997	<0.62U	SQL is greater than RAL
Benzene	30	8.4E+01	1.0E-01	2	1.0E-01	$^{GW}Soil_{Ing}$		HWPW-SB08-S18	18	3/6/1997	1.1	
Chlorbenzene	30	7.7E+02	6.5E+00	2	6.5E+00	$^{GW}Soil_{Ing}$		HWPW-SB08-S18	18	3/6/1997	<0.62U	
Ethylbenzene	30	7.9E+03	4.4E+01	2	4.4E+01	$^{GW}Soil_{Ing}$		HWPW-SB08-S18	18	3/6/1997	19	
Methylene chloride	30	3.9E+02	2.2E-02	2	2.2E-02	$^{GW}Soil_{Ing}$		HWPW-SB08-S18	18	3/6/1997	<0.62U	SQL is greater than RAL
Toluene	30	3.9E+04	4.3E+01	2	4.3E+01	$^{GW}Soil_{Ing}$		HWPW-SB08-S18	18	3/6/1997	13	
Xylenes (tot)	30	7.9E+02	7.3E+02	2	7.3E+02	$^{GW}Soil_{Ing}$		HWPW-SB08-S18	18	3/6/1997	55	
1,2-Diphenylhydrazine	30	7.2E+01	2.3E-01	2	2.3E-01	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	SQL is greater than RAL
2,4-Dimethylphenol	30	2.6E+03	1.8E+01	2	1.8E+01	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	SQL is greater than RAL
2,4-Dinitrotoluene	30	1.5E+01	2.2E-02	2	2.2E-02	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	SQL is greater than RAL
2,6-Dinitrotoluene	30	2.2E+01	1.8E-02	2	1.8E-02	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	SQL is greater than RAL
2-Chloronaphthalene	30	---	5.0E+03	2	5.0E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	
4,6-Dinitro-o-cresol	30	2.4E+01	2.1E-03	2	2.1E-03	$^{GW}Soil_{Ing}$		SB-141(16-17.1)	16	6/23/2010	<0.004U	SQL is greater than RAL
2-Methylnaphthalene	30	---	1.3E+02	2	1.3E+02	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	1700	
4-Nitrophenol	30	1.6E+02	8.9E-02	2	8.9E-02	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<160U	SQL is greater than RAL
Acenaphthene	30	---	1.8E+03	2	1.8E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	460	
Acenaphthylene	30	---	3.0E+03	2	3.0E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33	
Anthracene	30	---	3.4E+03	1	3.4E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	280	
Benzo(a)anthracene	30	1.9E+03	1.3E+02	2	1.3E+02	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	59	
Benzo(a)pyrene	30	4.4E+02	5.7E+01	2	5.7E+01	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33	
bis(2-Chloroethoxy)methane	30	5.8E+00	7.7E-02	2	7.7E-02	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	SQL is greater than RAL
bis(2-Ethylhexyl)phthalate	30	---	1.2E+03	2	1.2E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33	
Chrysene	30	5.9E+05	1.2E+04	2	1.2E+04	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	56	
Dibenzofuran	30	---	2.5E+02	2	2.5E+02	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	360	
Di-n-butyl phthalate	30	3.0E+04	2.5E+04	2	2.5E+04	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33	
Fluoranthene	30	---	1.4E+04	2	1.4E+04	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	330	
Fluorene	30	---	2.2E+03	2	2.2E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	430	
Naphthalene	30	1.4E+02	2.3E+02	2	1.4E+02	$^{Air}Soil_{Inh-V}$		HWPW-SB08-S18	18	3/6/1997	17,000	
Nitrobenzene	30	2.9E+02	4.9E-01	2	4.9E-01	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	SQL is greater than RAL
N-Nitrosodiphenylamine	30	---	1.9E+01	2	1.9E+01	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33U	SQL is greater than RAL
Pentachlorophenol	30	2.3E+02	1.2E-01	2	1.2E-01	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<160	SQL is greater than RAL
Phenanthrene	30	---	3.1E+03	2	3.1E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	2600	
Phenol	30	1.7E+03	4.5E+01	2	4.5E+01	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	<33	
Pyrene	30	---	8.4E+03	2	8.4E+03	$^{GW}Soil_{Ing}$		HWPW-SB07-S19	19	3/6/1997	280	

Explanations

1) $^{Air}Soil_{Inh-V}$ PCL = TRRP Tier 1 Protective Concentration Level for inhalation of constituents volatilized from soil pathway (30 acre source area).

2) $^{GW}Soil_{Ing}$ = TRRP Tier 1 Protective Concentration Level for soil to Class 2 groundwater ingestion pathway (30 acre source area).

Notes

1) Residential land use assumed to provide most conservative TRRP PCLs.

2) Only COCs having at least one detection and/or a non-detection with a SQL greater than the RAL are included in this table.

3) U = not detected above SQL

3) J = estimated value. Concentration is between sample quanititation limit and method quantitation limit.

7) bgs = below ground surface

Table 4D-2
SUMMARY OF SURFACE SOIL SAMPLING RESULTS - A-TZ TEMPORARY WELLS
UPRR Houston Wood Preserving Works

						Location ID:	TW-01	TW-01	TW-02	TW-03	TW-03
						Sample Date:	2/28/2007	3/12/2007	3/12/2007	3/14/2007	3/14/2007
						Sample Interval:	2-4'	10-12'	10-12.5'	2-5'	11-15'
Constituent	CAS	Method	RALs and Off-Site cPCLs	Tier	On-Site cPCLs (C/I)	Tier	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Volatile Organic Compounds											
1,1,1-Trichloroethane	71-55-6	8260	8.1E-01	1	8.1E-01	1	--	<0.00164	<0.00165	<0.00167	<0.00164
1,1,2,2-Tetrachloroethane	79-34-5	8260	1.2E-02	1	2.6E-02	1	--	<0.0041	<0.00412	<0.00417	<0.0041
1,1,2-Trichloroethane	79-00-5	8260	1.0E-02	1	1.0E-02	1	--	<0.00285	<0.00286	<0.0029	<0.00285
1,1-Dichloroethane	75-34-3	8260	9.2E+00	1	2.8E+01	1	--	<0.00201	<0.00202	<0.00204	<0.00201
1,1-Dichloroethene	75-35-4	8260	2.5E-02	1	2.5E-02	1	--	<0.0033	<0.00331	<0.00335	<0.00329
1,2-Dichloroethane	107-06-2	8260	3.1E-02	2	3.1E-02	2	--	<0.00287	0.0106	<0.00292	<0.00287
1,2-Dichloroethene (total)	540-59-0	8260	7.2E-02	1	1.2E-01	1	--	<0.00427	<0.00429	<0.00434	<0.00426
1,2-Dichloropropane	78-87-5	8260	1.1E-02	1	1.1E-02	1	--	<0.0022	<0.00221	<0.00224	<0.0022
2-Hexanone	591-78-6	8260	1.9E+00	1	5.8E+00	1	--	<0.00461	<0.00463	<0.00469	<0.0046
4-Methyl-2-pentanone (MIBK)	108-10-1	8260	2.5E+00	1	7.4E+00	1	--	<0.00207	<0.00208	<0.0021	<0.00207
Acetone	67-64-1	8260	2.1E+01	1	6.4E+01	1	--	0.0652	0.711	0.0267	0.0117
Benzene	71-43-2	8260	1.0E-01	2	1.0E-01	2	--	0.00247	0.03	<0.00202	<0.00198
Bromodichloromethane	75-27-4	8260	3.3E-02	1	7.3E-02	1	--	<0.00173	<0.00173	<0.00175	<0.00172
Bromoform	75-25-2	8260	3.2E-01	1	7.1E-01	1	--	<0.00228	<0.00229	<0.00232	<0.00228
Bromomethane	74-83-9	8260	6.5E-02	1	2.0E-01	1	--	<0.00352	<0.00354	<0.00358	<0.00352
Carbon Disulfide	75-15-0	8260	6.8E+00	1	2.0E+01	1	--	<0.00189	<0.0019	<0.00192	<0.00189
Carbon Tetrachloride	56-23-5	8260	3.1E-02	1	3.1E-02	1	--	<0.00188	<0.00189	<0.00191	<0.00188
Chlorobenzene	108-90-7	8260	6.5E+00	2	6.5E+00	2	--	<0.00189	<0.0019	<0.00192	<0.00189
Chloroethane	75-00-3	8260	1.5E+01	1	4.6E+01	1	--	<0.00259	<0.0026	<0.00263	<0.00259
Chloroform	67-66-3	8260	5.1E-01	1	1.5E+00	1	--	<0.00294	<0.00296	<0.00299	<0.00294
Chloromethane	74-87-3	8260	2.0E-01	1	4.5E-01	1	--	<0.00515	<0.00518	<0.00524	<0.00515
cis-1,2-Dichloroethene	156-59-2	8260	1.2E-01	1	1.2E-01	1	--	<0.00203	<0.00204	<0.00207	<0.00203
cis-1,3-Dichloropropene	10061-01-5	8260	3.3E-03	1	7.4E-03	1	--	<0.00152	<0.00153	<0.00155	<0.00152
Dibromochloromethane	124-48-1	8260	2.5E-02	1	5.5E-02	1	--	<0.00195	<0.00196	<0.00198	<0.00195
Ethylbenzene	100-41-4	8260	4.4E+01	2	4.4E+01	2	--	0.0242	8.49	<0.00168	0.00258
Methyl Ethyl Ketone (2-Butanone)	78-93-3	8260	1.5E+01	1	4.4E+01	1	--	<0.00557	<0.00559	<0.00566	<0.00556
Methylene Chloride	75-09-2	8260	2.2E-02	2	2.2E-02	2	--	<0.00378	<0.0038	<0.00385	<0.00378
Styrene	100-42-5	8260	1.6E+00	1	1.6E+00	1	--	<0.00189	0.0373	<0.00192	<0.00189
Tetrachloroethene	127-18-4	8260	2.5E-02	1	2.5E-02	1	--	<0.00196	<0.00197	<0.00199	<0.00196
Toluene	108-88-3	8260	4.3E+01	2	4.3E+01	2	--	0.0103	9.02	<0.0016	<0.00157
trans-1,2-Dichloroethene	156-60-5	8260	2.5E-01	1	2.5E-01	1	--	<0.00245	<0.00246	<0.00249	<0.00244
trans-1,3-Dichloropropene	10061-02-6	8260	1.8E-02	1	4.0E-02	1	--	<0.0016	<0.0016	<0.00162	<0.00159
Trichloroethene	79-01-6	8260	1.7E-02	1	1.7E-02	1	--	<0.00197	<0.00198	<0.00201	<0.00197
Vinyl Chloride	75-01-4	8260	1.1E-02	1	1.1E-02	1	--	<0.00196	<0.00197	<0.00199	<0.00196
Xylenes (total)	1330-20-7	8260	7.3E+02	2	7.3E+02	2	--	0.0103	9.02	<0.0016	<0.00157

Notes:
1. Sampling locations shown on Figures 4A and 4E
2. Residential Assessment Levels (RALs) used to evaluate Affected property on-site and off-sit
3. Critical PCLs (cPCLs) based on Commericial/Industrial (C/I) PCLs on-site, RALs off-sit
4. Concentrations > RALs are **bold** type.
5. Concentrations > Off-Site cPCL (RAL) or On-Site cPCL (C/I) are highlighted and bol
6. Non-detected concentrations > RAL or cPCL are highlighted and **bold type**.
7. TRRP PCLs (30 TAC §350, Tables 1, 2, and 3), last updated on March 31, 201
8. J = Estimated Value, < = Compound not detected at the specified detection limi
9. -- = not analyzed

Table 4D-2
SUMMARY OF SURFACE SOIL SAMPLING RESULTS - A-TZ TEMPORARY WELLS
UPRR Houston Wood Preserving Works

						Location ID:	TW-01	TW-01	TW-02	TW-03	TW-03
						Sample Date:	2/28/2007	3/12/2007	3/12/2007	3/14/2007	3/14/2007
						Sample Interval:	2-4'	10-12'	10-12.5'	2-5'	11-15'
Constituent	CAS	Method	RALs and Off-Site cPCLs	Tier	On-Site cPCLs (C/I)	Tier	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Semivolatile Organic Compounds											
1,2,4-Trichlorobenzene	120-82-1	8270	2.4E+00	1	2.4E+00	1	--	<0.00332	<0.00334	<0.0338	<0.0332
1,2-Dichlorobenzene	95-50-1	8270	8.9E+00	1	8.9E+00	1	--	<0.0028	<0.00281	<0.0285	<0.028
1,2-Diphenylhydrazine	122-66-7	8270	2.3E-01	2	5.1E-01	2	--	<0.0000096	<0.00019	<0.000097	<0.000096
1,3-Dichlorobenzene	541-73-1	8270	3.4E+00	1	1.0E+01	1	--	<0.00273	<0.00274	<0.0278	<0.0273
1,4-Dichlorobenzene	106-46-7	8270	1.1E+00	1	1.1E+00	1	--	<0.00304	<0.00305	<0.0309	<0.0303
2,4,5-Trichlorophenol	95-95-4	8270	1.7E+01	1	5.1E+01	1	--	<0.00434	<0.00436	<0.0442	<0.0433
2,4,6-Trichlorophenol	88-06-2	8270	8.7E-02	1	2.6E-01	1	--	<0.00242	<0.00243	<0.0247	<0.0242
2,4-Dichlorophenol	120-83-2	8270	1.8E-01	1	5.3E-01	1	--	<0.00435	<0.00437	<0.0443	<0.0434
2,4-Dimethylphenol	105-67-9	8270	1.8E+01	2	5.3E+01	2	--	<0.00238	<0.00239	<0.0242	<0.0237
2,4-Dinitrophenol	51-28-5	8270	4.7E-02	1	1.4E-01	1	--	<0.00667	<0.0067	**<0.0678**	**<0.0666**
2,4-Dinitrotoluene	121-14-2	8270	2.2E-02	2	4.9E-02	2	--	<0.00018	<0.00361	<0.00183	<0.00179
2,6-Dinitrotoluene	606-20-2	8270	1.8E-02	2	4.0E-02	2	--	<0.000245	<0.00492	<0.00249	<0.00244
2-Chloronaphthalene	91-58-7	8270	5.0E+03	2	1.5E+04	2	--	<0.00183	<0.00184	<0.0186	<0.0183
2-Chlorophenol	95-57-8	8270	8.2E-01	1	2.4E+00	1	--	<0.00314	<0.00316	<0.032	<0.0314
2-Methyl-4,6-dinitrophenol	534-52-1	8270	2.3E-03	1	7.0E-03	1	--	**<0.00984**	**<0.198**	**<0.1**	**<0.0983**
2-Methylnaphthalene	91-57-6	8270	1.3E+02	2	3.8E+02	2	--	19.5	13.6	<0.0184	6.14
2-Methylphenol (o-Cresol)	95-48-7	8270	3.6E+00	1	1.1E+01	1	--	<0.00221	0.153	<0.0225	<0.0221
2-Nitroaniline	88-74-4	8270	6.6E-02	2	2.0E-01	2	--	<0.00404	<0.00406	<0.0411	<0.0404
2-Nitrophenol	88-75-5	8270	6.7E-02	1	2.0E-01	1	--	<0.00474	<0.00476	<0.0482	<0.0473
3,3'-Dichlorobenzidine	91-94-1	8270	4.4E-01	2	9.9E-01	2	--	<0.0111	<0.0112	<0.113	<0.111
3-Nitroaniline	99-09-2	8270	9.3E-02	2	2.8E-01	2	--	<0.00453	<0.00455	<0.0461	<0.0452
4-Bromophenyl Phenyl Ether	101-55-3	8270	1.8E-01	1	4.0E-01	1	--	<0.00334	<0.00336	<0.034	<0.0334
4-Chloro-3-methylphenol	59-50-7	8270	2.3E+00	1	6.8E+00	1	--	<0.00326	<0.00328	<0.0332	<0.0326
4-Chloroaniline	106-47-8	8270	2.2E-01	1	6.7E-01	1	--	<0.0011	<0.0011	<0.012	<0.011
4-Chlorophenyl Phenyl Ether	7005-72-3	8270	1.5E-01	1	5.4E-01	2	--	<0.0023	<0.00232	<0.0235	<0.023
4-Methylphenol (p-Cresol)	106-44-5	8270	3.2E-01	1	9.4E-01	1	--	<0.0017	0.161	<0.0173	<0.017
4-Nitroaniline	100-01-6	8270	1.0E-01	2	2.3E-01	2	--	<0.00384	<0.00386	<0.0391	<0.0384
4-Nitrophenol	100-02-7	8270	8.8E-02	2	2.7E-01	2	--	0.00445	0.0167	**<0.169**	0.0444
Acenaphthene	83-32-9	8270	1.8E+03	2	5.2E+03	2	--	22	17.1	<0.0214	33.7
Acenaphthylene	208-96-8	8270	3.0E+03	2	9.1E+03	2	--	<0.00176	0.228	<0.0179	<0.0176
Anthracene	120-12-7	8270	3.4E+03	1	1.0E+04	1	--	9.87	8.14	<0.0155	20.8
Benzo(a)anthracene	56-55-3	8270	5.6E+00	1	2.4E+01	1	**179**	2.27	3.04	<0.0189	**6.63**
Benzo(a)pyrene	50-32-8	8270	5.6E-01	1	2.4E+00	1	**51.5**	**0.681**	0.36	0.0089	**6.27**
Benzo(b)fluoranthene	205-99-2	8270	5.7E+00	1	2.4E+01	1	--	0.368	0.596	<0.0267	3.18
Benzo(ghi)perylene	191-24-2	8270	1.8E+03	1	1.9E+04	1	--	0.145	0.166	<0.0198	1.53
Benzo(k)fluoranthene	207-08-9	8270	5.7E+01	1	2.4E+02	1	--	0.485	0.917	<0.0245	5.01
bis(2-chloroethoxy)methane	111-91-1	8270	7.7E-02	2	1.7E-01	2	--	<0.000293	<0.00589	<0.00298	<0.00293

Notes:
1. Sampling locations shown on Figures 4A and 4E
2. Residential Assessment Levels (RALs) used to evaluate Affected property on-site and off-sit
3. Critical PCLs (cPCLs) based on Commericial/Industrial (C/I) PCLs on-site, RALs off-sit
4. Concentrations > RALs are **bold** type.
5. Concentrations > Off-Site cPCL (RAL) or On-Site cPCL (C/I) are highlighted and bolc
6. Non-detected concentrations > RAL or cPCL are highlighted and **bold type**.
7. TRRP PCLs (30 TAC §350, Tables 1, 2, and 3), last updated on March 31, 201(
8. J = Estimated Value, < = Compound not detected at the specified detection limi
9. -- = not analyzed

Table 4D-2
SUMMARY OF SURFACE SOIL SAMPLING RESULTS - A-TZ TEMPORARY WELLS
UPRR Houston Wood Preserving Works

						Location ID:	TW-01	TW-01	TW-02	TW-03	TW-03
						Sample Date:	2/28/2007	3/12/2007	3/12/2007	3/14/2007	3/14/2007
						Sample Interval:	2-4'	10-12'	10-12.5'	2-5'	11-15'
Constituent	CAS	Method	RALs and Off-Site cPCLs	Tier	On-Site cPCLs (C/I)	Tier	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Semivolatile Organic Compounds											
bis(2-Chloroethyl)ether	111-44-4	8270	4.6E-03	2	1.0E-02	2	--	<0.00142	<0.00143	**<0.0144**	**<0.0142**
bis(2-chloroisopropyl)ether	108-60-1	8270	9.5E-02	1	2.1E-01	1	--	0.00209	<0.00146	<0.0148	<0.0145
bis(2-ethylhexyl)phthalate	117-81-7	8270	4.3E+01	1	5.6E+02	1	--	<0.00394	<0.00395	<0.0401	<0.0393
Butyl Benzyl Phthalate	85-68-7	8270	1.3E+03	1	4.0E+03	1	--	<0.00243	<0.00245	<0.0248	<0.0243
Carbazole	86-74-8	8270	3.4E+01	2	7.5E+01	2	--	2.69	3.14	<0.0209	1.65
Chrysene	218-01-9	8270	5.6E+02	1	2.4E+03	1	--	2.29	3.01	<0.0267	9.8
Dibenzo(a,h)anthracene	53-70-3	8270	5.5E-01	1	2.4E+00	1	--	0.0639	0.106	0.113	**0.593**
Dibenzofuran	132-64-9	8270	2.5E+02	2	7.4E+02	2	--	18.3	11.2	<0.0198	26.2
Diethyl Phthalate	84-66-2	8270	7.8E+01	1	2.3E+02	1	--	<0.00238	<0.00239	<0.0242	<0.0237
Dimethyl Phthalate	131-11-3	8270	3.1E+01	1	9.3E+01	1	--	<0.00156	<0.00157	<0.0159	<0.0156
Di-n-butyl Phthalate	84-74-2	8270	4.4E+03	1	1.6E+04	1	--	<0.0023	<0.00232	<0.0235	<0.023
Di-n-octyl Phthalate	117-84-0	8270	1.3E+03	1	1.3E+04	1	--	<0.00239	<0.0024	<0.0243	<0.0238
Fluoranthene	206-44-0	8270	2.3E+03	1	2.5E+04	1	--	22.5	23	<0.017	57.5
Fluorene	86-73-7	8270	2.2E+03	2	6.6E+03	2	--	19.4	14.4	<0.0235	33.1
Hexachlorobenzene	118-74-1	8270	5.6E-01	1	5.6E-01	1	--	<0.00342	<0.00343	<0.0348	<0.0341
Hexachlorobutadiene	87-68-3	8270	1.6E+00	1	3.7E+00	1	--	<0.00345	<0.00347	<0.0351	<0.0345
Hexachlorocyclopentadiene	77-47-4	8270	7.2E+00	1	9.6E+00	1	--	<0.00385	<0.00387	<0.0392	<0.0385
Hexachloroethane	67-72-1	8270	9.2E-01	1	2.7E+00	1	--	<0.00397	<0.00399	<0.0404	<0.0397
Indeno(1,2,3-cd)pyrene	193-39-5	8270	5.7E+00	1	2.4E+01	1	--	0.168	0.254	<0.0328	1.86
Isophorone	78-59-1	8270	1.5E+00	1	3.4E+00	1	--	<0.00229	<0.0023	<0.0233	<0.0229
Naphthalene	91-20-3	8270	1.2E+02	1	1.9E+02	1	**2480**	34.4	29.7	0.0842	33.8
Nitrobenzene	98-95-3	8270	4.9E-01	2	1.5E+00	2	--	<0.00303	<0.00304	<0.0308	<0.0302
n-Nitrosodi-n-propylamine	621-64-7	8270	8.8E-04	2	2.0E-03	2	--	**<0.00469**	**<0.00471**	**<0.0478**	**<0.0468**
n-Nitrosodiphenylamine	86-30-6	8270	1.9E+01	2	4.2E+01	2	--	<0.00209	<0.0021	<0.0213	<0.0209
Pentachlorophenol	87-86-5	8270	1.2E-01	2	1.2E-01	2	**<0.505**	<0.00984	**<0.198**	<0.1	<0.0983
Phenanthrene	85-01-8	8270	1.7E+03	1	9.3E+03	2	--	62.7	48.7	<0.0165	78.7
Phenol	108-95-2	8270	4.5E+01	2	1.3E+02	2	--	<0.00353	<0.00355	<0.036	<0.0353
Pyrene	129-00-0	8270	1.7E+03	1	1.9E+04	1	--	11.9	12.3	<0.0144	34.2

Notes:
1. Sampling locations shown on Figures 4A and 4B.
2. Residential Assessment Levels (RALs) used to evaluate Affected property on-site and off-site.
3. Critical PCLs (cPCLs) based on Commericial/Industrial (C/I) PCLs on-site, RALs off-site.
4. Concentrations > RALs are **bold** type.
5. Concentrations > Off-Site cPCL (RAL) or On-Site cPCL (C/I) are highlighted and bold.
6. Non-detected concentrations > RAL or cPCL are highlighted and **bold type**.
7. TRRP PCLs (30 TAC §350, Tables 1, 2, and 3), last updated on March 31, 2010.
8. J = Estimated Value, < = Compound not detected at the specified detection limit.
9. -- = not analyzed

AFFECTED PROPERTY ASSESSMENT REPORT ADDENDUM

UPRR Houston Wood Preserving Works
Houston, Texas

4.0 Figures

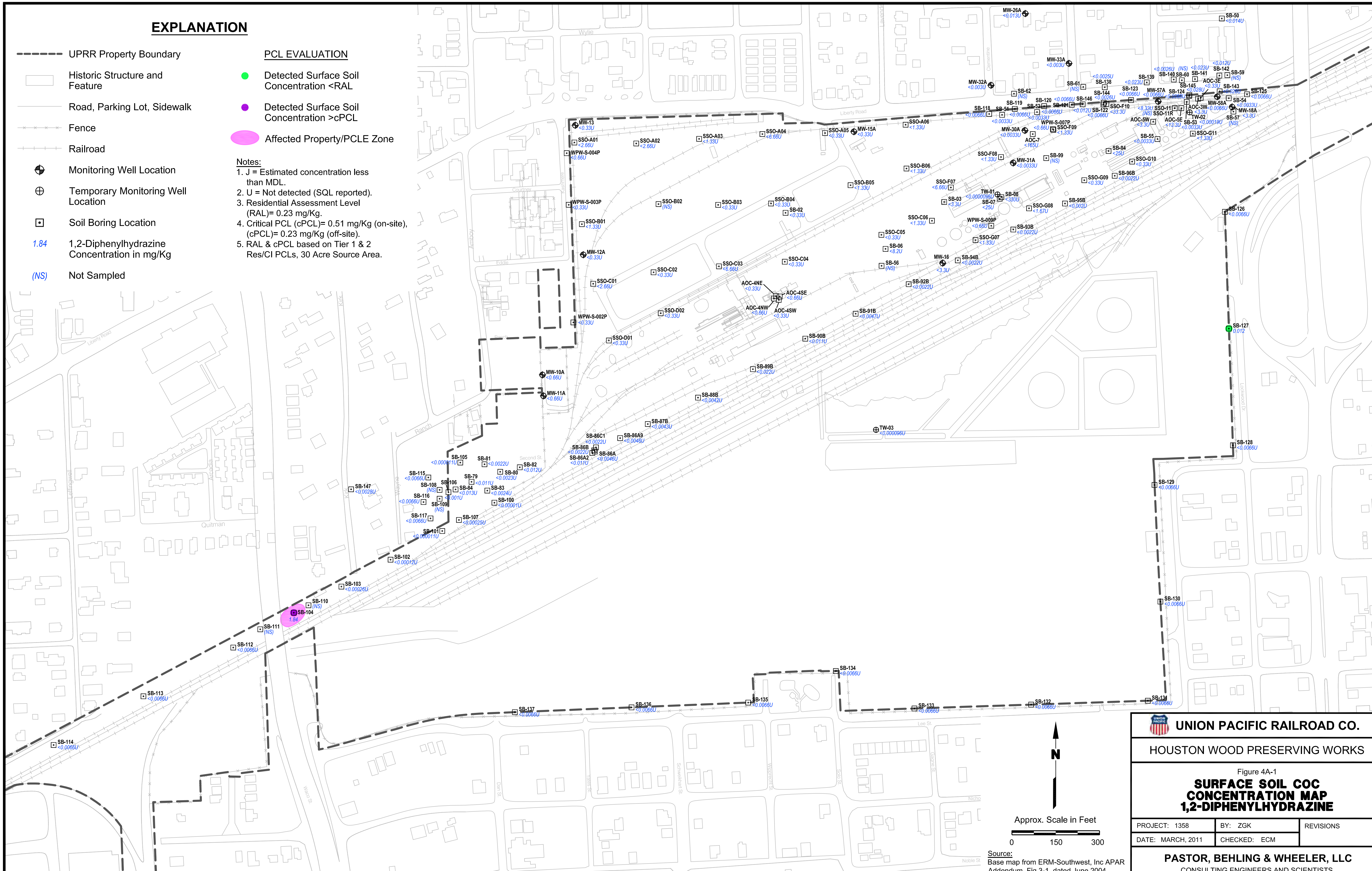
EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Temporary Monitoring Well Location
- Soil Boring Location
- *1.84* 1,2-Diphenylhydrazine Concentration in mg/Kg
- *(NS)* Not Sampled

PCL EVALUATION

- Detected Surface Soil Concentration <RAL
- Detected Surface Soil Concentration >cPCL
- Affected Property/PCLE Zone

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 0.23 mg/Kg.
4. Critical PCL (cPCL)= 0.51 mg/Kg (on-site), (cPCL)= 0.23 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.



N

Approx. Scale in Feet

0 150 300

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

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

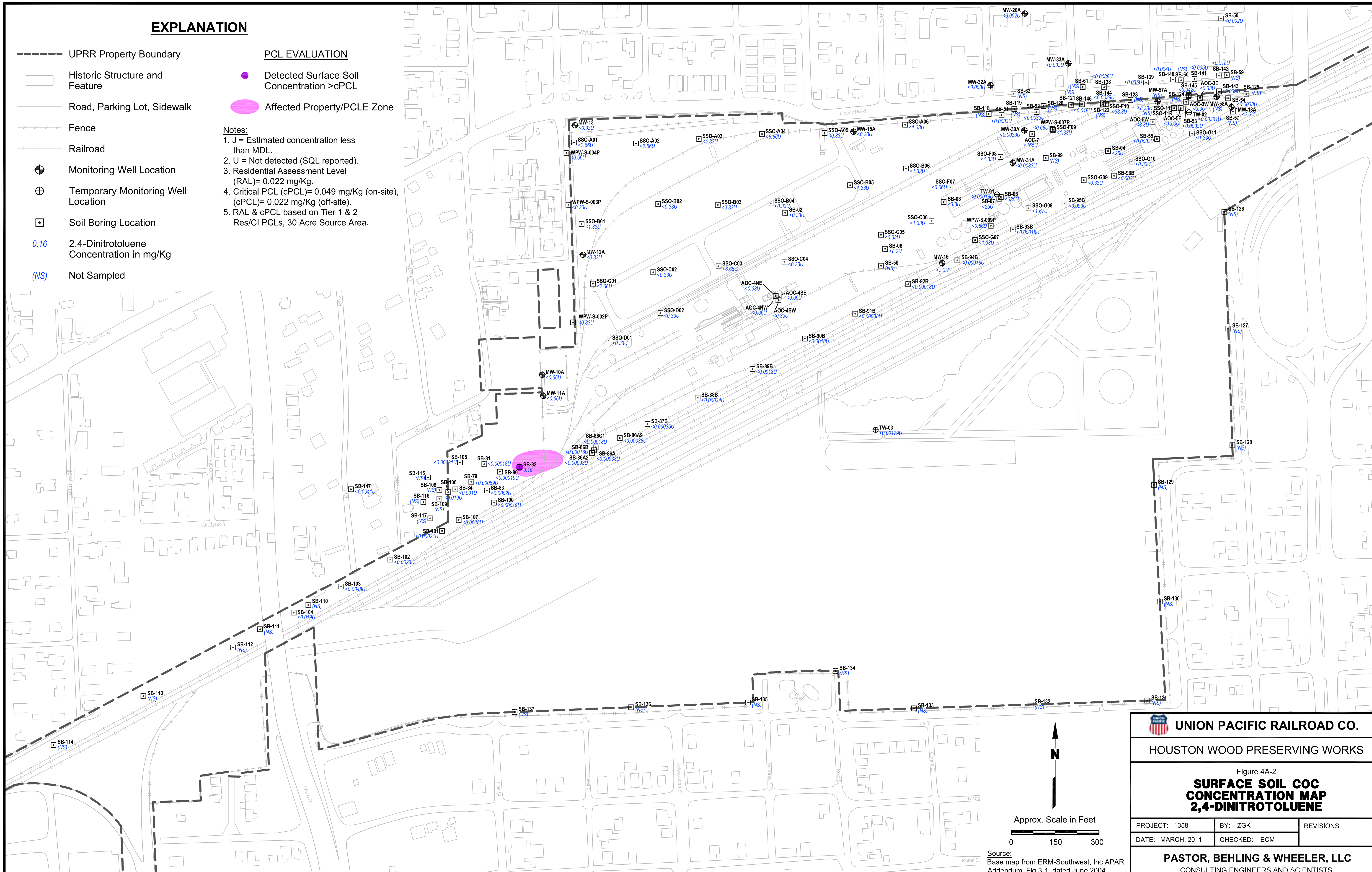
Figure 4A-1

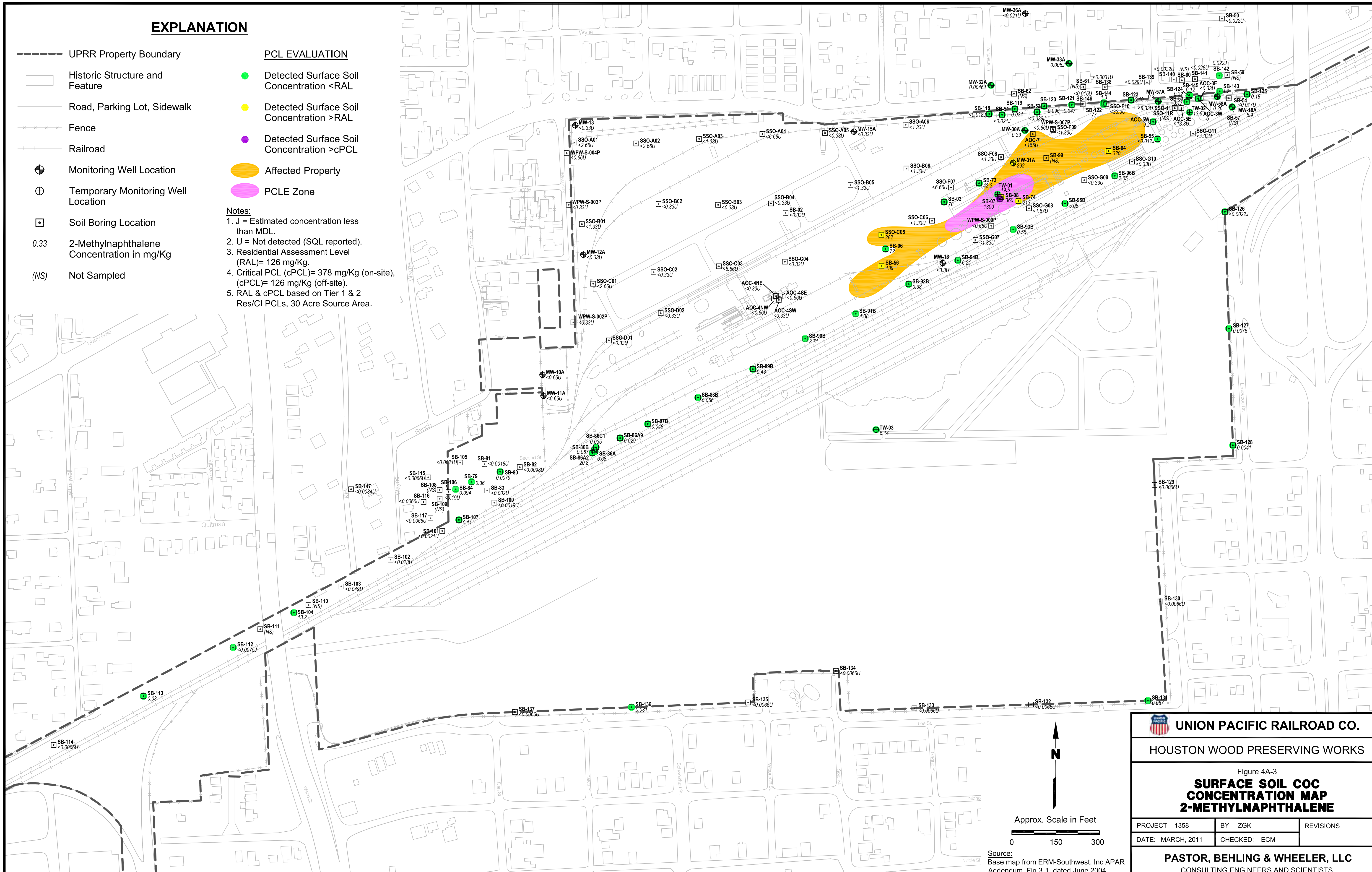
SURFACE SOIL COC CONCENTRATION MAP 1,2-DIPHENYLHYDRAZINE

PROJECT: 1358	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: ECM	

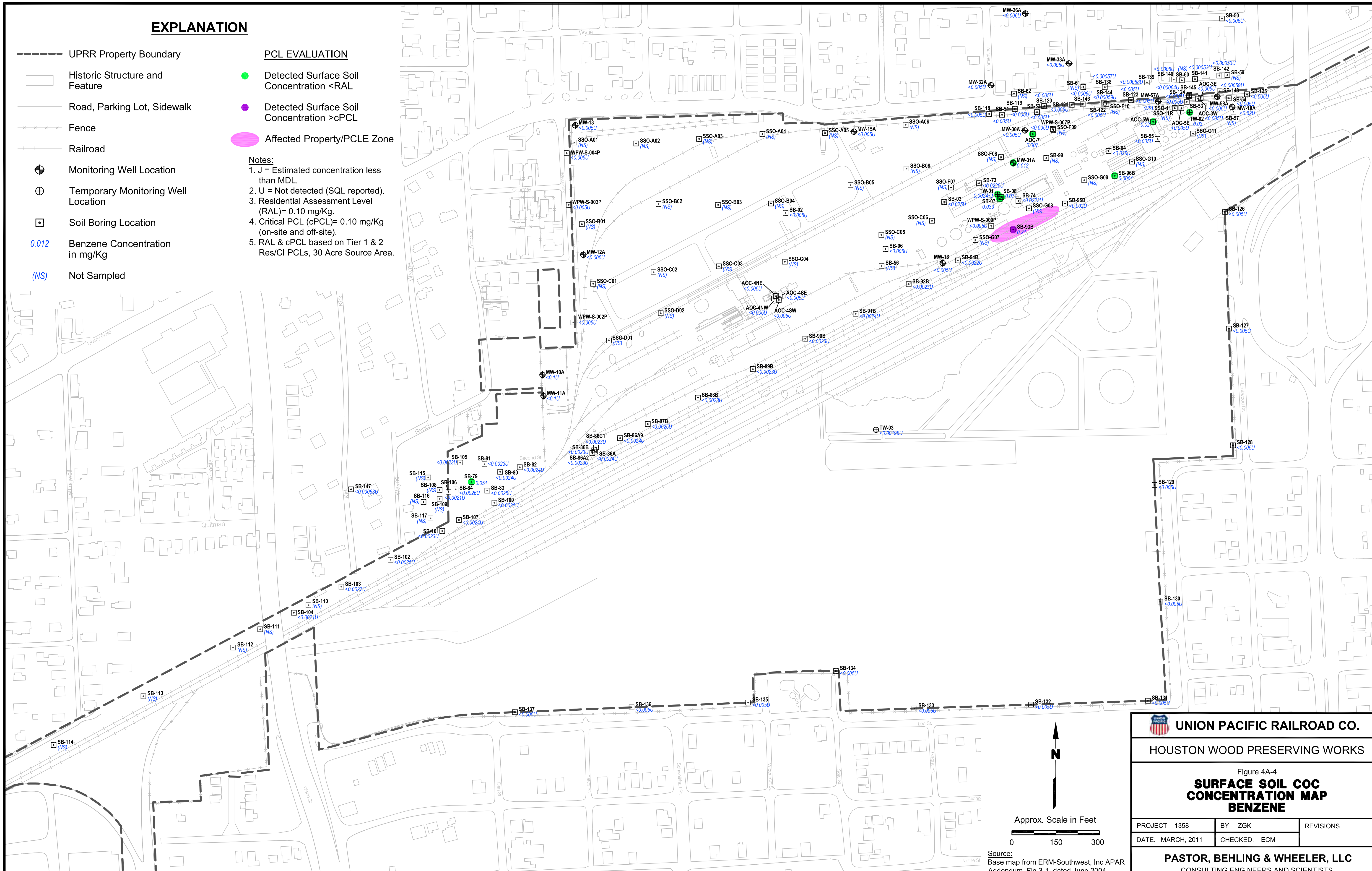
PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS


EXPLANATION
UPRR Property Boundary
Historic Structure and Feature
Road, Parking Lot, Sidewalk
Fence
Railroad
Monitoring Well Location
Temporary Monitoring Well Location
Soil Boring Location
0.16 2,4-Dinitrotoluene Concentration in mg/Kg
(NS) Not Sampled
PCL EVALUATION
Detected Surface Soil Concentration >cPCL
Affected Property/PCLE Zone
Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 0.022 mg/Kg.
4. Critical PCL (cPCL)= 0.049 mg/Kg (on-site), (cPCL)= 0.022 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.
SB-82
0.16
N
Approx. Scale in Feet
0 150 300
Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.
UNION PACIFIC RAILROAD CO.
HOUSTON WOOD PRESERVING WORKS
Figure 4A-2
SURFACE SOIL COC CONCENTRATION MAP 2,4-DINITROTOLUENE
PROJECT: 1358
BY: ZGK
REVISIONS
DATE: MARCH, 2011
CHECKED: ECM
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION
UPRR Property Boundary
Historic Structure and Feature
Road, Parking Lot, Sidewalk
Fence
Railroad
Monitoring Well Location
Temporary Monitoring Well Location
Soil Boring Location
0.33 2-Methylnaphthalene Concentration in mg/Kg
(NS) Not Sampled
PCL EVALUATION
Detected Surface Soil Concentration <RAL
Detected Surface Soil Concentration >RAL
Detected Surface Soil Concentration >cPCL
Affected Property
PCLE Zone
Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 126 mg/Kg.
4. Critical PCL (cPCL)= 378 mg/Kg (on-site), (cPCL)= 126 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.
N
Approx. Scale in Feet
0 150 300
Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.
UNION PACIFIC RAILROAD CO.
HOUSTON WOOD PRESERVING WORKS
Figure 4A-3
SURFACE SOIL COC CONCENTRATION MAP 2-METHYLNAPHTHALENE
PROJECT: 1358
BY: ZGK
REVISIONS
DATE: MARCH, 2011
CHECKED: ECM
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Temporary Monitoring Well Location
- Soil Boring Location
- 0.012 Benzene Concentration in mg/Kg
- (NS) Not Sampled

PCL EVALUATION

- Detected Surface Soil Concentration <RAL
- Detected Surface Soil Concentration >cPCL
- Affected Property/PCLE Zone

Notes:

1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 0.10 mg/Kg.
4. Critical PCL (cPCL)= 0.10 mg/Kg (on-site and off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.

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

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

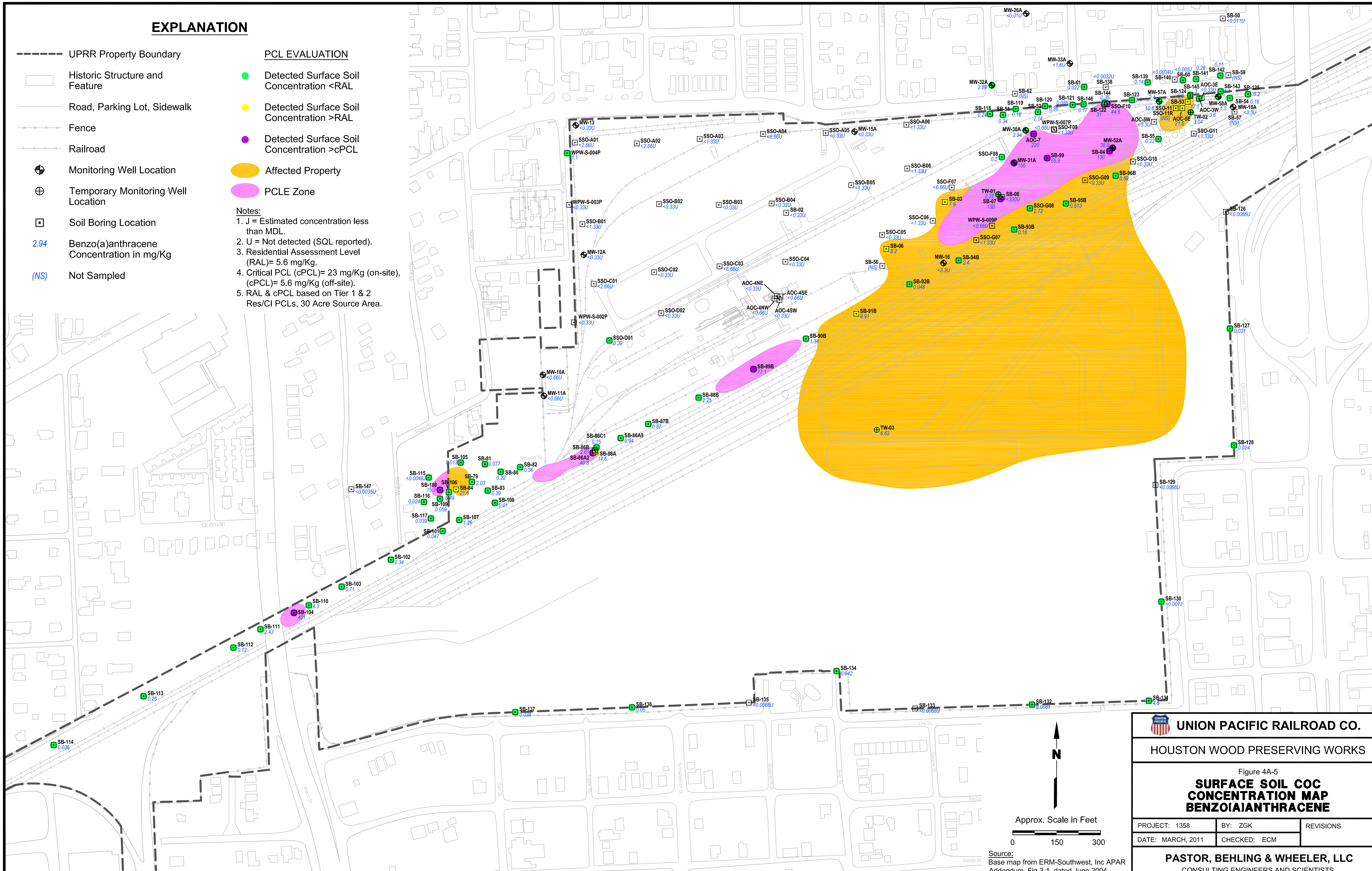
Figure 4A-4

SURFACE SOIL COC CONCENTRATION MAP BENZENE

PROJECT: 1358	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Temporary Monitoring Well Location
- Soil Boring Location
- 2.94 Benzo(a)anthracene Concentration in mg/Kg
- (NS) Not Sampled

PCL EVALUATION

- Detected Surface Soil Concentration <RAL
- Detected Surface Soil Concentration >RAL
- Detected Surface Soil Concentration >cPCL
- Affected Property
- PCLE Zone

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 5.6 mg/Kg.
4. Critical PCL (cPCL)= 23 mg/Kg (on-site), (cPCL)= 5.6 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.

N

Approx. Scale in Feet
0 150 300

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

UNION PACIFIC RAILROAD CO.

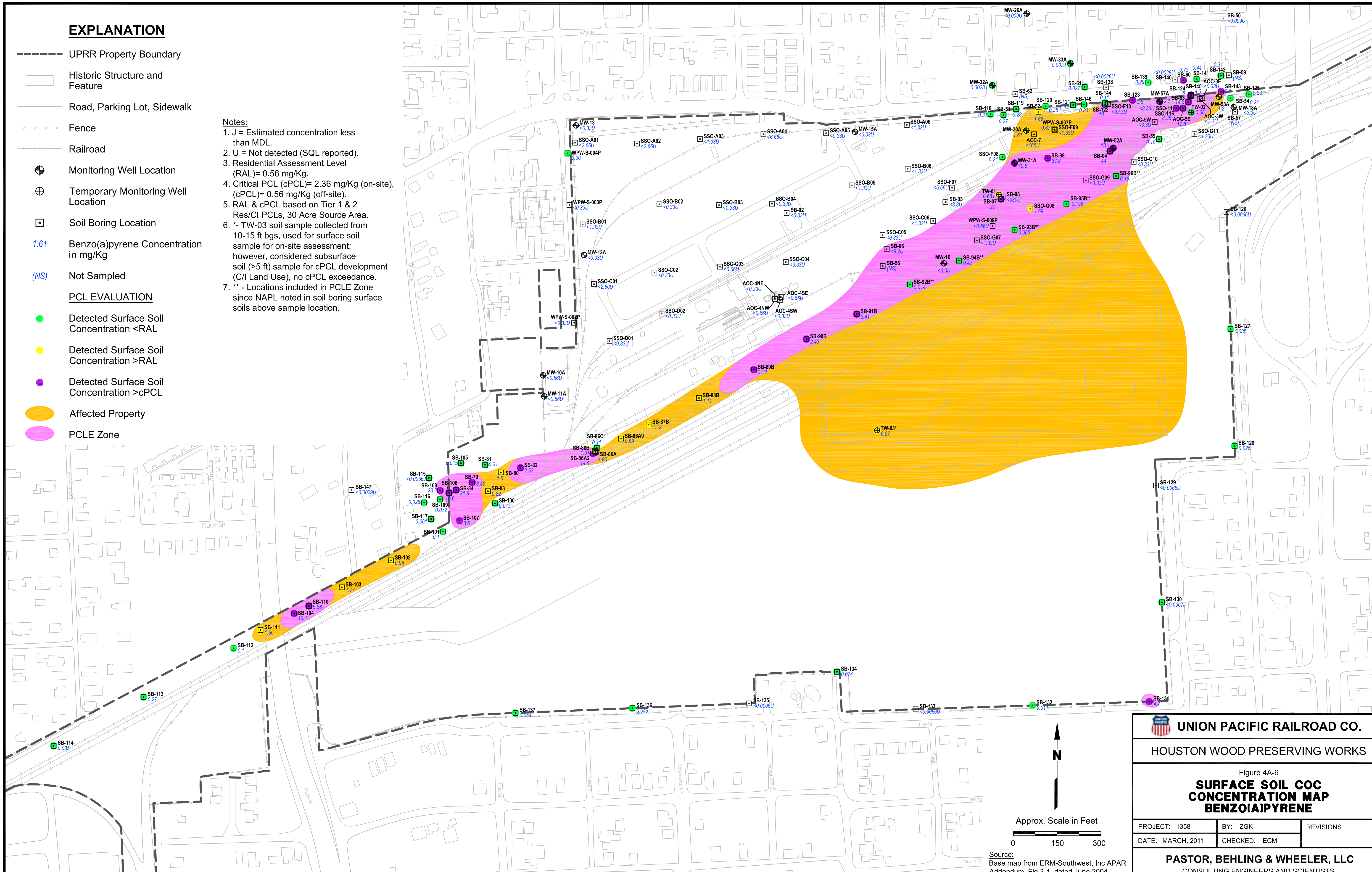
HOUSTON WOOD PRESERVING WORKS

Figure 4A-5

SURFACE SOIL COC CONCENTRATION MAP BENZO(A)ANTHRACENE

PROJECT: 1358	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

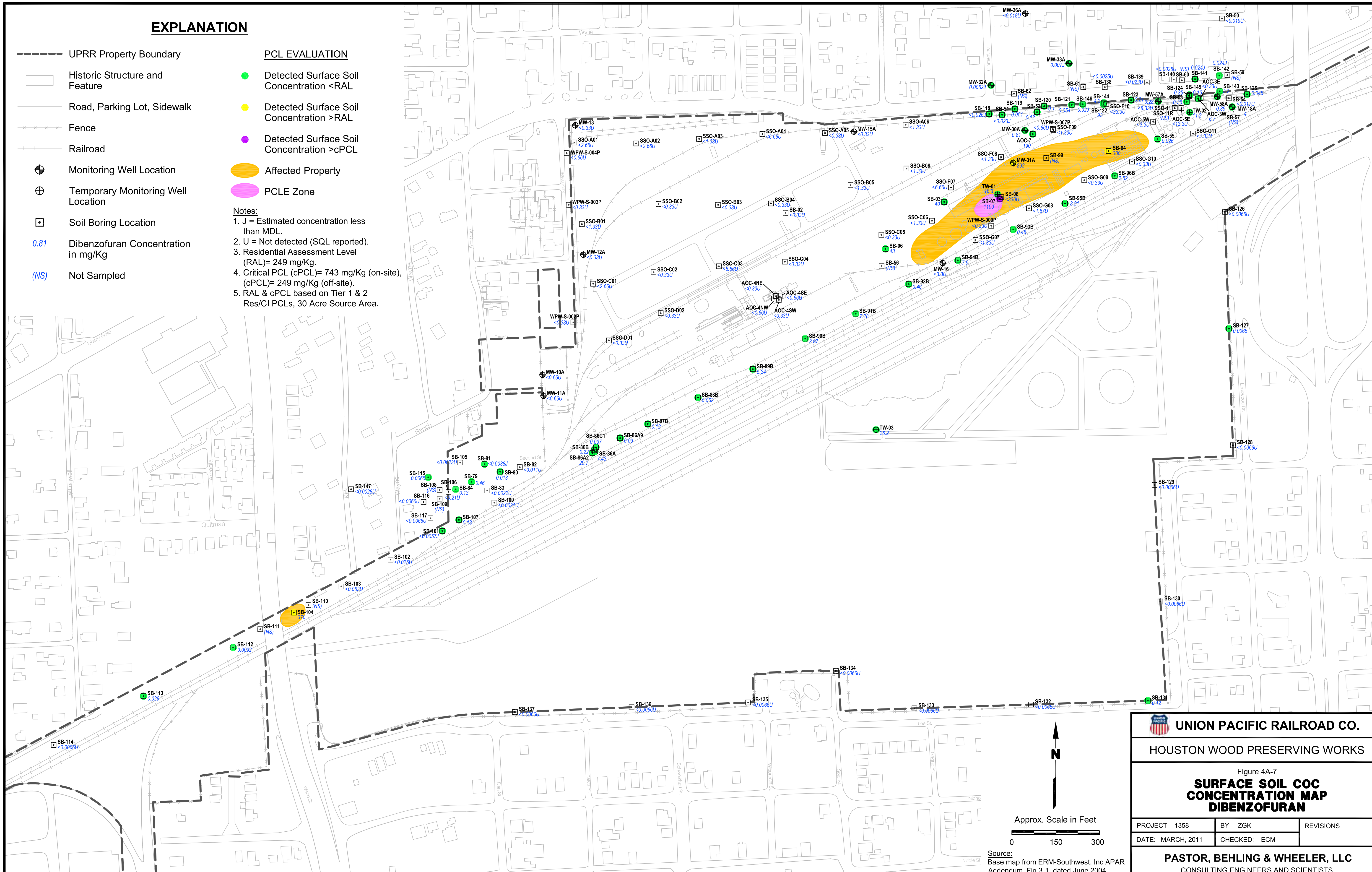
Figure 4A-6

SURFACE SOIL COC CONCENTRATION MAP BENZO(A)PYRENE

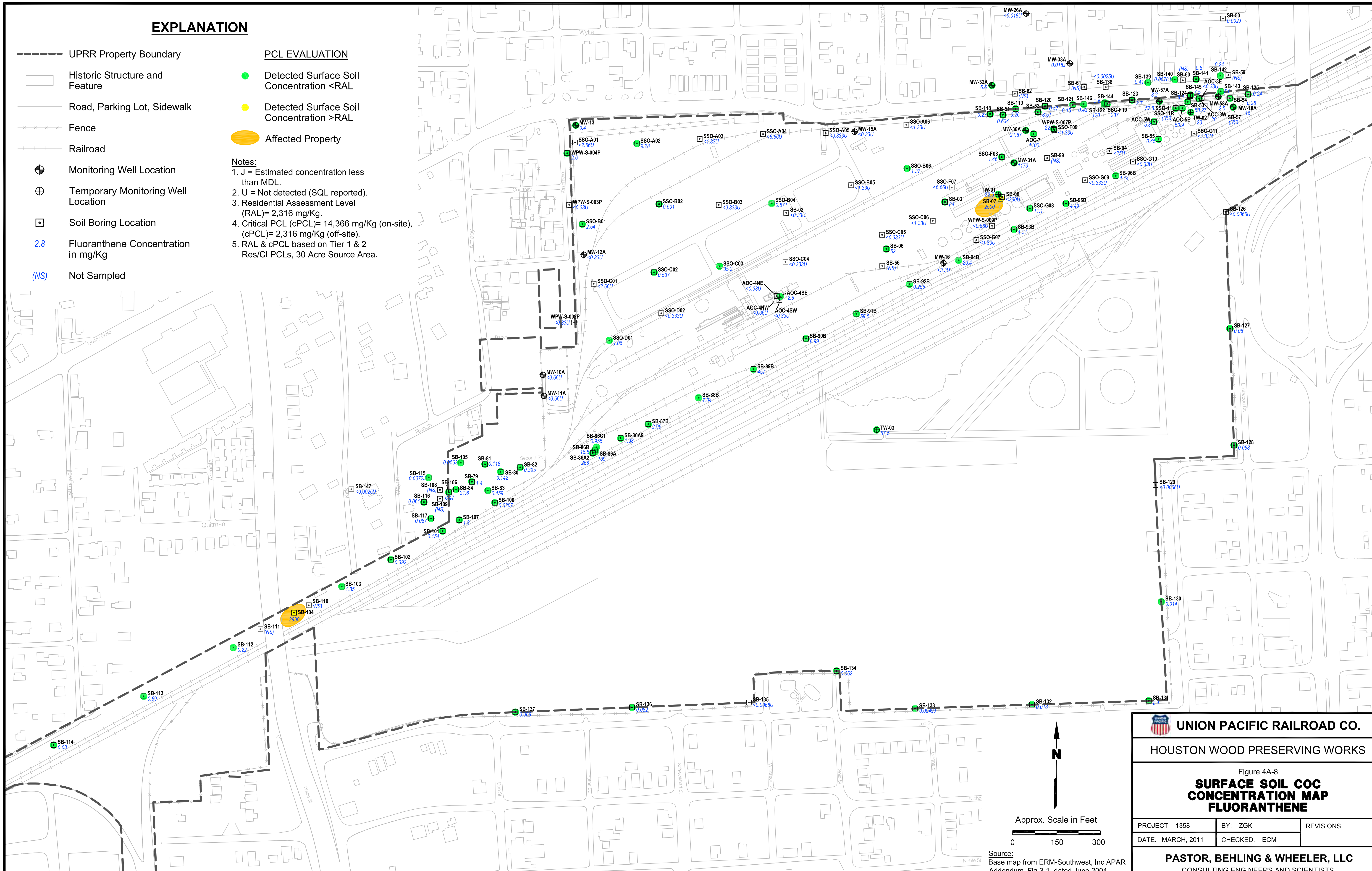
PROJECT: 1358	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION
UPRR Property Boundary
Historic Structure and Feature
Road, Parking Lot, Sidewalk
Fence
Railroad
Monitoring Well Location
Temporary Monitoring Well Location
Soil Boring Location
0.81 Dibenzofuran Concentration in mg/Kg
(NS) Not Sampled
PCL EVALUATION
Detected Surface Soil Concentration <RAL
Detected Surface Soil Concentration >RAL
Detected Surface Soil Concentration >cPCL
Affected Property
PCLE Zone
Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 249 mg/Kg.
4. Critical PCL (cPCL)= 743 mg/Kg (on-site), (cPCL)= 249 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.
N
Approx. Scale in Feet
0
150
300
Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.
UNION PACIFIC RAILROAD CO.
HOUSTON WOOD PRESERVING WORKS
Figure 4A-7
SURFACE SOIL COC CONCENTRATION MAP DIBENZOFURAN
PROJECT: 1358
BY: ZGK
REVISIONS
DATE: MARCH, 2011
CHECKED: ECM
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure 4A-8

SURFACE SOIL COC CONCENTRATION MAP FLUORANTHENE

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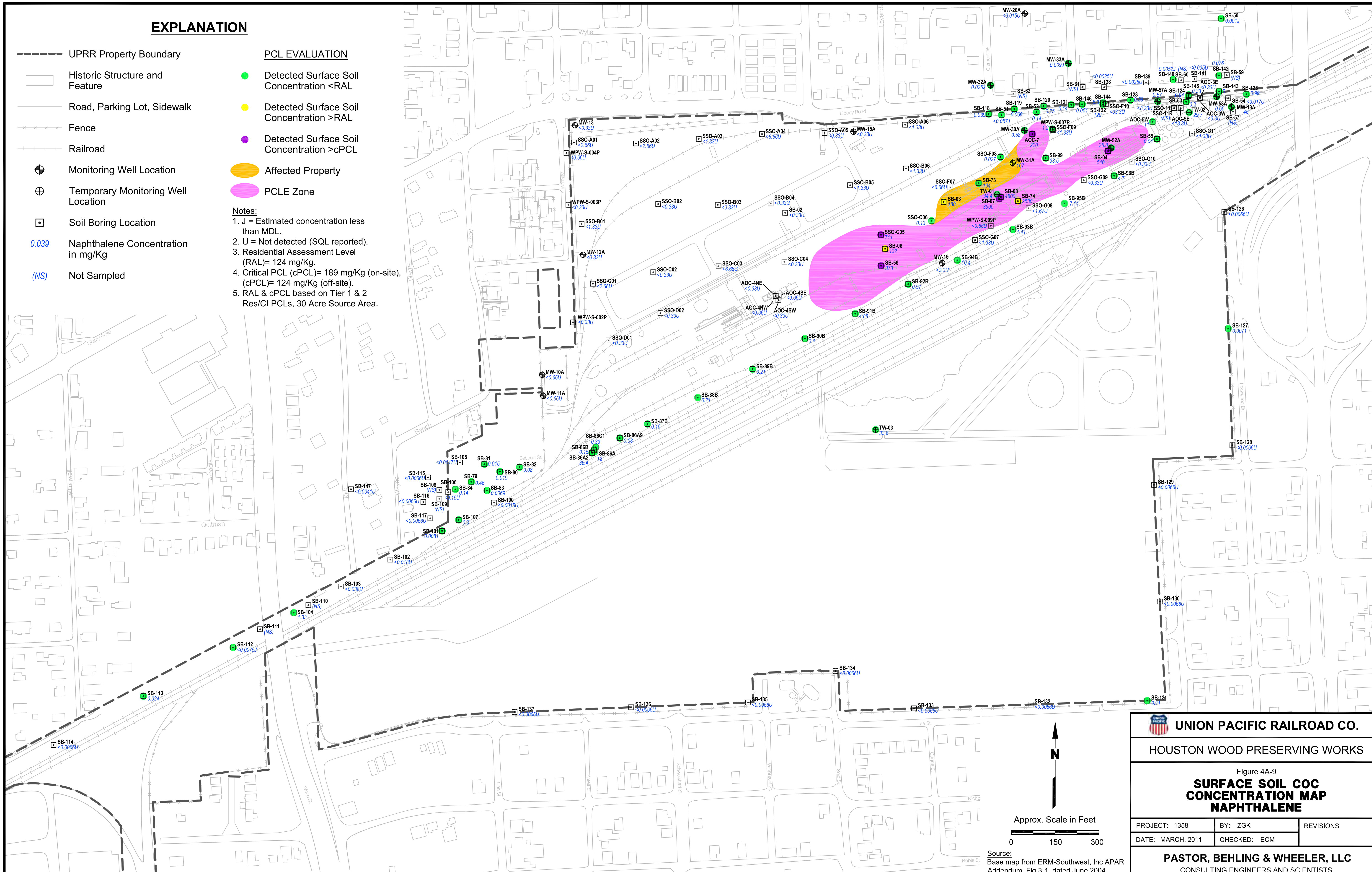

EXPLANATION
UPRR Property Boundary
Historic Structure and Feature
Road, Parking Lot, Sidewalk
Fence
Railroad
Monitoring Well Location
Temporary Monitoring Well Location
Soil Boring Location
0.039 Naphthalene Concentration in mg/Kg
(NS) Not Sampled
PCL EVALUATION
Detected Surface Soil Concentration <RAL
Detected Surface Soil Concentration >RAL
Detected Surface Soil Concentration >cPCL
Affected Property
PCLE Zone
Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 124 mg/Kg.
4. Critical PCL (cPCL)= 189 mg/Kg (on-site), (cPCL)= 124 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.
N
Approx. Scale in Feet
0 150 300
Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.
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HOUSTON WOOD PRESERVING WORKS
Figure 4A-9
SURFACE SOIL COC CONCENTRATION MAP NAPHTHALENE
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BY: ZGK
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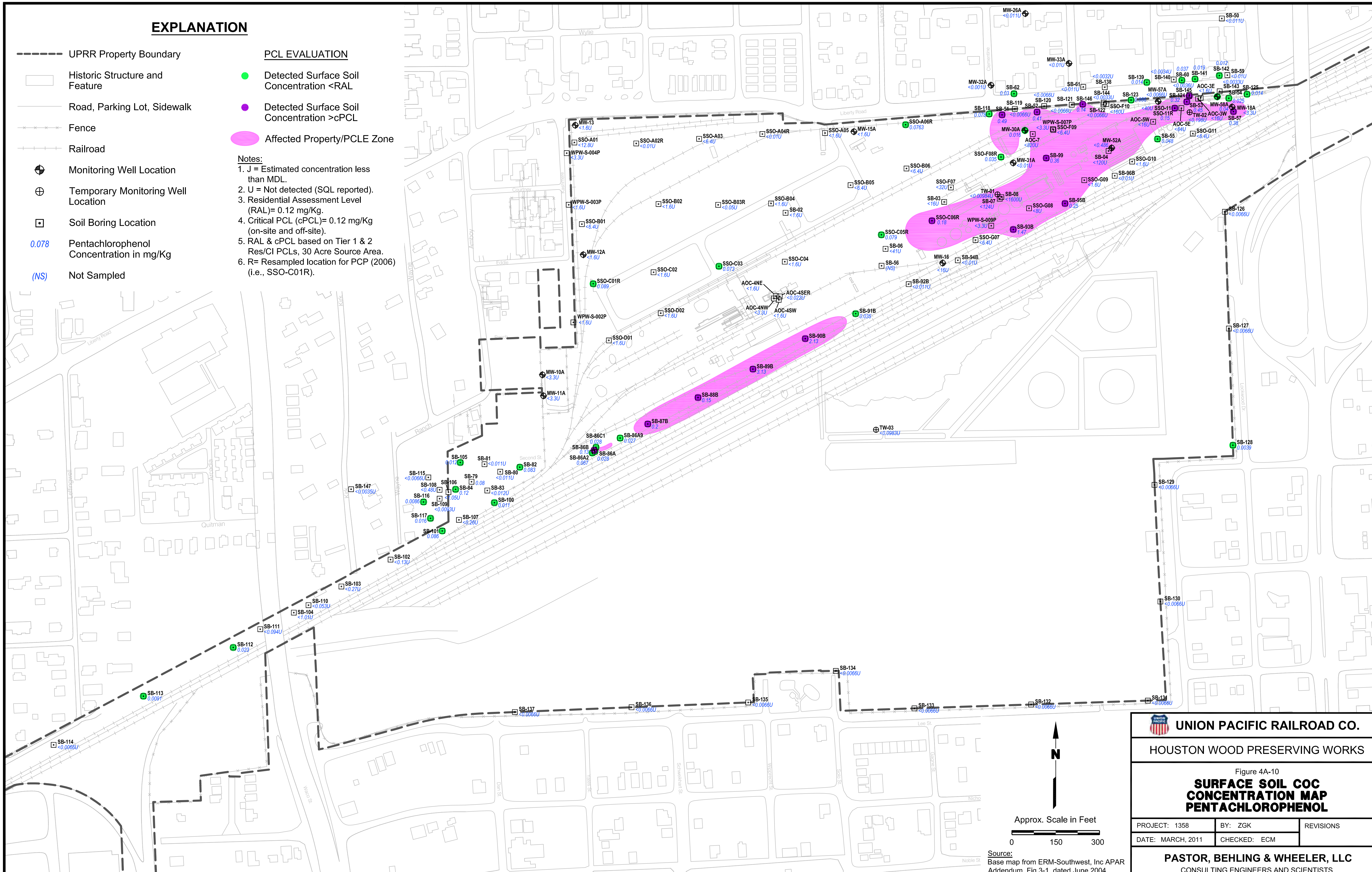
EXPLANATION
UPRR Property Boundary
Historic Structure and Feature
Road, Parking Lot, Sidewalk
Fence
Railroad
Monitoring Well Location
Temporary Monitoring Well Location
Soil Boring Location
0.078 Pentachlorophenol Concentration in mg/Kg
(NS) Not Sampled
PCL EVALUATION
Detected Surface Soil Concentration <RAL
Detected Surface Soil Concentration >cPCL
Affected Property/PCLE Zone
Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 0.12 mg/Kg.
4. Critical PCL (cPCL)= 0.12 mg/Kg (on-site and off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.
6. R= Resampled location for PCP (2006) (i.e., SSO-C01R).
N
Approx. Scale in Feet
0 150 300
Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.
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Figure 4A-10
SURFACE SOIL COC CONCENTRATION MAP PENTACHLOROPHENOL
PROJECT: 1358
BY: ZGK
REVISIONS
DATE: MARCH, 2011
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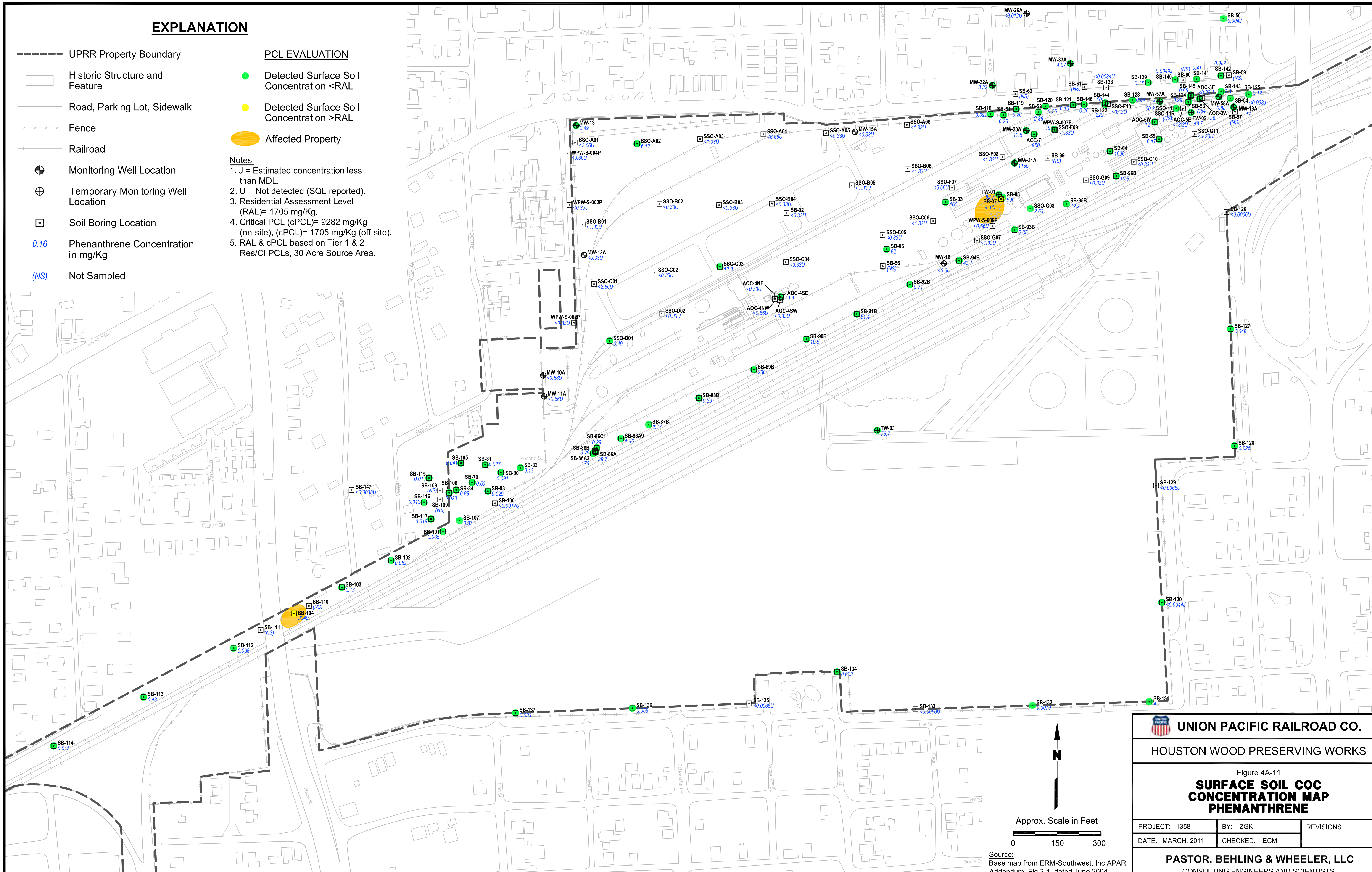

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Temporary Monitoring Well Location
- Soil Boring Location
- 0.16 Phenanthrene Concentration in mg/Kg
- (NS) Not Sampled

PCL EVALUATION

- Detected Surface Soil Concentration <RAL
- Detected Surface Soil Concentration >RAL
- Affected Property

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 1705 mg/Kg.
4. Critical PCL (cPCL)= 9282 mg/Kg (on-site), (cPCL)= 1705 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.

N

Approx. Scale in Feet

0 150 300

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

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Figure 4A-11

SURFACE SOIL COC CONCENTRATION MAP PHENANTHRENE

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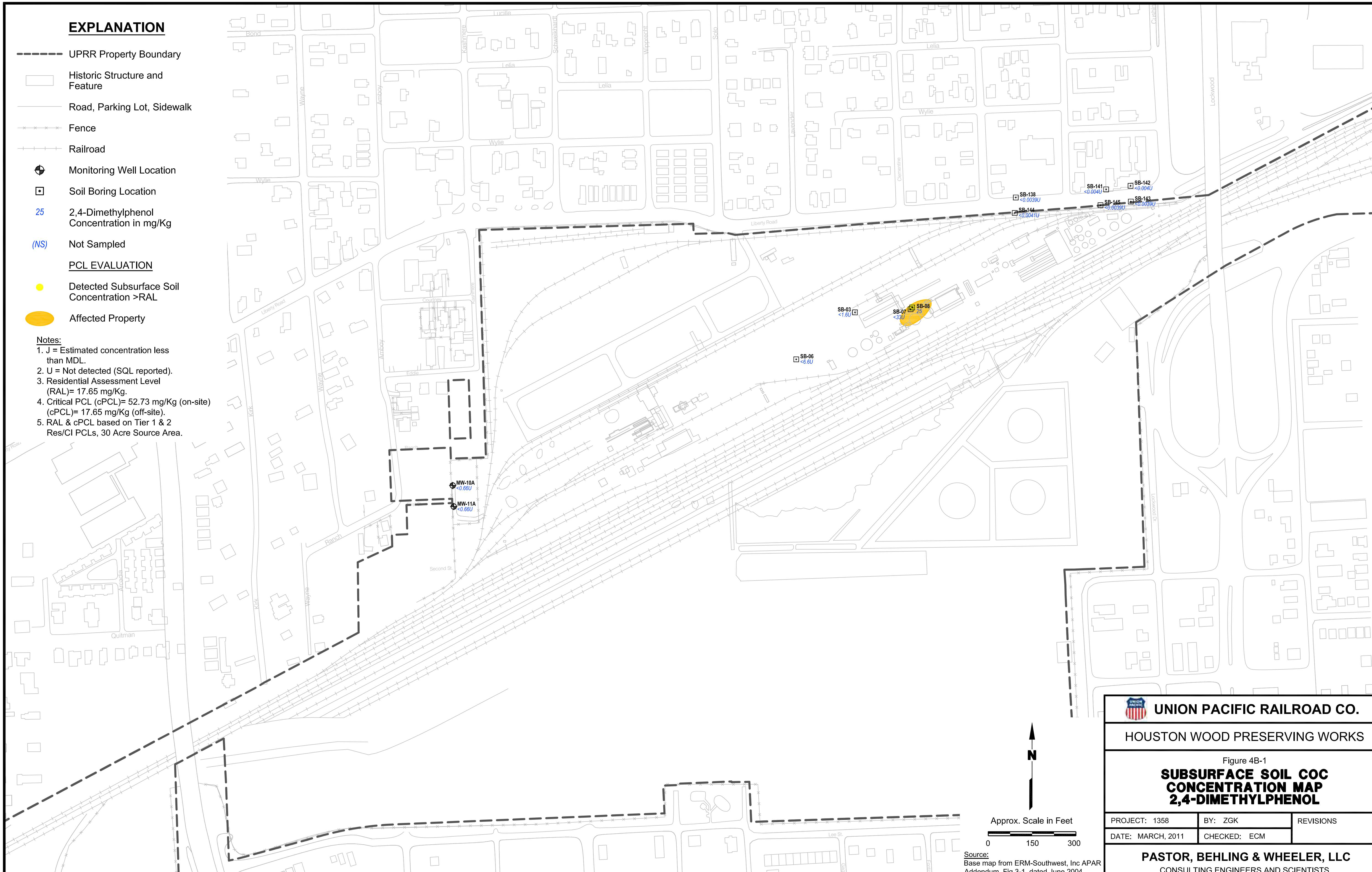

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Soil Boring Location
- 25 — 2,4-Dimethylphenol Concentration in mg/Kg
- (NS) — Not Sampled

PCL EVALUATION

- Detected Subsurface Soil Concentration >RAL
- Affected Property

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 17.65 mg/Kg.
4. Critical PCL (cPCL)= 52.73 mg/Kg (on-site) (cPCL)= 17.65 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.

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

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Figure 4B-1

SUBSURFACE SOIL COC CONCENTRATION MAP 2,4-DIMETHYLPHENOL

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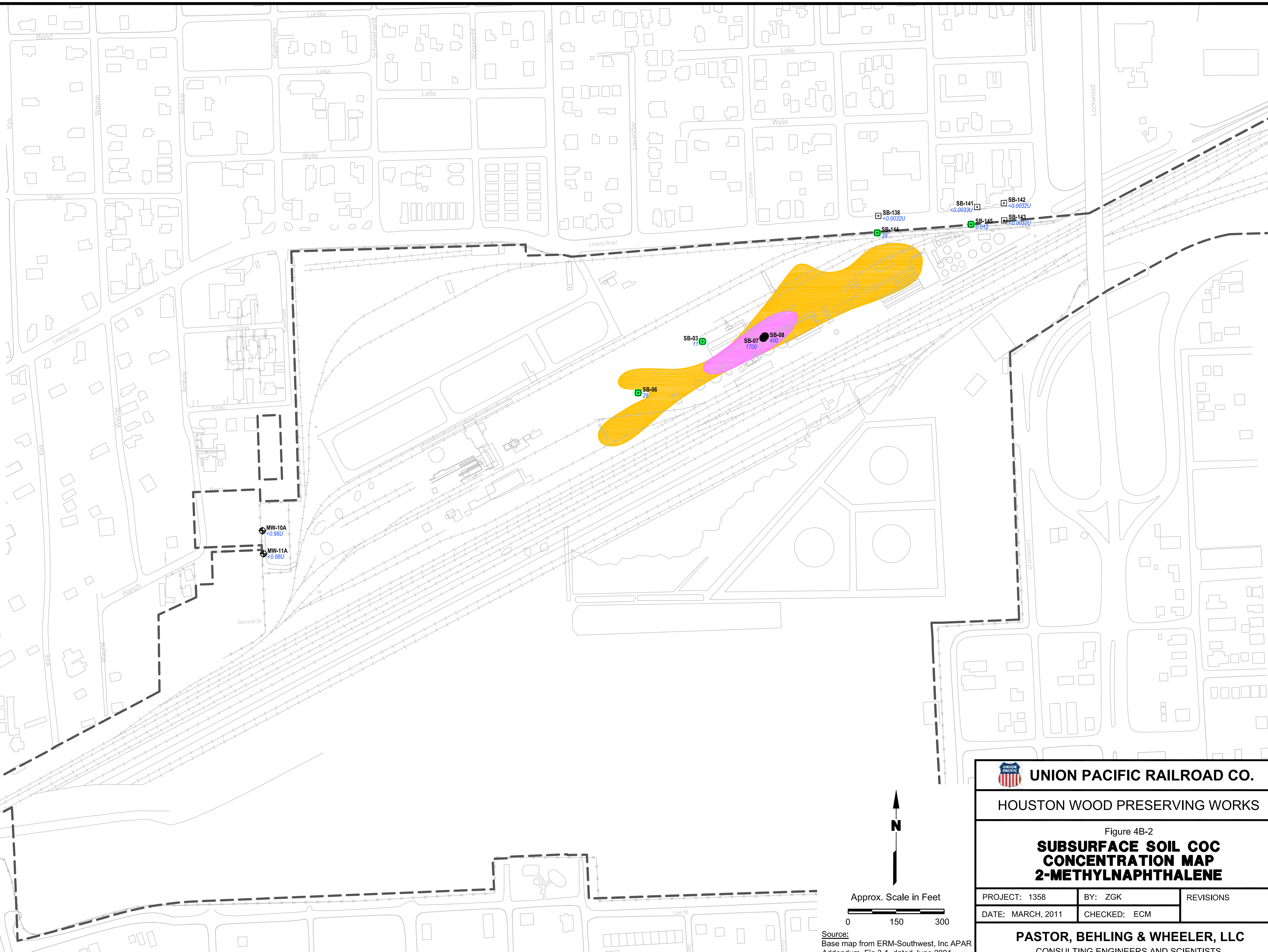
EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Soil Boring Location
- *25* 2-Methylnaphthalene Concentration in mg/Kg
- *(NS)* Not Sampled

PCL EVALUATION

- Detected Subsurface Soil Concentration <RAL
- Detected Subsurface Soil Concentration >RAL
- Detected Subsurface Soil Concentration >cPCL
- Affected Property
- PCLE Zone

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 126 mg/Kg.
4. Critical PCL (cPCL)= 378 mg/Kg (on-site), (cPCL)= 126 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.



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

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Figure 4B-2

SUBSURFACE SOIL COC CONCENTRATION MAP 2-METHYLNAPHTHALENE

PROJECT: 1358	BY: ZGK	REVISIONS
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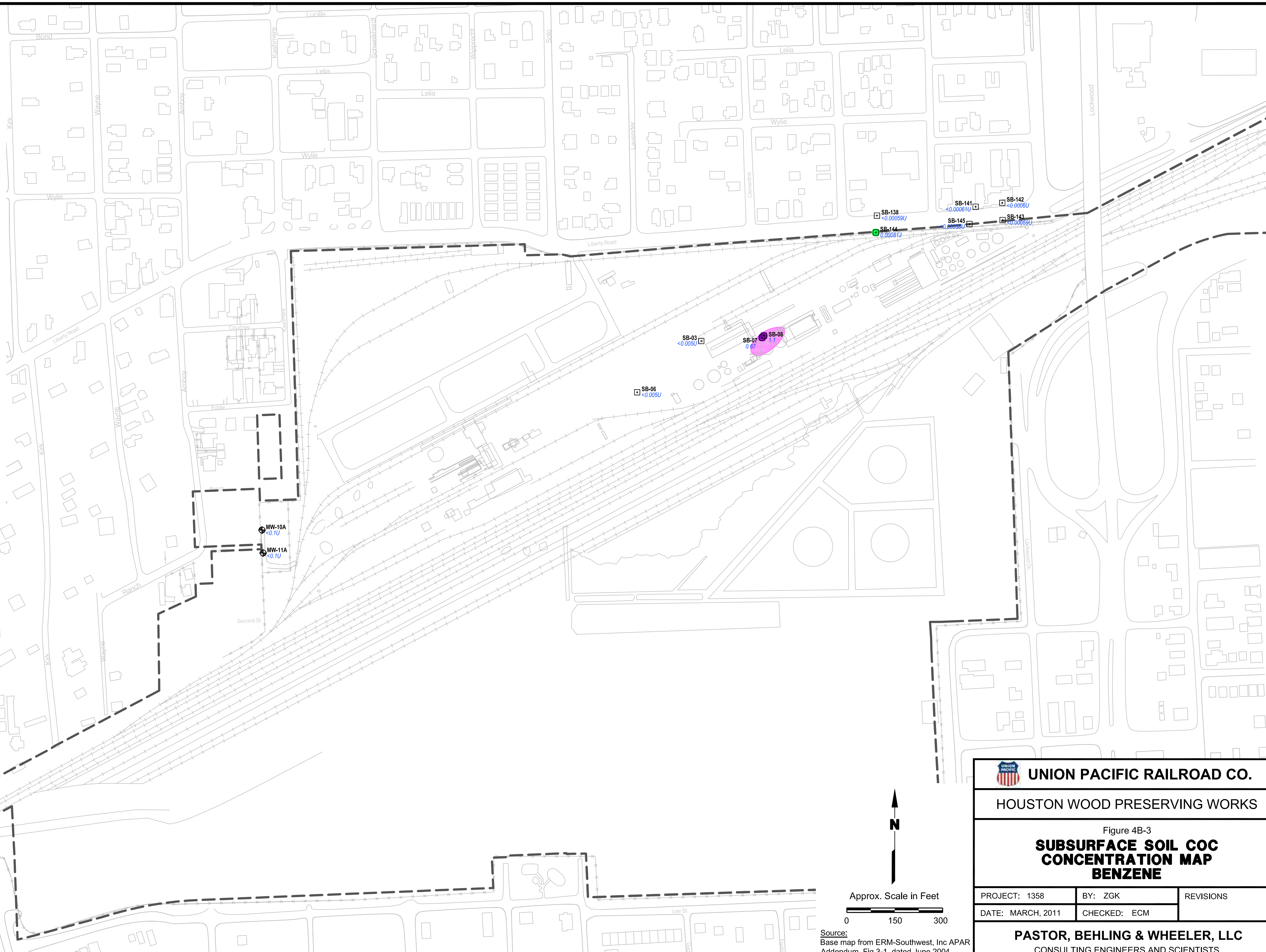

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Soil Boring Location
- 25 — Benzene Concentration in mg/Kg
- (NS) — Not Sampled

PCL EVALUATION

- Detected Subsurface Soil Concentration <RAL
- Detected Subsurface Soil Concentration >cPCL
- Affected Property/PCLE Zone

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 0.105 mg/Kg.
4. Critical PCL (cPCL)= 0.105 mg/Kg (on-site and off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.

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

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Figure 4B-3

SUBSURFACE SOIL COC CONCENTRATION MAP BENZENE

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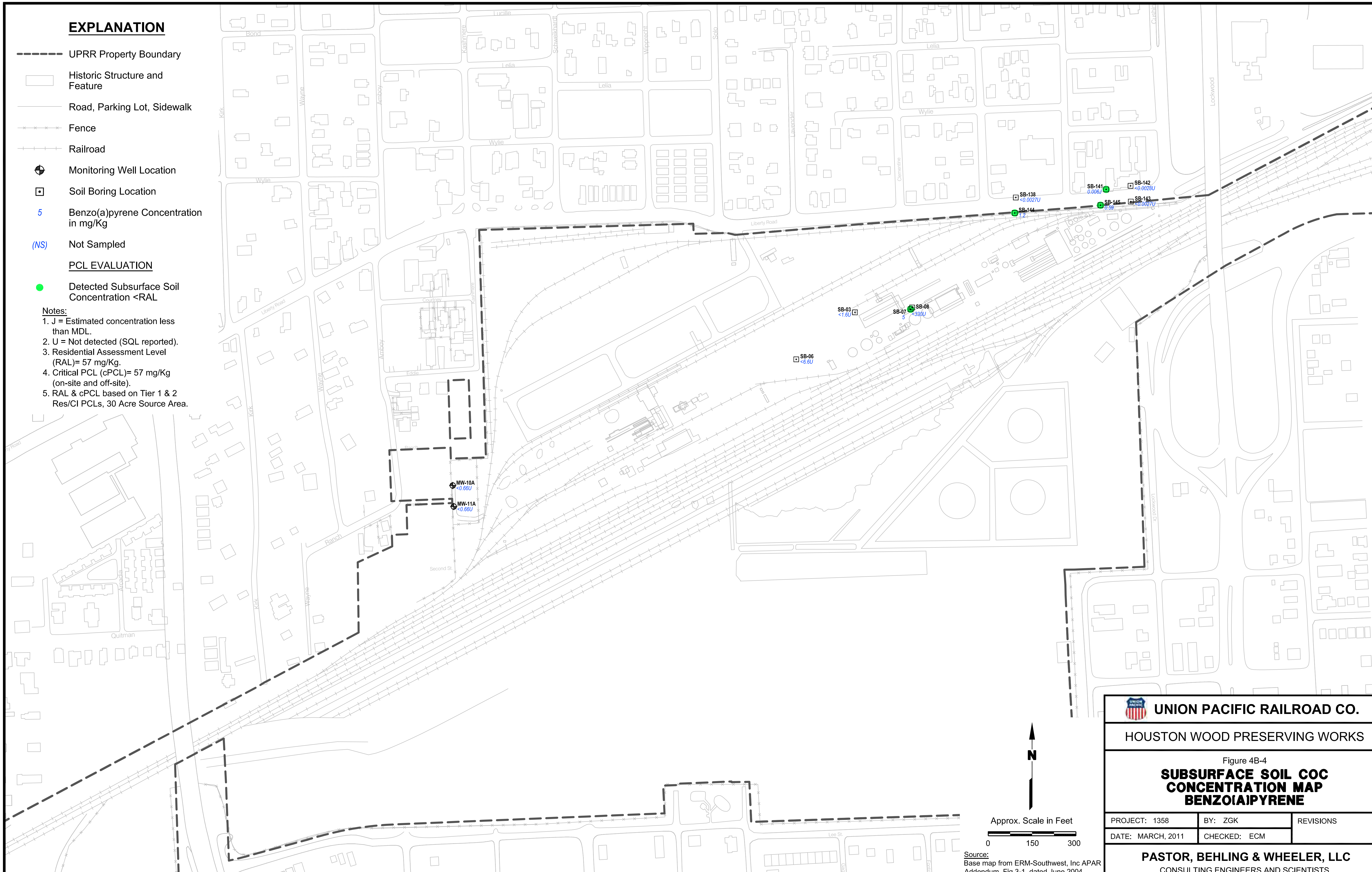

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Soil Boring Location
- *5* Benzo(a)pyrene Concentration in mg/Kg
- *(NS)* Not Sampled

PCL EVALUATION

- Detected Subsurface Soil Concentration <RAL

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 57 mg/Kg.
4. Critical PCL (cPCL)= 57 mg/Kg (on-site and off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.

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

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Figure 4B-4

SUBSURFACE SOIL COC CONCENTRATION MAP BENZO(A)PYRENE

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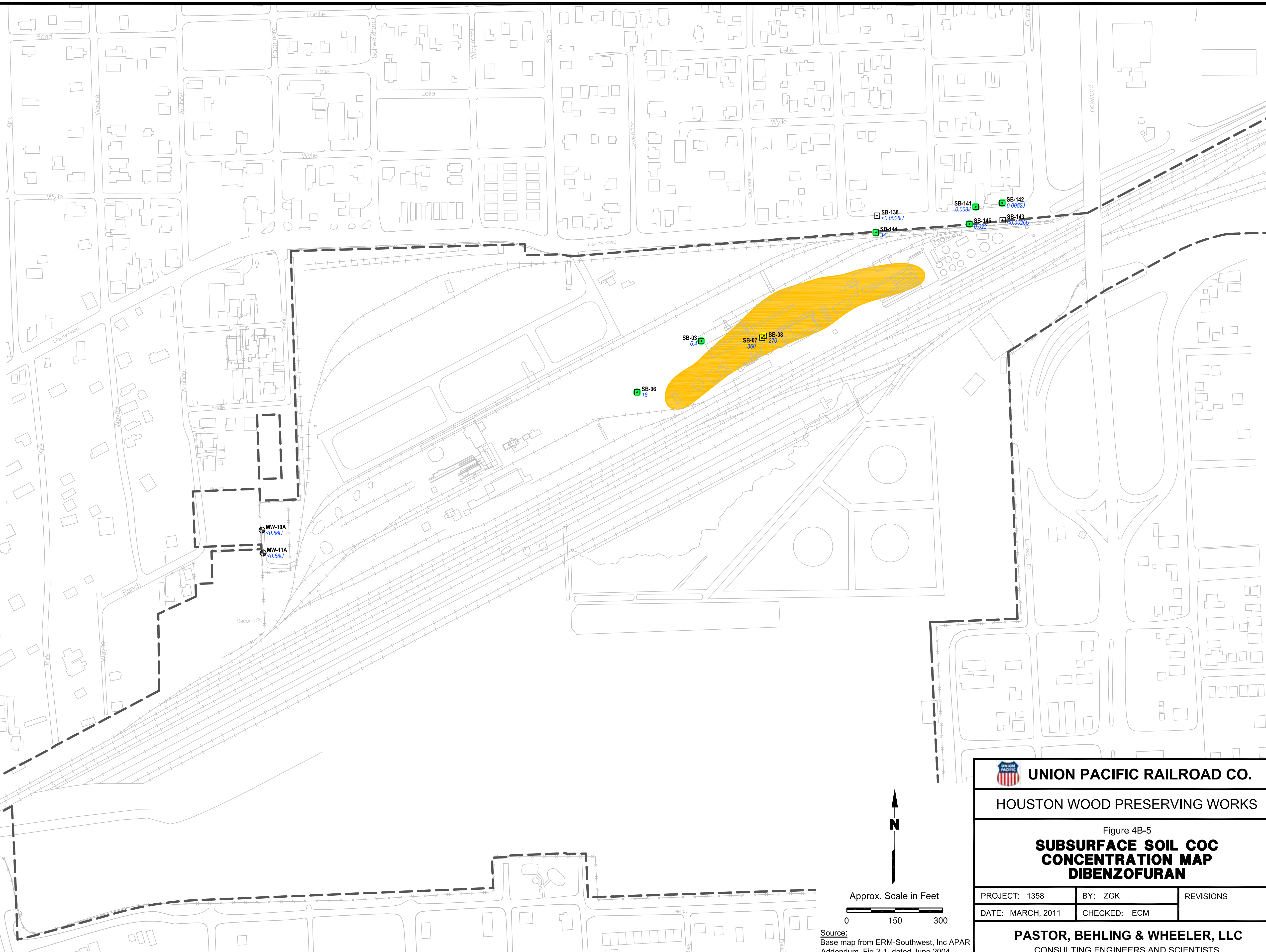
EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Soil Boring Location
- 300 — Dibenzofuran Concentration in mg/Kg
- (NS) — Not Sampled

PCL EVALUATION

- Detected Subsurface Soil Concentration <RAL
- Detected Subsurface Soil Concentration >RAL
- Affected Property (Surface soil Affected Property extrapolated to subsurface soils)

Notes:
1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 249 mg/Kg.
4. Critical PCL (cPCL)= 743 mg/Kg (on-site), (cPCL)= 249 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.



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

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Figure 4B-5

SUBSURFACE SOIL COC CONCENTRATION MAP DIBENZOFURAN

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EXPLANATION

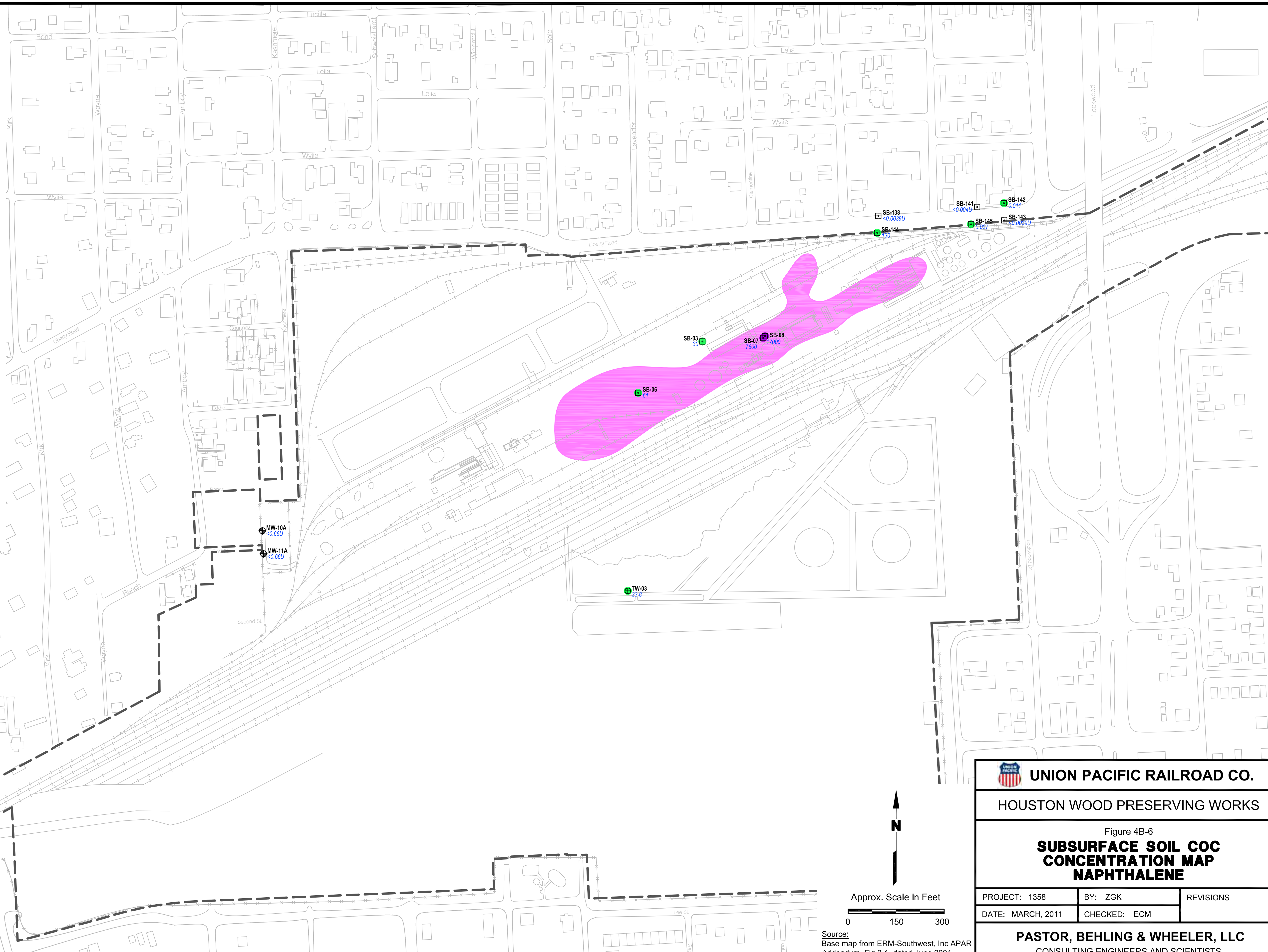
- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Soil Boring Location
- 25 — Naphthalene Concentration in mg/Kg
- (NS) — Not Sampled

PCL EVALUATION

- Detected Subsurface Soil Concentration <RAL
- Detected Subsurface Soil Concentration >cPCL
- Affected Property/PCLE Zone (Surface soil Affected Property/ PCLE Zone extrapolated to subsurface soils)

Notes:

1. J = Estimated concentration less than MDL.
2. U = Not detected (SQL reported).
3. Residential Assessment Level (RAL)= 137 mg/Kg.
4. Critical PCL (cPCL)= 192 mg/Kg (on-site), (cPCL)= 137 mg/Kg (off-site).
5. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.



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

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HOUSTON WOOD PRESERVING WORKS

Figure 4B-6

SUBSURFACE SOIL COC CONCENTRATION MAP NAPHTHALENE

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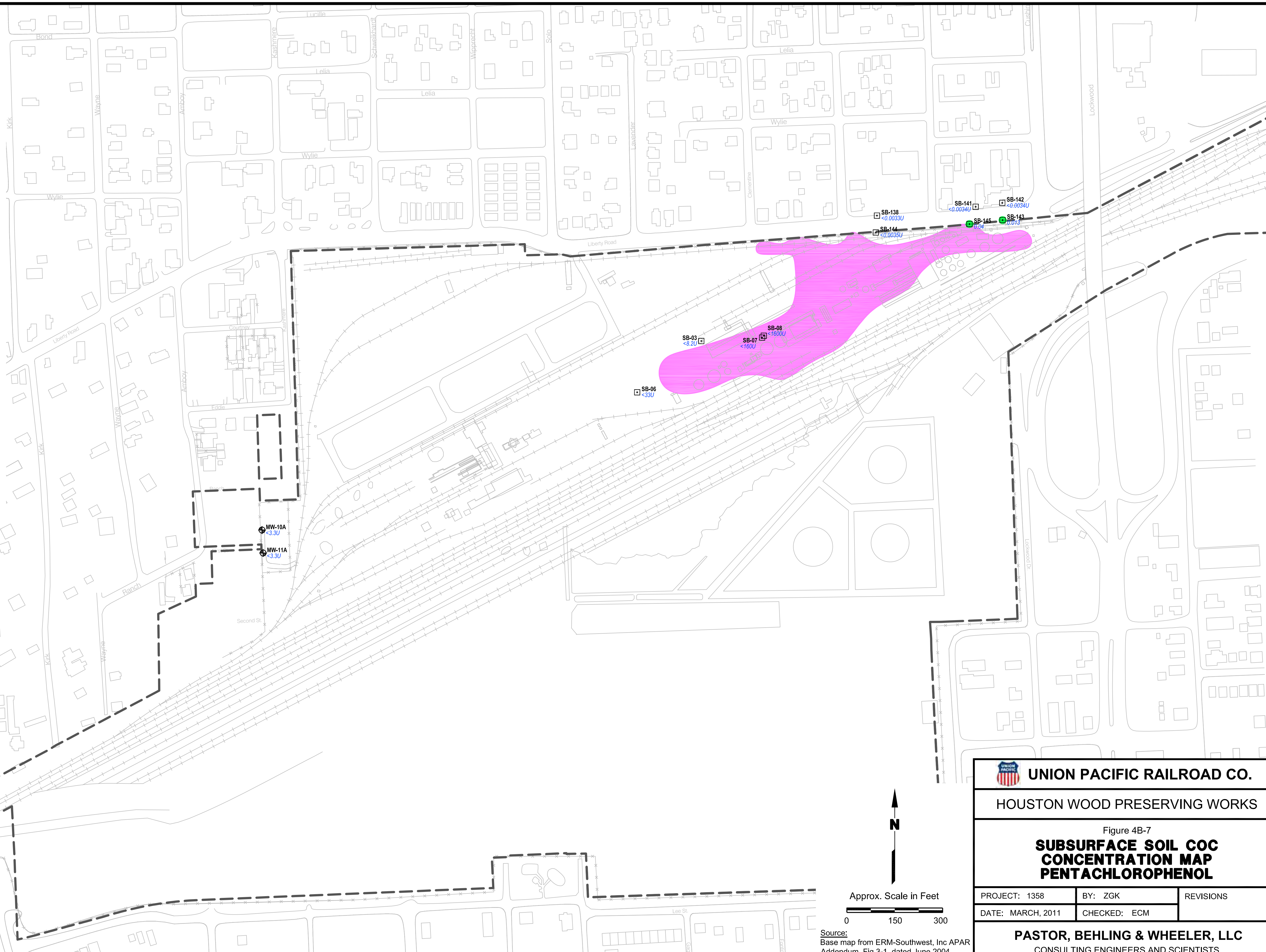

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Soil Boring Location
- 0.25 Pentachlorophenol Concentration in mg/Kg
- (NS) Not Sampled

PCL EVALUATION

- Detected Subsurface Soil Concentration <RAL
- Detected Subsurface Soil Concentration >cPCL
- Affected Property/PCLE Zone (Surface soil Affected Property/ PCLE Zone extrapolated to subsurface soils)

Notes:
1. U = Not detected (SQL reported).
2. Residential Assessment Level (RAL)= 0.12 mg/Kg.
3. Critical PCL (cPCL)= 0.12 mg/Kg (on-site and off-site).
4. RAL & cPCL based on Tier 1 & 2 Res/CI PCLs, 30 Acre Source Area.

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

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HOUSTON WOOD PRESERVING WORKS

Figure 4B-7

SUBSURFACE SOIL COC CONCENTRATION MAP PENTACHLOROPHENOL

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EXPLANATION

- Fill: Sand, Silt, Clay & Gravel, wood fragments, bricks, scrap metal
- Transmissive Zone (TZ): Sand & Silty Sand
- Cohesive Zone (CZ): Clay, Silty Clay & Silt
- Water Level Elevation (Ft HVD) (A-ATZ, B-BTZ, C-CTZ, D-DTZ)
- Elevation of Top of DNAPL (Ft HVD), and Measured DNAPL Thickness in Well (Ft) (June/July 2010)
- NAPL or Sheen/Staining Noted in Soils for Boring Log, or for CPT/ROST Location ROST Result >25% RE

MONITORING WELL CONSTRUCTION

- Boring
- Water Level (Ft HVD) Measured 7/12/2010
- Well Screen
- Well Sump

ROST LOGS

ROST (% RE) 0 50 100

Parameter	RAL (mg/L)
1,2-Dichloroethane	0.005
2,4-Dimethylphenol	0.49
2-Methylnaphthalene	0.098
Acenaphthene	1.5
Benzo(a)anthracene	0.0013
Benzene	0.005
Benzo(a)pyrene	0.0002
bis(2-ethylhexyl)phthalate	0.006
Chrysene	0.13
Dibenzofuran	0.098
Dichloromethane	0.005
Fluoranthene	0.98
Fluorene	0.98
Naphthalene	0.49
Pentachlorophenol	0.001
Phenanthrene	0.73
Pyrene	0.73
Toluene	1

- Groundwater Affected Property/ PCLE Zone

Notes:
1. Topography is estimated.
2. See Figure 1B for cross section location.
3. Concentration are in mg/L.
4. Highlighted and bolded concentrations exceed RALs.
5. Utility locations based on drawings provided by the City of Houston Department of Public Works & Engineering.
6. Vertical datum based on City of Houston Monument System (HVD), Ft HVD.

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Vertical Exaggeration 5X

75 0 75 150

scale in feet

STATE OF TEXAS ERIC C. MATZNER GEOLOGY LIC. # 795 LICENSED PROFESSIONAL GEOSCIENTIST

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Figure 4C-1

CROSS SECTIONS A-A', B-B' & C-C'

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EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- Monitoring Well Location
- Temporary Monitoring Well Location
- CPT with Rost Location
- Soil Boring Location
- NAPL Noted on Boring Log as Observed in Vadose Zone (* - black staining observed)
- 75 — Rost Response (%RE, 50%RE Contour)

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

N

Scale in Feet

0 200 400

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

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Figure 4D

VADOSE ZONE NAPL OBSERVATION AND ROST READING

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5.0 GROUNDWATER ASSESSMENT

Section 5.1 Derivation of Assessment Levels

The groundwater assessment levels at the Site were selected in consideration of the well yield testing detailed in the Revised APAR (ERM, 2004). Based on the evaluation of potentially complete expose pathways, the following groundwater-related residential pathways were assessed at the Site:

- $^{GW}GW_{Ing}$, and
- $^{Air}GW_{Inh\text{-}V}$.

For this updated APAR Addendum, groundwater analytical data collected from the Site collected in January 2010 and June/July 2010 were compared to the TCEQ TRRP Residential Groundwater PCLs dated March 2010, assuming the source area is greater than 0.5 acres (30-acre size), to evaluate target COCs that exceeded the groundwater RALs. RALs were established as the lesser value of the Residential $^{GW}GW_{Ing}$ and $^{Air}GW_{Inh\text{-}V}$ PCLs.

As discussed in the APAR Addendum (PBW, 2009), there are no water bodies within 0.5 miles of the Site. The closest water body is Buffalo Bayou, which is located about 1.6 miles southwest of the Site. Therefore, the surface water pathway as a function of groundwater-to-surface water evaluation (^{SW}GW PCLs) and the sediment pathway as a function of groundwater-to-sediment evaluation (^{Sed}GW PCLs) were considered incomplete for the purposes of this affected property assessment.

The Affected Property was established based on groundwater COC results using the groundwater analytical data collected in 2010 (January and June/July). Details of the nature and extent of the COCs in groundwater as indicated by recent groundwater data are discussed below.

Section 5.2 Nature and Extent of COCs and NAPL in Groundwater

Groundwater samples were collected from monitoring wells installed in the four units of the uppermost GWBUs at the Site. Laboratory data packages for the data collected in 2010 are provided in Appendix 10. A complete summary of groundwater analytical data for the Site from 2004 through 2010 is presented on the following tables:

Table	Description
5B-1	Summary of Groundwater Sampling Results – A-TZ
5B-2	Summary of Groundwater Sampling Results – Selected A-TZ Wells - VOCs
5B-3	Summary of Groundwater Sampling Results – Temporary Wells – A-TZ
5B-4	Summary of Groundwater Sampling Results – B-TZ and B-CZ
5B-5	Summary of Groundwater Sampling Results – C-TZ
5B-6	Summary of Groundwater Sampling Results – D-TZ

COCs evaluated for the purpose of the APAR were site-specific COCs identified in the RFI Work Plan (IC, 1994) prepared for the Site. In addition to the 34 site-specific COCs, groundwater samples collected in January 2010 from monitoring wells in and around the former Aboveground Storage Tank Area (SWMU No. 8) MW-18A, MW-57A, MW-58A, and TW-56A were analyzed for the target constituent list (TCL) of volatile organic compounds (VOCs) by EPA Method 8260 (Table 5B-2). Comparing the maximum groundwater analytical data from the 2010 groundwater sampling events to RALs, concentrations of 24 target COCs exceeded their respective RALs or had a SDL greater than the RAL (>SDL) for COCs with no detections:

VOCs

- 1,2-Dichloroethane (A-TZ only)
- Benzene (A-TZ, B-TZ, C-TZ)
- Dichloromethane (A-TZ and C-TZ,
- Toluene (A-TZ only)
- Vinyl Chloride (A-TZ, only one well)*

SVOCs

- 1,2-Diphenylhydrazine (B-CZ)*
- 2-Methylnaphthalene (A-TZ, B-TZ, C-TZ)
- Acenaphthene (A-TZ and C-TZ only)
- Benzo(a)pyrene (A-TZ, B-TZ, C-TZ)
- Bis(2-chloroethoxy)methane (>SDL, only one C-TZ well)
- Bis(2-ethylhexyl)phthalate (B-CZ, possible lab contaminant)
- Chrysene (A-TZ and C-TZ)
- Dibenzofuran (A-TZ, B-TZ, C-TZ)
- Fluoranthene (A-TZ and C-TZ)
- Fluorene (A-TZ and C-TZ)
- Naphthalene (A-TZ, B-TZ, C-TZ)
- Pentachlorophenol (A-TZ and C-TZ)
- Phenanthrene (A-TZ and C-TZ)
- Phenol (A-TZ only)
- Pyrene (A-TZ and C-TZ)

* - first time PCL exceedance, will be resampled and verified.

Groundwater flow conditions at the Site have been evaluated based on multiple fluid measurements collected since 2004, with the potentiometric surface relatively consistent in the transmissive zones over that time period. Groundwater data collected from the January and June/July 2010 gauging events are consistent with data collected previously at the Site, and with the additional wells installed in units A-TZ, B-CZ, C-TZ and D-TZ in June 2010. Potentiometric surface maps from the two semi-annual events in 2010 for each of the four transmissive zones, A-TZ, B-TZ, C-TZ, and D-TZ, are presented on Figures 5A-1 through and 5A-8, respectively.

The spatial distributions of the COCs exceeding RALs in each GWBU from the January 2010 and June/July 2010 monitoring events are presented on the following figures:

- Figures 5B-1 (Jan 2010) and 5B-2 (June/July 2010) for unit A-TZ,
- Figures 5B-3 (Jan 2010) and 5B-4 (June/July 2010) for B-TZ/B-CZ,
- Figures 5B-5 (Jan 2010) and 5B-6 (June/July 2010) for C-TZ, and
- Figures 5B-7 (Jan 2010) and 5B-8 (June/July 2010) for D-TZ.

The NAPL distribution at the Site based on DNAPL measurements from monitoring wells completed in the A-TZ, B-TZ/B-CZ, and C-TZ units are presented for January and July 2010 on Figures 5A-9 through 5A-14, respectively. Table 5D provides a summary of the fluid-level measurements since 2004.

Details of the potentiometric surface, distribution of the COCs, and the occurrence of NAPL for each transmissive zone are discussed below.

<u>Section 5.2.1 Groundwater Flow Conditions and COC Distribution</u>

Transmissive Zone A-TZ

Groundwater in the A-TZ generally flows from west to east across the Site at a gradient of approximately 0.006 ft/ft, with groundwater divide on the east side of the Site just west of the Lockwood Road Bridge (Figures 5A-1 and 5A-2). Identified just west of the bridge is the 60-in wastewater line that runs north to south (Figure 3A) and appears to intersect the A-TZ (see Cross Section A-A', B-B', and C-C', Figure 4C-1). Groundwater flow in the A-TZ flows to the east on the west side of the wastewater line, and flows to the west on the east side of the wastewater line. The highest groundwater elevations in the A-TZ are generally near SWMU No.1 (45.22 feet relative to the City of Houston Vertical Datum (HVD) (MW-10A, Jan 2010)), with the lowest elevations near the east side of the Site along Lockwood Drive (33.46 feet HVD (MW-18A, July 2010)) near the area where the wastewater line is located. Although these groundwater flow directions suggest potential discharge to the wastewater line, as discussed in Section 3.0, fluid samples collected from the line suggested there is not a significant loading of COCs from groundwater into the wastewater line.

VOCs – A-TZ

During the two semi-annual 2010 groundwater monitoring events, benzene concentrations were detected above the RAL of 0.005 mg/L in A-TZ wells located predominantly on the eastern portion of the Site near SWMU Nos. 4, 5, and 8 (Figures 5B-1 and 5B-2). The maximum benzene concentration detected in the A-TZ wells in 2010 was 1.5 mg/L at off-site well MW-32A. Benzene concentrations on-site were detected generally between 0.038 mg/L and 0.65 mg/L. Naphtha, a common drying agent used in the wood-treating process, consists of lighter fraction carbon chain compounds, including benzene.

Other VOC compounds detected in the groundwater samples from A-TZ wells included one PCL exceedance for 1,2-dichloroethane (0.023J mg/L at TW-56A, Jan 2010), three PCL exceedances for dichloromethane (MW-16, MW-17, and MW-57A, only in June/July 2010 event, possible laboratory contaminant), one PCL exceedance for toluene (1.5 mg/L at MW-32A, June/July 2010), and one PCL exceedance for vinyl chloride (0.059 mg/L at MW-18A, Jan 2010). Monitoring wells MW-57A, MW-58A, and TW-56A were also analyzed for vinyl chloride, with none of the concentrations in these wells exceeding the vinyl chloride PCL (0.002 mg/L) (Table 5B-2). During the next scheduled sampling event (January 2011), the groundwater sample from MW-18A will analyzed for vinyl chloride to confirm the January 2010 result. The horizontal distribution of VOCs has been delineated to RALs based on the monitoring points located in all directions around the area with detections of VOCs less than RALs or not detected at downgradient, cross-gradient, and up-gradient well locations.

SVOCs – A-TZ

SVOCs were detected above the applicable RALs in A-TZ wells located generally on the eastern portion of the Site near SWMU Nos. 4, 5, and 8; and one A-TZ well located on the western portion of the Site (MW-12A) (Figures 5B-1 and 5B-2). The predominant SVOCs detected in the A-TZ above RALs include 2-methylnaphthalene, 2,4-dimethylphenol, dibenzofuran, and naphthalene. Other SVOCs, including benz(a)anthracene, benzo(a)pyrene, and phenol, were also detected at concentrations greater than RALs. Acenaphthene, chrysene, fluoranthene, fluorine, phenanthrene, and pyrene were detected in only one sample above RALs, in the MW-57A sample collected during the June/July 2010 sampling event. The increase in SVOC concentration coincides with the first occurrence of DNAPL in the well (see Section 5.3). The horizontal distribution of SVOCs has been delineated to RALs based on the monitoring points located in all directions around the area with detections of SVOCs less than RALs or not detected.

Groundwater Plume Stability – A-TZ

For the A-TZ groundwater Affected Property, the configuration of the groundwater plume based on the data collected from 2008 through 2010 has been stable as shown on Figure 5B-9. Groundwater data from the A-TZ wells suggests the plume is not migrating and COC concentrations are predominantly limited to the on-site property except for areas near wells MW-32A and along the east portion of the Site at wells MW-18A and MW-49A. Unit A-TZ groundwater flow conditions near the wastewater utility on the east side of the Site likely controls the migration of COCs in the A-TZ downgradient to the southeast; however, as discussed in Section 3.0, there does not appear to be significant mass loading of COCs into the wastewater line.

Transmissive Zone B-TZ/Cohesive Zone B-CZ

Groundwater in the B-TZ/B-CZ generally flows from west to east across the Site at a gradient of approximately 0.004 ft/ft, and flows to the west on the far west side of the Site at a gradient approximately 0.012 ft/ft (Figures 5A-3 and 5A-4). As shown on Figures 5A-3 and 5A-4, there is a piezometric high near the west perimeter of the Site, similar to the A-TZ. The highest groundwater elevation in the B-TZ in 2010 was 45.63 feet HVD (P-10 near SWMU No. 1, July 2010), and lowest elevation in the B-TZ wells was 26.97 feet HVD (MW-29B, July 2010).

Four wells were installed in 2007 and 2009 in the B-CZ clay unit east of where the B-TZ pinches out to evaluate dissolved phase COCs and potential DNAPL migration in the clay unit (Figure 5A-3): MW-33B, MW-35B, MW-49B, and MW-63B. Three additional wells were installed in June 2010 in the B-CZ to evaluate COC concentrations in the clay (Figure 5A-4): MW36B, MW-59B, and MW-67B. At each location, groundwater was encountered in very thin carbonate seams (typically less than 0.1 feet thick) within the B-CZ clay unit. Groundwater flow based on the January 2010 measurements is to the east-southeast, with a component of flow from the north to the southeast off-site to the north (wells MW-63B and MW-33B) (Figure 5A-3). Groundwater flow during the July 2010 gauging event shows flow to the east-southeast on the east portion of the Site; however, with groundwater potentiometric elevations from the wells east of the Site (i.e., MW-36B and MW-59B), there is a component of groundwater flow to the southwest from MW-36B and flow to the northwest from MW-59B (Figure 5A-4).

As detailed in the APAR Addendum, the B-CZ yields less than 0.1 gallons per minute (GPM) (i.e., behaves as a Class 3 Groundwater-Bearing Unit (GWBU)) in those areas east of MW-35B. Additional groundwater yield testing was conducted on the three new B-CZ wells (MW-36B, MW-59B, and MW-

67B installed in 2010. Based on the aquifer testing results, the hydraulic conductivity estimated using the Bouwer-Rice analysis ranged from 6 x 10^{-8} cm/sec to 1 x 10^{-7} cm/sec for six of the seven wells completed in the B-CZ. The only well with a hydraulic conductivity greater than 1 x 10^{-5} cm/sec (criteria for saturated soils) was well MW-35B, which had a hydraulic conductivity estimate at 1 x 10^{-4} cm/sec. MW-35B appears to be installed in the area of the lateral transitional boundary where the B-TZ pinches out into the B-CZ with some hydraulic connection between the more transmissive sands to the southwest and the carbonate seams encountered in MW-35B. Details of the aquifer testing and results are discussed in Section 2.1 and Appendix 7. For the purposes of evaluating the Affected Property, COCs detected in groundwater encountered in the B-CZ were conservatively evaluated to Class 2 groundwater PCLs, as discussed below.

Based on the potentiometric elevations within the A-TZ and B-TZ, there appears to be communication between the two GWBUs on the west side of the Site as shown with the relatively similar groundwater elevations shown for the two units on Figures 5A-1 and 5A-2 for the A-TZ wells, and Figures 5A-3 and 5A-4 for the B-TZ/B-CZ wells. Groundwater elevations in the B-CZ on the east side of the Site are generally higher relative to the groundwater elevations in the A-TZ, indicating an upward vertical gradient between the B-CZ and the A-TZ.

VOCs – B-TZ/B-CZ

Benzene was detected above the RAL in the B-TZ on the west side of the Site at only one monitoring well, MW-40B, at 0.028 mg/L in January 2010, and at 0.026 mg/L in June/July 2010, with no detections above the SDL (<0.0005 mg/L) at any B-TZ monitoring points located downgradient from this area (i.e., MW-42B, MW-14, MW-39B, and MW-38B) (Figures 5B-3 and 5B-4). With benzene concentrations less than the PCL in on-site monitoring wells MW-14, MW-39B, P-11, and off-site well MW-38B, benzene concentrations are delineated on-site to the RAL in the B-TZ. No other VOCs were detected in Unit B-TZ monitoring wells at concentrations exceeding the applicable RALs.

As previously discussed, the B-CZ, where monitoring wells MW-33B, MW-36B, MW-49B, MW-59B, MW-63B, and MW-67B are completed in the non-groundwater bearing unit, does not yield a sufficient quantity of groundwater to be considered a current or future usable water resource. However, COC concentrations detected in groundwater samples from these wells were compared to Class 2 groundwater PCLs to conservatively evaluate the Affected Property. Using the Class 2 Tier 1 PCLs, benzene was detected above the RAL in the four B-CZ wells MW-33B, MW-35B, MW-49B, and MW-63B during the January 2010 monitoring event ranging from 0.013 mg/L (MW-49B) to 1.2 mg/L (MW-33B) where

DNAPL was encountered (Figure 5B-3). After three new B-CZ wells were installed in June 2010, benzene concentrations detected during the June/July 2010 event (Figure 5B-4) were again detected in the same four B-CZ wells listed above with concentrations ranging from 0.01 mg/L (MW-49B) to 2 mg/L (MW-33B); however, benzene concentrations were not detected above the SDL (<0.0005 mg/L) in new wells MW-36B, MW-59B, and MW-67B. These data indicate that the benzene is delineated to RALs in the B-CZ. No other VOCs were detected in Unit B-CZ monitoring wells in 2010 at concentrations exceeding the applicable RALs.

SVOCs – B-TZ/B-CZ

SVOCs exceeding the applicable RALs in the B-TZ were detected at MW-40B on the west side of the Site. The SVOCs detected above RALs consisted of 2-methylnaphthalene, dibenzofuran, and naphthalene. SVOCs were not detected above RALs at any of the monitoring wells located downgradient of MW-40B during either the January 2010 or June/July 2010 events (Figures 5B-3 and 5A-4, respectively), demonstrating delineation to the RALs in this portion of the B-TZ. The general absence of COCs in monitoring wells MW-38B and MW-39B located downgradient of MW-12B and MW-41B, which contain DNAPL, show that COCs in groundwater attenuate below RALs over a short distance (<100 feet). Well TW-41B, located within 50 feet of MW-41B, had no COCs detected at concentrations greater than RALs (Figure 5B-3).

On the northeastern portion of the Site, 2-methylnaphthalene and naphthalene were detected at concentrations based on the January 2010 sampling event above RALs in three monitoring wells completed in the B-CZ located north of the Site (MW-33B, MW-35B, and MW-63B) (Figure 5B-3). None of the site-specific SVOCs were detected in MW-49B above RALs. Bis(2-ethylhexyl)phthalate, a common laboratory contaminant, and dibenzofuran were the only other SVOCs detected above RALs in MW-33B. Groundwater data collected in June/July 2010 from the seven B-CZ wells had concentrations of 2-methylnaphthalene, dibenzofuran, and naphthalene greater than RALs in MW-33B, MW-35B, and MW-63B (Figure 5B-4). None of the site-specific SVOC COCs were detected above RALs in MW-59B and MW-67B. The only COC detected above MQLs in MW-36B was bis(2-ethylhexyl)phthalate at 0.010 mg/L, which exceeds the RAL of 0.006 mg/L. Bis(2-ethylhexyl)phthalate was commonly detected in field blanks collected during the sampling event ranging from 0.0002 mg/L to 0.0033 mg/L, as discussed in Appendix 10. Therefore, the bis(2-ethylhexyl)phthalate detected in MW-36B is likely a sampling/laboratory artifact and not indicative of concentrations in the groundwater. Two other SVOCs were detected above RALs in the B-CZ groundwater samples: 1,2-diphenylhydrazine (PCL=0.0011 mg/L, detected at 0.0012 mg/L at MW-35B, July 2010); 2,4-dimethylphenol (PCL=0.049 mg/L, detected at 1.2 mg/L at MW-49B, June 2010). Benzo(a)pyrene was not detected above the RAL in any B-TZ or B-CZ samples; however, the SDL for benzo(a)pyrene at MW-49B (0.00035U) was higher than the PCL (0.0002 mg/L). Using the June/July 2010 groundwater data, SVOCs are shown to be delineated to RALs within the B-CZ.

Groundwater Plume Stability – B-TZ/B-CZ

The groundwater Affected Property in the B-TZ and the B-CZ appears to be stable based on the groundwater data collected from 2008 through 2010. The groundwater PCLE Zone in the B-TZ on the west side of the Site is stable and limited in extent laterally (Figures 5B-10). With the limited data set for the B-CZ wells (recently installed wells only sampled once), additional sampling of the wells is necessary to evaluate any trends in the COC data.

Transmissive Zone C-TZ

Groundwater in the C-TZ flows from northeast to southwest across the Site (Figures 5A-5 and 5A-6) at a gradient ranging from 0.0006 ft/ft to 0.0008 ft/ft. Groundwater elevations measured in 2010 ranged from a high of approximately 30.81 feet (MW-25C, Jan 2010) to 25.14 feet (MW-29C, July 2010). This flow pattern has been consistent at the Site since 2004.

VOCs – C-TZ

Of the VOCs analyzed during the January and June/July 2010 groundwater monitoring events, benzene concentrations were detected above the RAL in five C-TZ monitoring wells located on the eastern portion of the Site: MW-17C, MW-18C, MW-19C (only in Jan 2010), MW-23C, and MW-25C with a maximum concentration in each well at 0.024 mg/L, 1.5 mg/L, 0.0056 mg/L, 0.012 mg/L, and 0.11J mg/L, respectively (Figures 5B-5 and 5B-6). Benzene was not detected above the RAL in monitoring wells MW-12C, MW-15C, or MW-21C located downgradient of well MW-17C, indicating that benzene is delineated to the RAL downgradient in the C-TZ. Groundwater data from monitoring wells MW-27C, MW-28C, MW-47C, MW-48C, MW-53C, MW-54C, and MW-68C (installed in June 2010) installed in the C-TZ confirm the horizontal extent of benzene concentrations to the RAL cross gradient and upgradient. Dichloromethane was detected at one location, MW-23C, at a concentration 0.0092J mg/L in June 2010 just above the RAL (0.005 mg/L). No other VOCs were detected during the 2010 sampling events in the C-TZ monitoring wells at concentrations exceeding applicable RALs.

SVOCs– C-TZ

SVOCs were detected above RALs in four monitoring wells, MW-17C, MW-18C, MW-23C, and MW-25C located on the eastern portion of the Site. Site-specific SVOC COCs detected above RALs included 2-methylnaphthalene, benz(a)anthracene, benzo(a)pyrene, dibenzofuran, naphthalene, and pentachlorophenol; with numerous SVOCs (acenaphthalene, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene) detected in MW-23C. The higher concentrations of these COCs in MW-23C are likely a result of DNAPL being present in the well. Pentachlorophenol concentrations were detected above the RAL (0.001 mg/L) in MW-18C (0.041 mg/L); however, no other C-TZ monitoring wells had pentachlorophenol detected above the SDL (Figures 5B-5 and 5B-6). SVOCs were not detected above RALs at monitoring wells located downgradient of MW-17C and MW-23C, indicating that SVOCs are sufficiently delineated in Unit C-TZ. Dissolved-phase data show relatively limited COC migration beyond the area where DNAPL has been observed in monitoring wells.

Groundwater Plume Stability – C-TZ

VOCs and SVOCs detected in the C-TZ wells appear to be stable with some shrinking of the C-TZ groundwater Affected Property with concentrations in MW-54C decreasing over time (specifically, 2-methylnaphthalene and naphthalene (Table 5B-5)). There does not appear to be any expansion of the C-TZ groundwater Affected Property (Figure 5B-11).

Transmissive Unit D-TZ

Using the groundwater elevations measured from the D-TZ wells in January and July 2010, groundwater in the D-TZ appears to flow from the southeast to northwest at a gradient of 0.002 ft/ft (Figure 5A-7 (Jan 2010)) to 0.003 ft/ft (Figure 5A-8 (July 2010)). Groundwater elevations range from a high of -37.51 feet HVD (MW-59D and MW-66D, Jan 2010) to a low of -41.06 feet HVD (MW-36D, July 2010).

In 2009, D-TZ wells MW-59D, MW-65D, and MW-66D were installed in the D-TZ south, north, and east, respectively, of the groundwater Affected Property and PCLE Zone for the C-TZ (Figure 5B-6) overlying the D-CZ unit. A fourth well, MW-36D, was installed in 2010 northwest of the C-TZ PCLE Zone. Based on the groundwater flow direction for the D-TZ (Figure 5A-8), well MW-36D is located immediately downgradient and within 250 feet of where DNAPL was noted in the C-TZ (wells MW-34C, MW-44C, and MW-45C) (see Section 5.2.2). There is a significant downward vertical gradient from the C-TZ to the D-TZ comparing the potentiometric elevations between wells in the two units (about 69 feet elevation difference between MW-36D and MW-44C in July 2010). The locations of the D-TZ wells, specifically MW-36D and MW-65D, are positioned to detect dissolved-phased COCs that could potentially migrate vertically from the C-TZ through the D-CZ into the D-TZ.

None of the site-specific COCs were detected at concentrations greater than RALs in the D-TZ wells (three wells in January 2010 (Figure 5B-7), four wells in June/July 2010 (Figure 5B-8)) sampled in 2010. Based on these results and given the location of D-TZ well MW-36D immediately downgradient of areas in the C-TZ where DNAPL has been consistently observed, there does not appear to be a groundwater Affected Property in the D-TZ, the lowest investigated GWBU at the Site.

Section 5.2.2 Occurrence of NAPL

NAPL in the A-TZ

DNAPL and LNAPL are evaluated for each of the monitoring wells at the Site. During previous sampling events, light NAPL (LNAPL) was observed at A-TZ in temporary well TW-02 within the AST Area (SWMU No. 8); however, no LNAPL was observed in January or July 2010 at this location. DNAPL is present in A-TZ monitoring wells on the northern edge and off site to the north. DNAPL was measured in MW-32A at 7.14 feet and 2.95 feet thick (in-well thickness) in January and July 2010, respectively. The decrease in DNAPL thickness from January to July 2010 is a result of the monthly DNAPL recovery pilot test that began in May 2010. Details of the DNAPL pilot test are discussed in Section 5.3. The in-well DNAPL thickness measured in MW-32A is not representative of the apparent thickness in the formation. The monitoring well was completed approximately 11 feet below the assumed base of the A-TZ. Therefore, the well appears to be acting as a collection sump for DNAPL, and may be collecting DNAPL from the B-CZ (Figure 4C-2). This is supported by the CPT/ROST data for CPT-42R-08 located approximately adjacent to MW-32A (shown on Cross Section F-F’, Figure 4C-2). The ROST fluorescence response of approximately 44% RE was observed at approximately 25.5 feet at this location, and smaller responses at 26 and 28.5 feet bgs. The base of the A-TZ as interpreted from the CPT boring for CPT-42R-08 to be about 20 feet bgs. With the base of MW-32A at 32 feet bgs, the DNAPL does not appear to be from the A-TZ, but rather the underlying B-CZ. The DNAPL near MW-32A appears to be delineated to the north based on the ROST response for CPT-36R-08 (Figure 4C-2). DNAPL was measured in well MW-57A for the first time in July 2010 with an in-well thickness of 2.55 feet (Figure 5A-10).

In addition to the measured DNAPL thicknesses in the monitoring wells completed in the A-TZ, Figures 5A-9 and 5A-10 present contours of ROST readings from CPT/ROST borings that encountered the A-TZ; and the figures also highlight monitoring wells where NAPL was observed in the A-TZ as noted on the soil boring logs for the A-TZ wells. Following the same format for presenting ROST readings in the vadose zone (discussed in Section 4.2), ROST readings greater than 25% RE encountered in the A-TZ unit were contoured (50% RE contour interval) based on ROST data from the CPT/ROST borings. The majority of the elevated ROST readings in the A-TZ are located in and around the Recent Process Area, Original Process Area, and the AST Area (SWMU Nos. 4, 5, and 8, respectively).

ROST profiles are posted on the geologic cross sections for the Site (Figures 4C-1 through 4C-4). Highlighted intervals where ROST readings were greater than 25% RE are posted on the cross sections. Three CPT/ROST borings with the highest ROST readings in the A-TZ include CPT-16R-95 (Cross Section A-A', Figure 4C-1), CPT-34R-95 (Cross Section F-F', Figure 4C-2), and CPT-26R-95 (Cross Section E-E', Figure 4C-1). At each of these locations, elevated ROST readings were also noted in the vadose zone above the A-TZ.

The elevated ROST readings are generally consistent with intervals where NAPL was visually observed in soil borings for A-TZ wells. As an example, NAPL was noted in the MW-55A boring log as "oily sheen/NAPL pockets at 18.0 to 20.0 [feet bgs]". This well is located near CPT/ROST boring CPT-32R-95, which had one of the highest ROST readings in the A-TZ (approximately 440% RE between 18 to 20 feet bgs). However, no DNAPL has been measured in well MW-55A (installed in January 2009). This indicates that areas of the A-TZ may have residual saturation of DNAPL in the sand matrix (i.e., MW-30A, MW-31A, MW-52A, MW-55A) that is not mobile, especially given the high viscosity of the DNAPL material (ranges from 8.52 to 192 centipoises (PBW, 2009)).

NAPL in the B-TZ/B-CZ

DNAPL has been detected in the B-TZ along the western boundary of the Site at MW-12B and MW-41B (Figure 5A-11 and 5A-12). During the 2010 monitoring events, DNAPL present in the B-TZ on the west side of the Site had a maximum in-well thickness of 21.15 feet observed at MW-41B, with MW-12B having a measured thickness of 8.34 feet in January 2010 (Figure 5A-11). With the DNAPL recovery pilot test beginning in May 2010, the in-well DNAPL thicknesses measured in July 2010 in these two wells ranged from 4.3 feet in MW-41B to 3.85 feet in MW-12B (Figure 5A-12). DNAPL has not been detected in monitoring wells MW-38B, MW-39B, MW-40B, TW-41B (located approximately 50 feet from MW-41B), and P-11, which indicates sufficient horizontal delineation of the DNAPL in the B-TZ.

DNAPL was detected in one of the wells completed in the non-groundwater bearing unit B-CZ located off site to the north of the Recent Process Area. Approximately 7.24 feet of DNAPL (in-well thickness) was observed at MW-33B in January 2010 (Figure 5A-11). During the July 2010 monitoring event, an obstruction was encountered in the well that prevented access to the bottom of the well to gauge the DNAPL.

As discussed in the APAR Addendum (PBW, 2009), the B-CZ north of the Site is a silty clay with thin intervals of carbonaceous nodules. In the vicinity of MW-33B, the DNAPL appears to be travelling laterally along these nodule intervals within the B-CZ. Cross Section G-G' (Figure 4C-3) shows the DNAPL measured in MW-33B, and potential DNAPL based on the ROST readings in the CPT/ROST borings CPT-43R-08 and CPT-26R-01 within the B-CZ at depths below the A-TZ. The ROST log for CPT-43R-08 shows fluorescence spikes approximately 28 feet and 35 feet bgs within the B-CZ. ROST readings greater than 25% RE from CPT/ROST borings that encountered the B-TZ or B-CZ are also posted on Figures 5A-11 and 5A-12, showing the overall distribution of ROST responses in the unit. As show on the figures, the majority of the elevated ROST readings are in the vicinity of SWMU Nos. 4 and 5. However, elevated ROST readings were observed in the B-CZ north of the Site at CPT/ROST boring CPT-43R-08, between the Site and well MW-33B (Figure 5A-11). The ROST readings in this area are consistent with the observations of NAPL in monitoring well soil borings in the B-CZ (i.e., MW-33B).

Highlighted ROST readings posted on the geologic cross sections for the Site (Figures 4C-1 through 4C-4) show the depth range of elevated ROST readings in the B-CZ. Specifically, Cross Section B-B' (Figure 4C-1) shows elevated ROST readings at intervals ranging from 25 feet bgs to 50 feet bgs, within the B-CZ clay unit. CPT-26R-95 posted on Cross Section E-E' (Figure 4C-2) shows elevated ROST readings to a depth of approximately 56 feet bgs.

In the area of MW-33B, groundwater samples collected from the A-TZ monitoring wells (MW-33A and MW-26A) have shown COC concentrations less than RALs; suggesting that the DNAPL is not travelling horizontally through the A-TZ, but rather through these carbonate nodule intervals in the B-TZ.

NAPL in the C-TZ

DNAPL is present in the C-TZ extending from the northeast side of the Site at MW-23C to approximately 900 feet off site to the northeast near MW-46C. During the 2010 monitoring events, DNAPL was observed in on-site monitoring well MW-23C, and off-site monitoring wells MW-25C (no DNAPL detected in July 2010), MW-34C (only gauged in January 2010), MW-44C, MW-45C, and MW-46C. Maximum DNAPL in-well thicknesses observed in the C-TZ during the 2010 sampling events was 9.29 feet at MW-45C, with the thickest DNAPL measured in the on-site well MW-23C at 1.70 feet (January

2010) (Figure 5A-13). As noted previously, the thickness of DNAPL in the wells does not represent actual thicknesses in the GWBU. The monitoring wells generally extend below the lower confining unit and typically have at least a 0.5-foot to 1-foot sump at the bottom of the well, which allows DNAPL to collect in the bottom of the well. DNAPL thicknesses measured in the wells in July 2010 were less than the measurements in January 2010 as a result of the DNAPL recovery pilot test.

As with the other transmissive zone NAPL figures, ROST readings from CPT/ROST borings that encountered the C-TZ unit were contoured and presented on Figures 5A-13 and 5A-14 with the measured in-well DNAPL thicknesses for the C-TZ unit. Of the 76 CPT/ROST borings conducted at the Site, only 13 CPT/ROST borings were advanced to the top of the C-TZ. Only one of the 13 CPT/ROST borings that penetrated the C-TZ had ROST readings greater than 25% RE, CPT-27R-01, as shown on Figures 5A-13 and 5A-14, and Cross Section A-A' (Figure 4C-1).

The groundwater gradient of Unit C-TZ is to the southwest; however, DNAPL in this unit was encountered in wells located upgradient to the northeast (i.e., MW-25C, MW-45C, MW-46C). DNAPL has not been observed southwest of the suspected historic source areas in the nearest downgradient well (MW-21C). There is a potential of DNAPL in the C-TZ near CPT-26R-95 (southwest of SWMU No. 5), which shows a ROST response in the B-CZ just above the contact with the C-TZ (Cross Section E-E', Figure 4C-2). CPT/ROST borings were conducted north and northwest of the DNAPL plume observed in the C-TZ to evaluate the lateral extent of the DNAPL. CPT/ROST locations CPT-44R-08, CPT-45R-08, and CPT-46R-08 (logs provided in the APAR Addendum, PBW, 2009) did not show any ROST fluorescence responses in the C-TZ, suggesting no DNAPL present at those locations. Based on the monitoring wells and CPT/ROST borings completed in the C-TZ, the horizontal extent of the DNAPL has sufficiently been delineated at the Site.

Section 5.3 DNAPL Recovery Pilot Test

As discusses in Section 3.0, PBW initiated a 12-month pilot study in May 2010 to evaluate DNAPL recovery by conducting tests on selected wells where DNAPL had been observed. The following wells are included in the monthly evaluation:

- A-TZ wells: MW-32A, MW-57A (added in August 2010),
- B-TZ/B-CZ wells: MW-12B, MW-33B, MW-41B,
- C-TZ wells: MW-23C, MW-25C, MW-44C, MW-45C, MW-46C.

At each of these wells on a monthly basis, the initial product thickness is measured and tubing is placed in the well to near the total depth. DNAPL in the well is then pumped with either a peristaltic or diaphragm pump until DNAPL is no longer measured in the well or the fluids removed were mostly water. The pump was then turned off and DNAPL thickness measurements are collected. Graphs of in-well DNAPL thicknesses from 2001 through August 2010 (including measurements taken during the pilot test) for the A-TZ, B-TZ/B-CZ, and C-TZ wells are provided on Figures 5E-1 through 5E-3, respectively. Field forms for the monthly tests conducted from May through August 2010 are provided in Appendix 11.

In-well DNAPL thicknesses in MW-32A were typically greater than 6 feet thick from 2005 through January 2010 (Figure 5E-1), and showed relative stability except for the reading in 2007. With the initiation of the pilot test in May 2010, in-well DNAPL thicknesses have decreased to less than 2 feet thick based on the August 2010 readings.

DNAPL thicknesses in the two wells on the west side of the Site, MW-12B and MW-41B, had increasing in-well DNAPL thicknesses from July 2004 through February 2008 for MW12B and January 2009 for MW-41B (Figure 5E-2). The drop in thickness in MW-12B in February 2008 was a result of a DNAPL well test conducted at that well. Both MW-12B and MW-41B had in-well DNAPL thicknesses drop significantly following initiation of the DNAPL recovery pilot test with monthly recovery in each well being relatively minor (in-well DNAPL thicknesses in MW-12B at 2.68 feet thick and in MW-41B at 3.48 feet thick in August 2010).

The C-TZ monitoring wells that are part of the monthly pilot test showed relatively stable thicknesses from 2005 through 2010, with slight increases in MW-23C and MW-44C. As with the other wells, in-well DNAPL thicknesses have significantly dropped since initiation of the pilot test, with recovery relatively minor in the C-TZ wells.

For each of the wells that are part of the pilot test, the little amount of recovery in the wells suggests minor amounts of DNAPL in the units. Further evaluation will be conducted following the 12-month pilot test period that will be submitted to the TCEQ as part of evaluating readily recoverable NAPL in accordance with the TCEQ TRRP-32 Risk-Based NAPL Management guidance document. The procedures outlined in the TCEQ guidance document, specifically Steps 2 (Identify NAPL Response Triggers) and 3 (Determine NAPL Response Objectives and Endpoints), are detailed in Appendix 11A.

AFFECTED PROPERTY ASSESSMENT REPORT ADDENDUM

UPRR Houston Wood Preserving Works
Houston, Texas

5.0 Figures

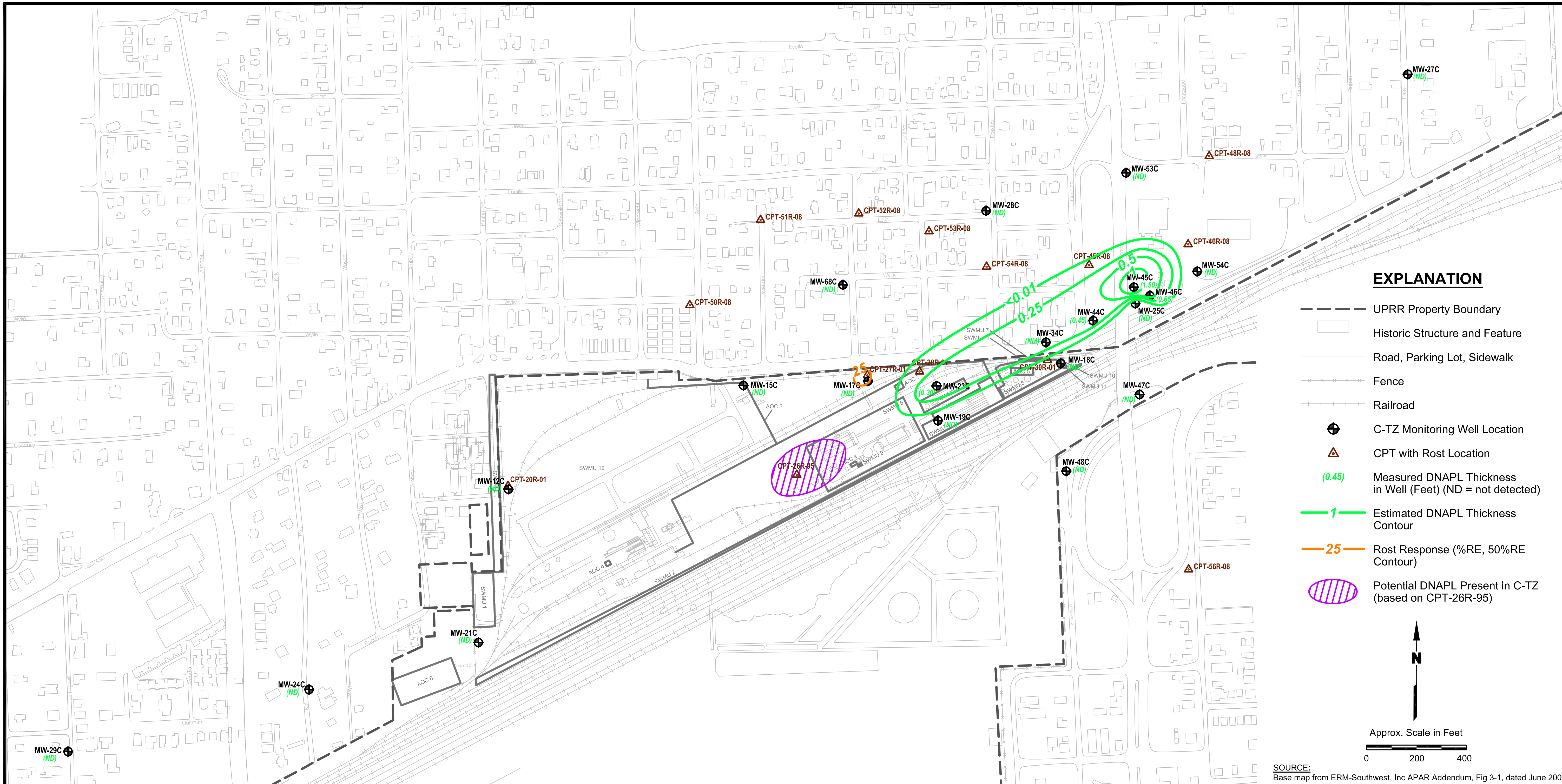

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Figure 5A-14

DNAPL DISTRIBUTION MAP
C-TZ JULY 2010

PROJECT: 1358	BY: ZGK	REVISIONS
DATE: MARCH, 2011	CHECKED: ECM	

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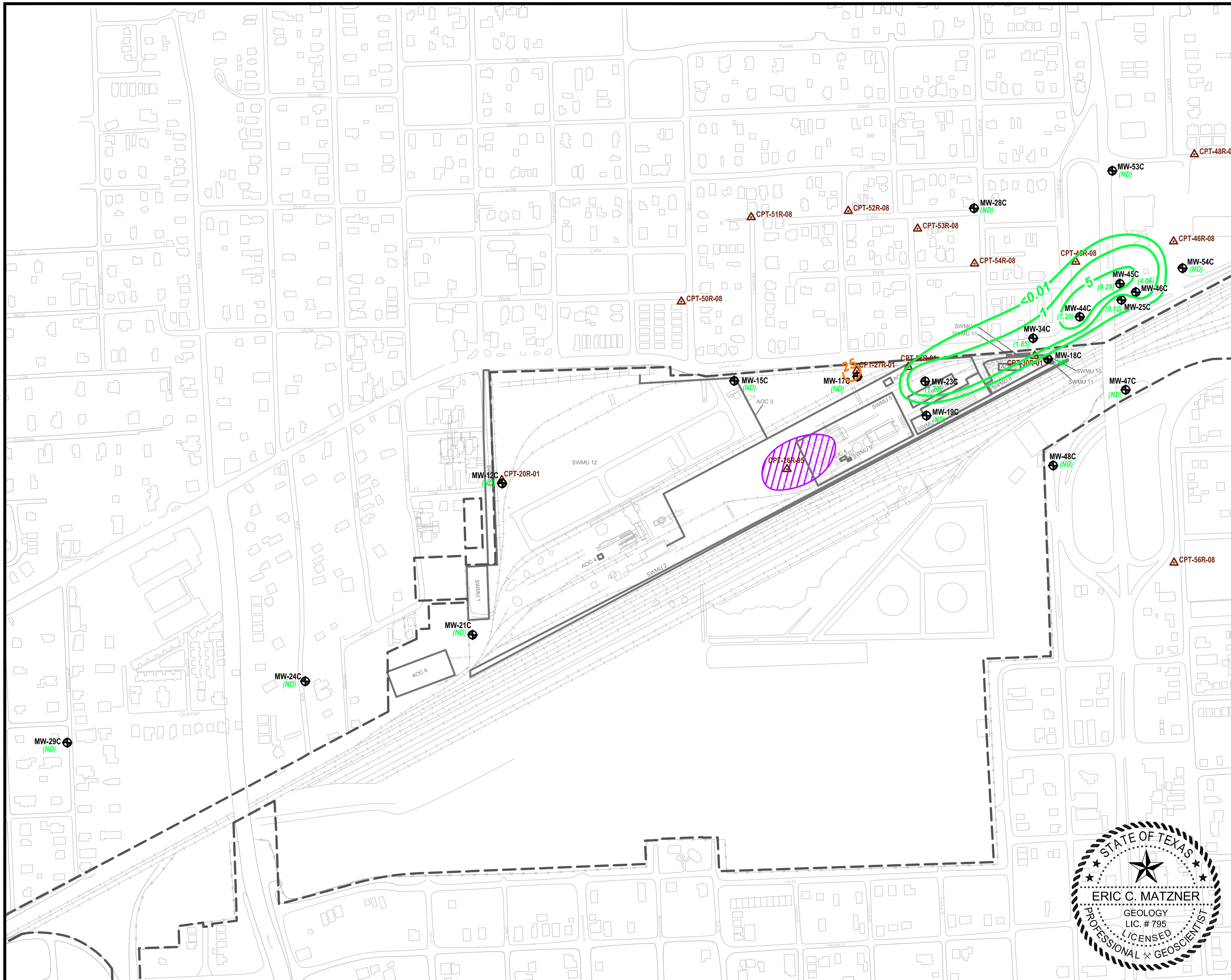

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- C-TZ Monitoring Well Location
- CPT with Rost Location
- (1.85) Measured DNAPL Thickness in Well (Feet) (ND = not detected)
- 1 Estimated DNAPL Thickness Contour
- 25 Rost Response (%RE, 50%RE Contour)
- Potential DNAPL Present in C-TZ (based on CPT-26R-95)

N

Approx. Scale in Feet

0 200 400

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

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Figure 5A-13

DNAPL DISTRIBUTION MAP
C-TZ JANUARY 2010

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DATE: MARCH, 2011	CHECKED: ECM	

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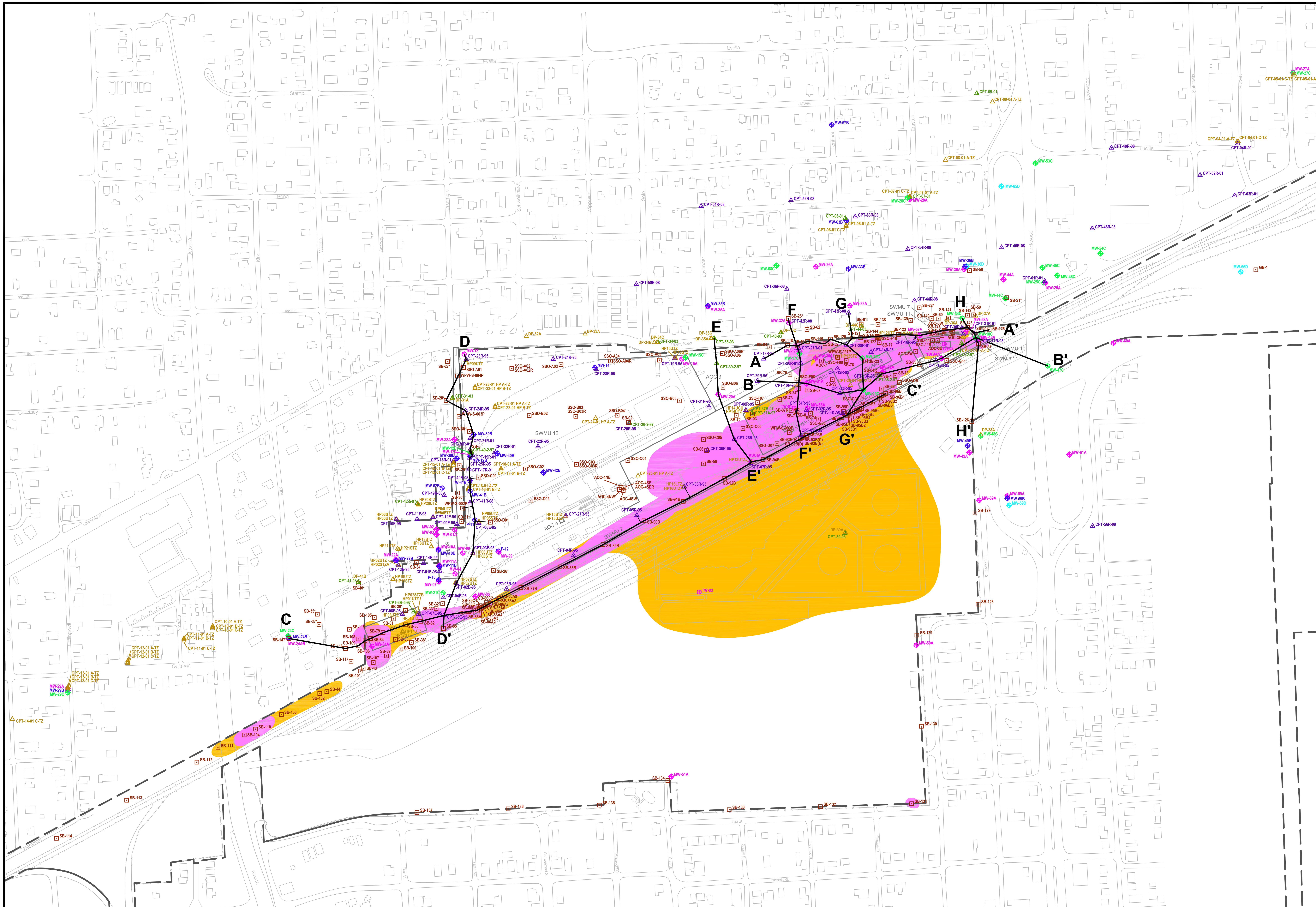
11.0 Figures



EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- B-TZ Monitoring Well Location
- C-TZ Monitoring Well Location
- D-TZ Monitoring Well Location
- A-TZ Temporary Monitoring Well Location
- CPT with Rost Location
- CPT Location
- Hydropunch Sample Location
- Soil Boring Location
- A —— A' Soil Cross Section Location (Figures 11C-1 and 11C-2)
- Surface Affected Property
- Surface PCLE Zone

Note:
* Soil analytical data rejected by validator.

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

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N

Scale in Feet
0 200 400

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

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Figure 11A

SURFACE SOIL COC PCLE ZONE MAP

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DATE: MARCH, 2011	CHECKED: ECM	

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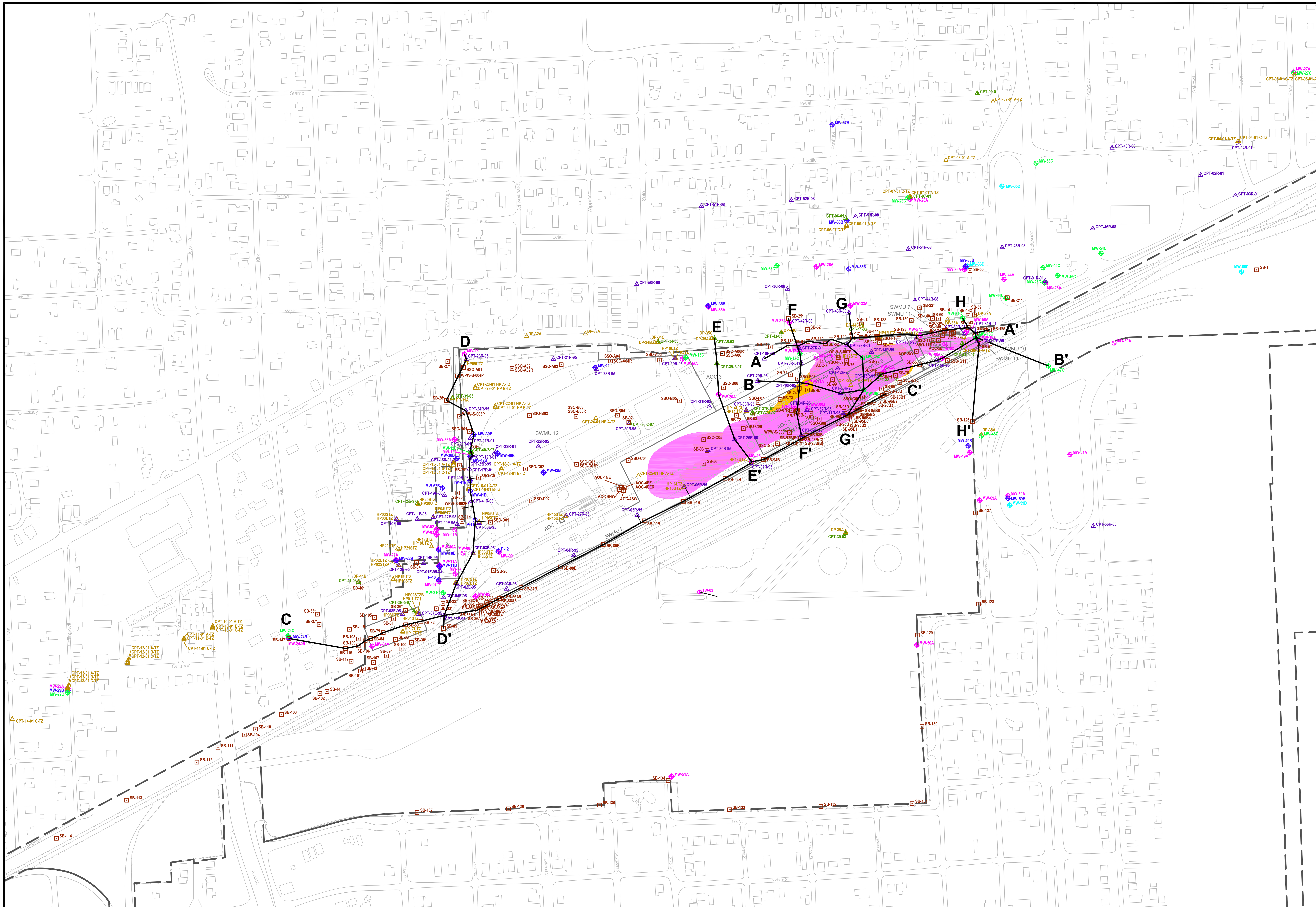

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- B-TZ Monitoring Well Location
- C-TZ Monitoring Well Location
- D-TZ Monitoring Well Location
- A-TZ Temporary Monitoring Well Location
- CPT with Rost Location
- CPT Location
- Hydropunch Sample Location
- Soil Boring Location
- A — A' Soil Cross Section Location (Figures 11C-1 and 11C-2)
- Subsurface Affected Property
- Subsurface PCLE Zone

Note:
* Soil analytical data rejected by validator.

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

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N

Scale in Feet

0 200 400

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

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HOUSTON WOOD PRESERVING WORKS

Figure 11B

SUBSURFACE SOIL COC PCLE ZONE MAP

PROJECT: 1358	BY: ZGK	REVISIONS
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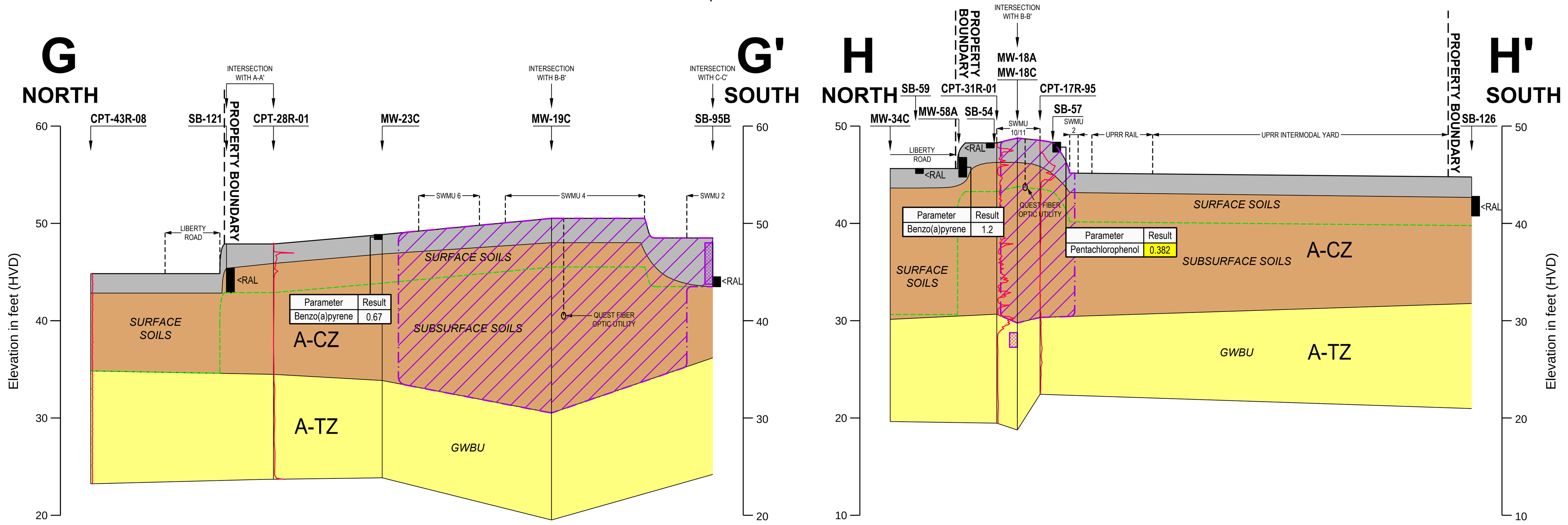
Parameter	3.5'-4'	13.5'-14'	17.5'-18'
2,4-Dimethylphenol	<RAL	<RAL	25
2-Methylnaphthalene	420	360	400
Benzene	<RAL	<RAL	1.1
Benzo(a)anthracene	160	<RAL	<RAL
Benzo(a)pyrene	62	<RAL	<RAL
Dibenzofuran	600	<RAL	270
Naphthalene	970	4600	17000

Parameter	2'-2.5'	18.5'-19'
2-Methylnaphthalene	1300	1700
Benzene	<RAL	0.23
Benzo(a)anthracene	130	<RAL
Benzo(a)pyrene	27	<RAL
Dibenzofuran	1100	360
Fluoranthene	2500	<RAL
Naphthalene	3900	7600
Phenanthrene	4100	<RAL



EXPLANATION

- Fill: Sand, Silt, Clay & Gravel, wood fragments, bricks, scrap metal
- Transmissive Zone (TZ): Sand & Silty Sand
- Cohesive Zone (CZ): Clay, Silty Clay & Silt
- Surface and Subsurface Soils PCLE Zone
- Line Denotes Surface (0-5 Ft on-site, 0-15 Ft off-site) /Subsurface (>5 Ft on-site, >15 Ft off-site) Soil Boundary
- Sample Interval
- Visual Indication of NAPL or ROST Result >25% RE

Notes:
1. Topography is estimated.
2. See Figure 11A and 11B for cross section location.
3. Concentration are in mg/Kg.
4. Highlighted concentrations exceed cPCLs for on-site or off-site.
5. Utility locations based on drawings provided by the City of Houston Department of Public Works & Engineering.
6. Vertical datum based on City of Houston Monument System (HVD), Ft HVD.

Surface Soil PCLs

Parameter	RAL & Off-Site cPCL (mg/Kg)	On-Site cPCL (C/I) (mg/Kg)
1,2-Dichloroethane	0.105	0.105
2,4-Dimethylphenol	0.022	0.049
2-Methylnaphthalene	127	378
Benzene	0.105	0.105
Benzo(a)anthracene	5.645	23.6
Benzo(a)pyrene	0.564	2.368
Dibenzofuran	249	744
Naphthalene	124	190
Pentachlorophenol	0.124	0.124
Phenanthrene	1705	9282

Subsurface Soil PCLs

Parameter	RAL & Off-Site cPCL (mg/Kg)	On-Site cPCL (C/I) (mg/Kg)
2,4-Dimethylphenol	17.7	52.7
2-Methylnaphthalene	126.65	378
Benzene	0.105	0.105
Benzo(a)pyrene	57.3	57.3
Dibenzofuran	249	744
Naphthalene	138	193

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
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SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
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AOC 7	Location of Former UST No. 44-023-21

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Vertical Exaggeration 8X

80 0 80 80

scale in feet

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Figure 11C-1

SURFACE/SUBSURFACE SOIL CROSS SECTIONS A-A' THROUGH H-H'

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