September 16, 2010

Mr. Christopher C. Carey
Remedial Section/Site Remediation Unit
Bureau of Environmental Remediation
Kansas Department of Health and Environment
1000 SW Jackson Street, Suite 410
Topeka, KS 66612-1367

RE: Documentation of Phytoremediation Interim Measure Activities
Former Unocal Chemical Distribution Facility
2100 East 37th Street North, Wichita, Kansas 67219

Dear Mr. Carey:

This report documents the implementation of the groundwater phytoremediation interim measure (IM), as described in the ***Phytoremediation Interim Measure (IM) Workplan*** (hereafter referred to as the ***Phytoremediation IM Workplan***) (URS Corporation [URS], March 2010). This work was implemented by URS in April 2010 on behalf of the Chevron Environmental Management Company (EMC) at the former Unocal Chemical Distribution Facility (Unocal) in Wichita, Kansas. To establish the interim measure, two plots of specially cultivated willow trees (*sax alba*) were planted in fully-penetrating boreholes and allowed to grow over the summer. The purpose of this memorandum is to provide details regarding the installation and document the condition of the plots after the initial period of growth.

Chevron EMC implemented the phytoremediation IM at historical Plumelets B and C, where the bedrock surface is relatively shallow. The objectives of the phytoremediation systems are to:

- Prevent the off-site migration of dissolved-phase groundwater constituents at levels exceeding the Kansas Department of Health and Environment (KDHE) Tier 2 residential Risk-Based Standards for Kansas (RSK) values; and
- Reduce contaminant mass that persists in the aquifer via rhizosphere degradation and uptake of contaminant mass followed by phytovolatilization into the atmosphere, where the contaminants will be rapidly photo-degraded.

The ***Phytoremediation IM Workplan*** was prepared so that the phytoremediation portion of the response action recommended in the ***Final Revision 1 Feasibility Study Report*** (URS, June 2009) could be executed prior to the issuance of the site's Corrective Action Decision (CAD). This CAD is currently being prepared by KDHE and will document all corrective actions to date at the former Unocal site, the IM injection work that was performed in December 2009, and this phytoremediation IM. The phytoremediation plan was modified from the Feasibility Study recommendations using recent analytical results from the 2009 Annual Groundwater Monitoring Event. The ***Phytoremediation IM Workplan*** and subsequent comment letters documented these changes.

The ***Phytoremediation IM Workplan*** was submitted to KDHE on March 3, 2010. On March 24, 2010, KDHE issued a letter with comments regarding the plan. Chevron EMC prepared a response letter, submitted to KDHE on March 30, 2010, providing responses to comments regarding phytoremediation

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system installation; however, Chevron EMC proposed that comments associated with monitoring, maintenance, and contingencies be addressed at a later date. KDHE approved the phytoremediation installation activities in a letter dated April 2, 2010 with the condition that previous comments regarding maintenance, monitoring, and contingencies be addressed later. These comments will be addressed by the Phytoremediation Operations and Maintenance (O&M) Plan that will subsequently be prepared and submitted to KDHE.

Implementation Activities

Phytoremediation system implementation activities were conducted in April 2010 (optimal hardwood planting time in Kansas) in accordance with the ***Phytoremediation IM Workplan***. Locating and staking of borehole locations for tree planting was conducted at two separate areas (designated Plots B and C) prior to subcontractor mobilization (Remington Technologies of Loveland, Colorado).

Once all personnel were on-site, the ***Phytoremediation IM Workplan*** was reviewed and the following activities were conducted at each location where a willow was to be planted:

- Drilled fully penetrating boreholes using a 3-inch diameter solid auger. The total depth of each borehole is provided in Table 1.
- Backfilled fully penetrating 3-inch boreholes with coarse sand from the bedrock surface to land surface.
- Overdrilled using an 8-inch diameter solid auger to the water table (9 ft below ground surface [bgs]).
- Backfilled the 8-inch boreholes with a compost, sand, and nutrient mixture (rooting matrix). The rooting matrix was soaked with water and tamped until it was well settled in the borehole.

After completing the above steps, the subcontractor performed localized grading to address low spots within the plots to reduce surface flow from higher elevations toward the planting areas. Top soil was trucked to the site and spread with a front-end loader. Additionally, the gravel driveway was expanded to provide space for parking and turnaround. The subcontractor demobilized from the site after the grading was complete.

Long hardwood willow cuttings (*Salix Alba*) (8 ft long "poles") were then delivered and stored in a shady, cool area. In preparation for planting, the cuttings were soaked for several days in water held in clean 55-gallon drums. A long dibble was used to make a planting hole in the backfill, and a willow pole planted. The cuttings were planted 7.5 ft deep in the rooting matrix. As described in the ***Phytoremediation IM Workplan***, an irrigation system is not required because the saplings are obtaining ample moisture from the groundwater. This is evidenced by continued growth during recent periods of lower rainfall.

At Plot B, the rows of trees were spaced 10 feet (ft) apart and trees within the rows were planted on 10-foot centers (depicted on Figure 1). At Plot C, the tree spacing in the north-south direction was 12 ft and the tree spacing in the east-west direction was approximately 10 ft (Figure 2).

Data Collected During Borehole Installation

Following installation of the 3-inch boreholes, groundwater grab samples were collected (using disposable bailers) at two locations in Plot B and seven locations in Plot C. The samples were analyzed

for volatile organic compounds (VOCs). In addition, the following measurements were conducted at each location:

- Measured organic vapors from the open boreholes using a photoionization detector (PID) with an 11.7 electron volt (eV) bulb for detection of chlorinated organics;
- Collected water level measurements; and
- Measured oxidation-reduction potential (ORP) using a Multi-Line P4 meter.

Analytical results from the groundwater grab samples are included in Table 1; PID, water level, and ORP data are included in Table 2. A summary of the results are included below.

Plot B

PID readings, water level measurements, and ORP results from Plot B are depicted on Figures 3, 4, and 5, respectively. As shown on Figure 3, PID readings greater than 10 parts per million (ppm) were observed on the northern portion of Plot B, as well as in the southeastern corner (location B-36). The remaining readings ranged between 0.3 and 5.9 ppm. Depth to water measurements at Plot B were fairly consistent, ranging from 6.75 to 7.72 ft bgs. ORP readings ranged from 166 to -392 millivolts (mV); however, a majority of the readings were negative. As shown on Figure 5, two areas exhibited ORP readings less than -300 mV.

Samples were collected at locations B-1 and B-19 (the two westernmost locations in Figure 1). The groundwater grab sample results revealed that several chlorinated ethenes and petroleum hydrocarbons exist in concentrations exceeding the KDHE screening values (Table 2). The high ratios of cis-1,2-dichloroethene (DCE) and vinyl chloride to tetrachloroethene (PCE) and trichloroethene (TCE) indicate a highly reduced condition.

Plot C

PID readings, water level measurements, and ORP results from Plot C are depicted on Figures 6, 7, and 8, respectively. As shown on Figure 6, PID readings greater than 10 ppm were observed on the northeastern and southeastern portions of Plot C. The majority of the southwestern portion of Plot C exhibited PID readings of 0.0 ppm. Water level measurements varied widely at Plot C (ranging from 1.59 to 16.2 ft bgs); the measurements may indicate an area of groundwater confining conditions extending from northeast to southwest across Plot C (Figure 7). At these locations, groundwater rose to the near surface quickly after the boreholes were drilled.

ORP readings ranged from -491 to 330 mV; however, a majority of the readings were positive. Three areas in Plot C exhibited ORP results less than +200 mV. Borehole C-17 was strongly negative, so a groundwater sample was collected from this location. The other area exhibiting ORP results below 200 mV is on the southeastern portion of Plot C at C-58, where the lowest ORP result (-491 mV at C-58) was observed. A groundwater sample was collected from borehole C-64 to characterize the southeast area.

In all, seven groundwater samples were collected across the western and southern boundaries of Plot C (locations C-3, C-5, C-9, C-11, C-17, C-48, and C-64). The Plot C groundwater grab sample results are summarized in Table 2. At two locations where confining groundwater conditions were evident (C-9 and C-17), there were no VOC concentrations above KDHE screening values. All other samples collected from Plot C on either side of this confining area were reported with several VOCs above KDHE screening values. The area where boreholes exhibited confining conditions may act as a barrier for migration of Plumelet C contaminants.

North and west of the hydraulic barrier (locations C-3 and C-5), sample results indicate the presence of mainly chlorinated ethenes. Concentrations of TCE in both samples are higher than PCE and cis-1,2-DCE concentrations, and vinyl chloride concentrations are minimal. Similar ratios are present at location C-11, on the southwest corner of Plot C. Moving east along the southern boundary of Plot C, sample results from C-48 exhibit exceedances for chlorinated ethenes, although in a more degraded condition (higher ratios of cis-1,2-DCE and vinyl chloride). Finally, at location C-64 (southeast corner of Plot C), results indicate a combination of petroleum hydrocarbons and chlorinated ethenes. The concentration of cis-1,2-DCE (15,000 micrograms per liter [μg/L]) is much higher than concentrations of PCE, TCE, and vinyl chloride at this location, indicating strongly reducing conditions.

Summary of First Season Growth

After installation, the phytoremedial plots have been monitored to evaluate the growth and health of the willows. On a monthly basis, each tree is measured and observed; these measurements and observations are recorded on an inspection form. Each tree's height is measured (circumference will be monitored in future years). Observations include the condition of the leaves (whether they are green, brown, or curled), soil condition surrounding the tree, and the presence of weeds and pests.

Table 3 provides a synopsis of growth and condition through August 2010. The average height of all of the trees in June 2010 was 2.2 feet. The average height rose by 0.8 feet between June and July and by 1.0 feet between July and August. The range in tree height for that month was zero to six feet, with six of the trees planted never exhibiting any growth. As a rule of thumb for phytoremedial installations, ten percent mortality is commonly expected. The average height of the trees that exhibited growth was 4.2 feet.

In June, it was noted that undesirable insects were present on the willow trees. Two insects were present: centipedes and bagworms. In a letter dated July 15, 2010, Chevron EMC proposed that a natural organic insecticide, Spinosad, be used to address the insects. KDHE approved this approach on July 15, 2010. The Spinosad was mixed with water inside a spraying rig, and each tree was sprayed individually. The August Inspection revealed that the insect population was drastically reduced (only the "bags" from the bagworms remained, and these were picked off the trees according to instructions).

Revised Monitoring Plan

The monitoring plan for the groundwater phytoremediation systems in Plots B and C will be presented in the Phytoremediation O&M Plan and will include the following four components:

- Groundwater quality monitoring;
- Hydraulic effects monitoring;
- Measuring transpiration rates of the tree stands; and
- Measuring phytovolatilization rates for chlorinated VOCs.

Specifics related to monitoring, maintenance, and contingencies will be presented in the Phytoremediation O&M Plan that will subsequently be prepared and submitted to KDHE.

If you have any questions regarding this implementation summary, please do not hesitate to contact me at (512) 419-6180.

Respectively Submitted,
URS Corporation

Derek R. Peacock, P.E.
Project Manager

cc: Mr. Michael P. Mailloux, Chevron EMC
Urmas Kelmser, Chevron ETC
File

Attachments

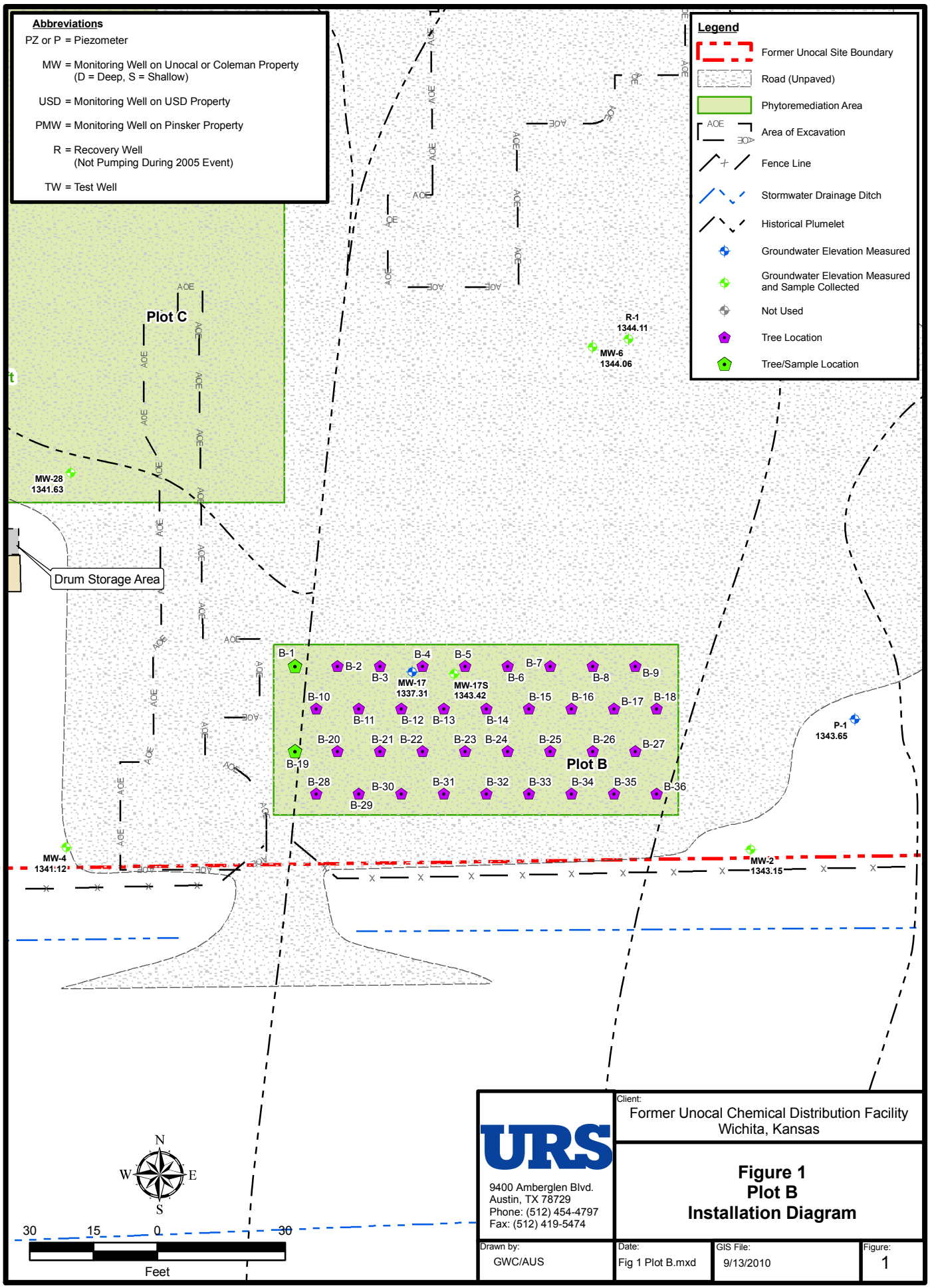

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Figure 1
Plot B
Installation Diagram

Drawn by:	Date:	GIS File:	Figure:
GWC/AUS	Fig 1 Plot B.mxd	9/13/2010	1

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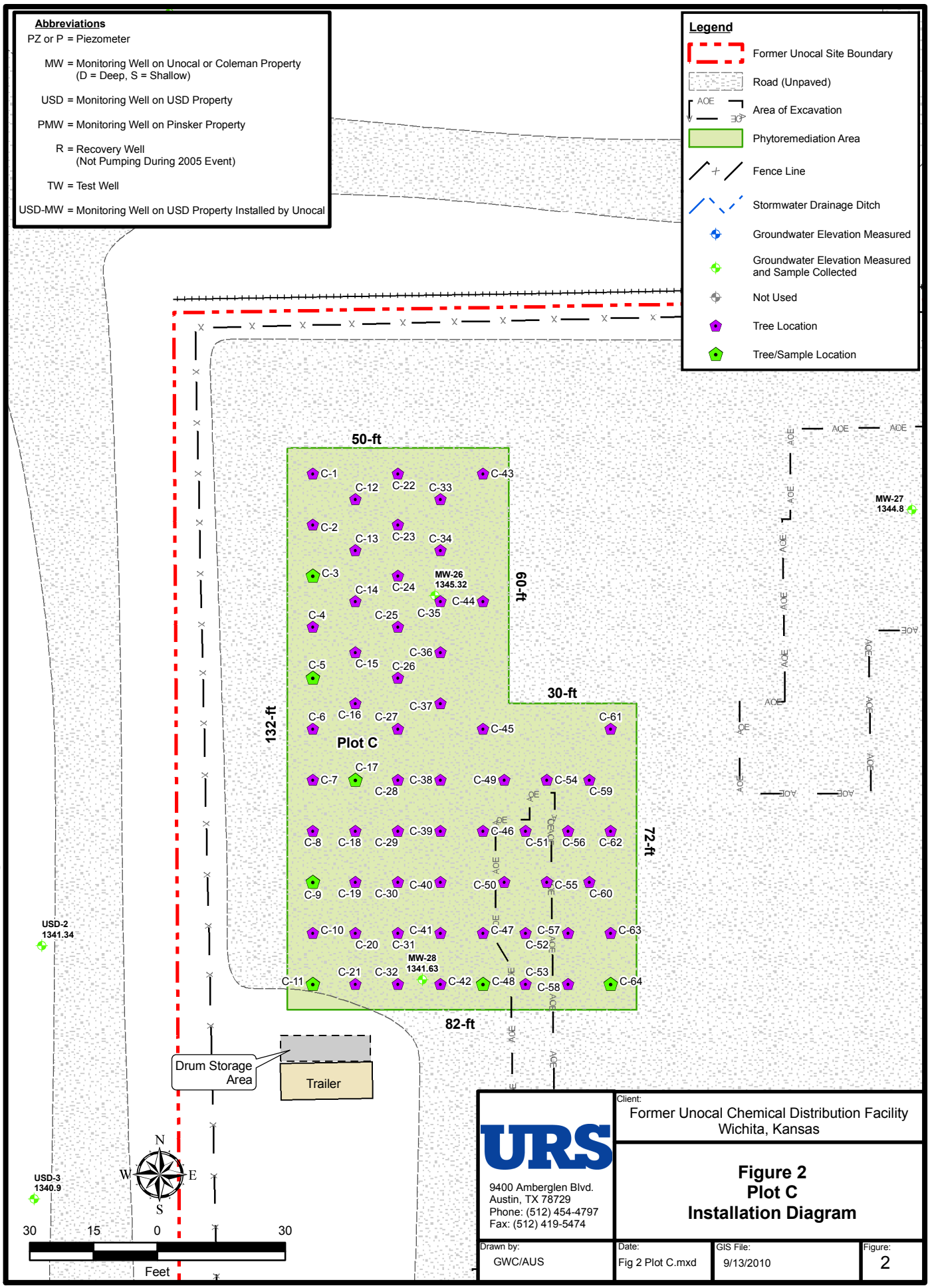
Abbreviations
PZ or P = Piezometer
MW = Monitoring Well on Unocal or Coleman Property (D = Deep, S = Shallow)
USD = Monitoring Well on USD Property
PMW = Monitoring Well on Pinsker Property
R = Recovery Well (Not Pumping During 2005 Event)
TW = Test Well
USD-MW = Monitoring Well on USD Property Installed by Unocal
Legend
Former Unocal Site Boundary
Road (Unpaved)
Area of Excavation
Phytoremediation Area
Fence Line
Stormwater Drainage Ditch
Groundwater Elevation Measured
Groundwater Elevation Measured and Sample Collected
Not Used
Tree Location
Tree/Sample Location
50-ft
60-ft
30-ft
72-ft
82-ft
132-ft
Plot C
MW-26 1345.32
MW-27 1344.8
MW-28 1341.63
USD-2 1341.34
USD-3 1340.9
Drum Storage Area
Trailer
N
S
E
W
30 15 0 30
Feet
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Figure 2
Plot C
Installation Diagram
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Figure: 2
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Table 1. Analytes Detected in Groundwater Grab Samples

	Location	C3	C5	C9	C11	C17	C48	C64	B1	B19
Analyte	**Residential KDHE Screening Value**									
1,1,2-Trichloroethane	5	**0.7 J**	**1.7 J**	ND (0.1)	**0.9 J**	ND (0.1)	ND (0.1)	ND (10)	ND (0.2)	ND (2.0)
1,1-Dichloroethane	340	**1.2**	**1.3 J**	ND (0.1)	**2.3 J**	ND (0.1)	**9.6**	**66**	**48**	**110**
1,1-Dichloroethene	7	**3.6**	**11**	**0.2 J**	**6.5**	ND (0.1)	**2.3 J**	**30 J**	**0.9 J**	ND (2.0)
1,2,4-Trimethylbenzene	5	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	**2.3 J**	**7,300**	**59**	**3,100**
1,2-Dichlorobenzene	600	ND (0.2)	**0.9 J**	**0.2 J**	ND (0.5)	ND (0.1)	**1.2 J**	**16 J**	**1.5**	**15**
1,2-Dichloroethane	5	**0.4 J**	**5.5**	ND (0.1)	**0.5 J**	ND (0.1)	**1.4 J**	**10 J**	**4.5**	**5.1 J**
1,3,5-Trimethylbenzene	5	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	**1,700**	**17**	**490**
Benzene	5	**0.3 J**	**1.2 J**	ND (0.1)	**0.6 J**	ND (0.1)	**2.9 J**	**49 J**	**8.2**	**20**
Carbon Tetrachloride	5	**1.1**	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	ND (10)	ND (0.2)	ND (2.0)
Chlorobenzene	100	ND (0.2)	ND (0.5)	**0.1 J**	ND (0.5)	ND (0.1)	ND (0.1)	ND (10)	ND (0.2)	ND (2.0)
Chloroethane	48	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	ND (10)	**1.3**	**7.0 J**
Chloroform	80	**0.9 J**	**0.9 J**	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	ND (10)	ND (0.2)	ND (2.0)
cis-1,2-Dichloroethene	70	**170**	**320**	**0.5 J**	**620**	**0.4 J**	**1,200**	**15,000**	**300**	**630**
Ethylbenzene	700	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	**920**	**11**	**330**
Isopropylbenzene	224	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	**180**	**2.1**	**61**
Methylene Chloride	5	**0.4 J**	**1.5 J**	ND (0.2)	ND (1.0)	ND (0.2)	ND (0.2)	ND (20)	ND (0.4)	**4.2 J**
Naphthalene	3	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	**820**	**5.4**	**200**
n-Butylbenzene	21	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	**29 J**	**0.7 J**	**21**
Tetrachloroethene	5	**100**	**520**	**0.4 J**	**460**	**0.8**	**76**	**1,700**	**4.1**	**2.1 J**
Toluene	1,000	ND (0.2)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	**4,200**	**0.6 J**	**19**
trans-1,2-Dichloroethene	100	**1.4**	**2.8**	ND (0.1)	**4.4**	ND (0.1)	**9.0**	**58**	**5.9**	**16**
Trichloroethene	5	**370**	**850**	**1.0**	**1,100**	**0.7**	**70**	**1,400**	**10**	**2.6 J**
Vinyl Chloride	2	**6.5**	**2.2 J**	ND (0.1)	**0.9 J**	ND (0.1)	**140**	**1,600**	**180**	**190**
Xylene (Total)	10,000	**0.2 J**	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.1)	ND (0.1)	**4,700**	**13**	**410**

Notes:
J - The analyte was positively identified, the quantitation is an estimation.
Bold values were detected.
Shaded values are above the Kansas Department of Health and Environment (KDHE) screening values.
All units are presented in micrograms per Liter (µg/L).
NA - Not available.
ND (#) - Non-Detect (Method Detection Limit [MDL]).

Table 2. Data Collected During Phytoremediation Installation

Boring	Total Depth (ft bgs)	PID in Hole (ppm)	Water Level (ft bgs)	ORP (mV)
Plot B				
B-1	32	0.3	7.25	-95
B-2	32	23.5	7.23	-255
B-3	37	19.0	7.20	-295
B-4	36	6.0	7.02	-241
B-5	36	23.6	6.75	-167
B-6	37	5.1	6.90	-169
B-7	37	2.7	7.21	-191
B-8	37	12.9	7.43	-174
B-9	37	1.2	7.45	38
B-10	35	1.2	7.07	-8
B-11	37	3.5	7.22	-309
B-12	33	3.6	6.89	-318
B-13	37	17.7	NM	NM
B-14	35	0.6	6.95	166
B-15	35	0.9	7.12	-188
B-16	40	24	7.23	-174
B-17	37	2.4	7.48	-222
B-18	36.5	1.6	7.72	0
B-19	34	2.2	7.34	-196
B-20	35	3.4	6.98	-305
B-21	35	1.4	6.86	-338
B-22	36	0.6	7.33	-275
B-23	36	0.3	7.02	-296
B-24	40	1.7	7.42	-198
B-25	37	0.3	7.40	-337
B-26	38	0.6	7.47	-342
B-27	35	0.7	7.62	-229
B-28	37	0.6	7.43	-259
B-29	35	2.7	7.21	-298
B-30	34	4.2	7.64	-289
B-31	35	3.2	7.45	-225
B-32	34	5.8	7.48	-279
B-33	40	2.6	7.53	-253
B-34	40	5.9	7.62	-223
B-35	40	3.1	7.54	-392
B-36	35	14.7	7.62	-167
Plot C				
C-1	31	0.0	6.4	307
C-2	32	0.0	7.32	315
C-3	33	0.0	7.07	313
C-4	30	0.0	8.4	317
C-5	31	1.4	9.25	311
C-6	45	0.0	1.95	295
C-7	31	0.0	1.88	311
C-8	31	0.0	9.11	305
C-9	32	0.0	3.15	-10

Table 2. Data Collected During Phytoremediation Installation (Continued)

Boring	Total Depth (ft bgs)	PID in Hole (ppm)	Water Level (ft bgs)	ORP (mV)
Plot C (Continued)				
C-10	32	0.0	9.75	224
C-11	30.5	0.0	8.7	NM
C-12	35	0.2	5.9	280
C-13	35	2.6	7.22	220
C-14	35	7.5	8.61	160
C-15	32	2.1	7.22	225
C-16	32	0.0	9.2	220
C-17	33	0.0	1.71	-350
C-18	35	0.0	9.44	262
C-19	35	0.0	12.26	246
C-20	30.5	0.0	10	265
C-21	30.5	0.0	NM	NM
C-22	25	0.0	8.2	302
C-23	25	1.4	6.94	285
C-24	25	16	12.42	287
C-25	25	37	8.94	186
C-26	25	0.1	1.74	193
C-27	25	0.0	1.8	237
C-28	25	0.2	1.9	301
C-29	25	0.0	14.96	302
C-30	25	0.0	15.12	305
C-31	25	0.0	10.19	294
C-32	25	0.2	NM	NM
C-33	25	2.0	NM	NM
C-34	25	52	1.81	253
C-35	25	50	1.62	292
C-36	25	3.2	1.73	301
C-37	25	0.0	9.72	311
C-38	25	0.0	5.2	330
C-39	25	0.0	10.27	322
C-40	25	0.0	14	326
C-41	25	0.0	NM	NM
C-42	25	0.4	NM	NM
C-43	25	0.0	2.05	200
C-44	25	2.0	1.59	109
C-45	25	0.0	NM	NM
C-46	25	0.0	13.95	309
C-47	25	0.5	11.32	304
C-48	25	1.0	NM	NM
C-49	25	1.0	NM	NM
C-50	25	10.9	NM	NM
C-51	25	3.3	NM	NM
C-52	25	20.7	NM	NM
C-53	25	6.2	8.75	275
C-54	25	6.2	10.15	167
C-55	25	16.4	NM	NM

Table 2. Data Collected During Phytoremediation Installation (Continued)

Boring	Total Depth (ft bgs)	PID in Hole (ppm)	Water Level (ft bgs)	ORP (mV)
Plot C (Continued)				
C-56	25	2.0	NM	NM
C-57	25	63.1	16.15	230
C-58	25	172	NM	-491
C-59	25	2.2	9.25	71
C-60	25	9.8	12.3	91
C-61	25	1.3	16.2	211
C-62	25	2.6	15.7	131
C-63	25	23	7.2	111
C-64	30	24.8	7.05	140

Notes:
ft bgs - Feet below ground surface.
mV - Millivolt.
NM - Not measured due to borehole collapse.
ORP - Oxidation-reduction potential.
PID - Photoionization detector.
ppm - Parts per million.

Table 3. Phytoremediation Growth Summary through August 2010

Tree	Monthly Height			Monthly Difference		Total Change
	June	July	August	Jun to July	July to Aug	June to Aug
B-1	2.7	3.9	4.5	1.2	0.6	1.8
B-2	1.6	2.8	3.7	1.2	0.9	2.1
B-3	1.7	2.3	3.2	0.6	0.9	1.5
B-4	2.4	2.6	2.5	0.2	-0.1	0.1
B-5	1.65	2.8	3.9	1.15	1.1	2.25
B-6	1.5	2.2	3.6	0.7	1.4	2.1
B-7	1.4	1.7	1.5	0.3	-0.2	0.1
B-8	4.6	4.8	5.4	0.2	0.6	0.8
B-9	3.8	3.9	4.5	0.1	0.6	0.7
B-10	1.9	1.9	2.4	0	0.5	0.5
B-11	4.2	5.2	6	1	0.8	1.8
B-12	1.9	2.4	3.1	0.5	0.7	1.2
B-13	1.9	2.5	3.7	0.6	1.2	1.8
B-14	1.4	2.3	3.7	0.9	1.4	2.3
B-15	3.8	4.2	4.9	0.4	0.7	1.1
B-16	2.8	3.4	4.3	0.6	0.9	1.5
B-17	2.3	3	3.9	0.7	0.9	1.6
B-18	1.4	1.4	0	0	-1.4	-1.4
B-19	3	3.9	4.6	0.9	0.7	1.6
B-20	5	5.5	6	0.5	0.5	1
B-21	3.8	4.3	5	0.5	0.7	1.2
B-22	3.4	3.9	4.5	0.5	0.6	1.1
B-23	3.95	4.2	5.2	0.25	1	1.25
B-24	4	4.4	4.7	0.4	0.3	0.7
B-25	1.3	2.3	3.8	1	1.5	2.5
B-26	2.8	3.5	4.3	0.7	0.8	1.5
B-27	1.7	1.9	2.2	0.2	0.3	0.5
B-28	3.2	4	5	0.8	1	1.8
B-29	1.6	1.9	2.7	0.3	0.8	1.1
B-30	4.7	5.1	5.3	0.4	0.2	0.6
B-31	1.8	3	3.3	1.2	0.3	1.5
B-32	3.1	4.1	5.3	1	1.2	2.2
B-33	2	2.1	2.6	0.1	0.5	0.6
B-34	2.2	3.1	4.2	0.9	1.1	2
B-35	1.7	2.9	3.5	1.2	0.6	1.8
B-36	1.5	2	2.6	0.5	0.6	1.1
C-1	1.7	2.5	4.1	0.8	1.6	2.4
C-2	4.2	4.9	5.8	0.7	0.9	1.6
C-3	1.5	2.8	4	1.3	1.2	2.5
C-4	0.7	2	4	1.3	2	3.3
C-5	1.9	3.3	4.6	1.4	1.3	2.7
C-6	1.9	3.2	5	1.3	1.8	3.1
C-7	2.8	3.2	4.1	0.4	0.9	1.3
C-8	0.7	0.5	0.7	-0.2	0.2	0
C-9	1.5	0.7	1.7	-0.8	1	0.2
C-10	2.4	3.4	4.3	1	0.9	1.9

Table 3. Phytoremediation Growth Summary through August 2010 (Continued)

Tree	Monthly Height			Monthly Difference		Total Change
	June	July	August	Jun to July	July to Aug	June to Aug
C-11	1.3	2.1	3.1	0.8	1	1.8
C-12	3.5	4.7	6	1.2	1.3	2.5
C-13	2	3.3	4.6	1.3	1.3	2.6
C-14	2.7	2.6	4.5	-0.1	1.9	1.8
C-15	1.7	3	4.7	1.3	1.7	3
C-16	1.7	2.2	3.1	0.5	0.9	1.4
C-17	1.3	2.9	4.3	1.6	1.4	3
C-18	2	2.6	3.9	0.6	1.3	1.9
C-19	3.1	4.2	5.4	1.1	1.2	2.3
C-20	1.7	2.6	4	0.9	1.4	2.3
C-21	1.3	1.3	0	0	-1.3	-1.3
C-22	2.9	4	5.3	1.1	1.3	2.4
C-23	2	3.8	5.3	1.8	1.5	3.3
C-24	1.9	3.6	4.4	1.7	0.8	2.5
C-25	1.8	3.3	4.7	1.5	1.4	2.9
C-26	2.5	3.2	4.4	0.7	1.2	1.9
C-27	2	2.9	4.5	0.9	1.6	2.5
C-28	2.1	2.8	4.4	0.7	1.6	2.3
C-29	1.3	1.6	3.1	0.3	1.5	1.8
C-30	3.1	3.9	4.8	0.8	0.9	1.7
C-31	1.6	2.8	3.5	1.2	0.7	1.9
C-32	2.8	3.9	5.8	1.1	1.9	3
C-33	1.3	2.4	4.1	1.1	1.7	2.8
C-34	2.8	4	4.8	1.2	0.8	2
C-35	2.9	3.1	4	0.2	0.9	1.1
C-36	1.4	2.9	4.7	1.5	1.8	3.3
C-37	2.3	2.5	2.4	0.2	-0.1	0.1
C-38	2.3	3.1	3.4	0.8	0.3	1.1
C-39	2.3	3.2	4.5	0.9	1.3	2.2
C-40	2	3.2	5	1.2	1.8	3
C-41	1.5	2.3	3.8	0.8	1.5	2.3
C-42	1.2	2.6	3.3	1.4	0.7	2.1
C-43	2	3.1	4.7	1.1	1.6	2.7
C-44	1.5	2.8	4.8	1.3	2	3.3
C-45	1.8	3	4.5	1.2	1.5	2.7
C-46	1.7	0.5	0.3	-1.2	-0.2	-1.4
C-47	1.5	2.7	4.1	1.2	1.4	2.6
C-48	0.9	2.3	3.7	1.4	1.4	2.8
C-49	2.1	2.8	4.3	0.7	1.5	2.2
C-50	2.8	3.9	4.9	1.1	1	2.1
C-51	2.7	3	4.4	0.3	1.4	1.7
C-52	2.5	3.7	4.9	1.2	1.2	2.4
C-53	1.7	2.9	4.5	1.2	1.6	2.8
C-54	3	4	5.2	1	1.2	2.2
C-55	2.3	3.7	4.9	1.4	1.2	2.6
C-56	1.9	3.1	4.6	1.2	1.5	2.7

Table 3. Phytoremediation Growth Summary through August 2010 (Continued)

Tree	Monthly Height			Monthly Difference		Total Change
	June	July	August	Jun to July	July to Aug	June to Aug
C-57	1.7	2.9	4.7	1.2	1.8	3
C-58	1.3	1.7	1.2	0.4	-0.5	-0.1
C-59	1.6	2.3	4.1	0.7	1.8	2.5
C-60	1.7	2.5	3.7	0.8	1.2	2
C-61	2.3	2.9	4.2	0.6	1.3	1.9
C-62	2.5	3.2	3.9	0.7	0.7	1.4
C-63	2.1	2.9	3.9	0.8	1	1.8
C-64	1.9	2.8	3.5	0.9	0.7	1.6
	2.23	3.01	4.01	0.78	1.00	1.78
	Average Height			Average Change		

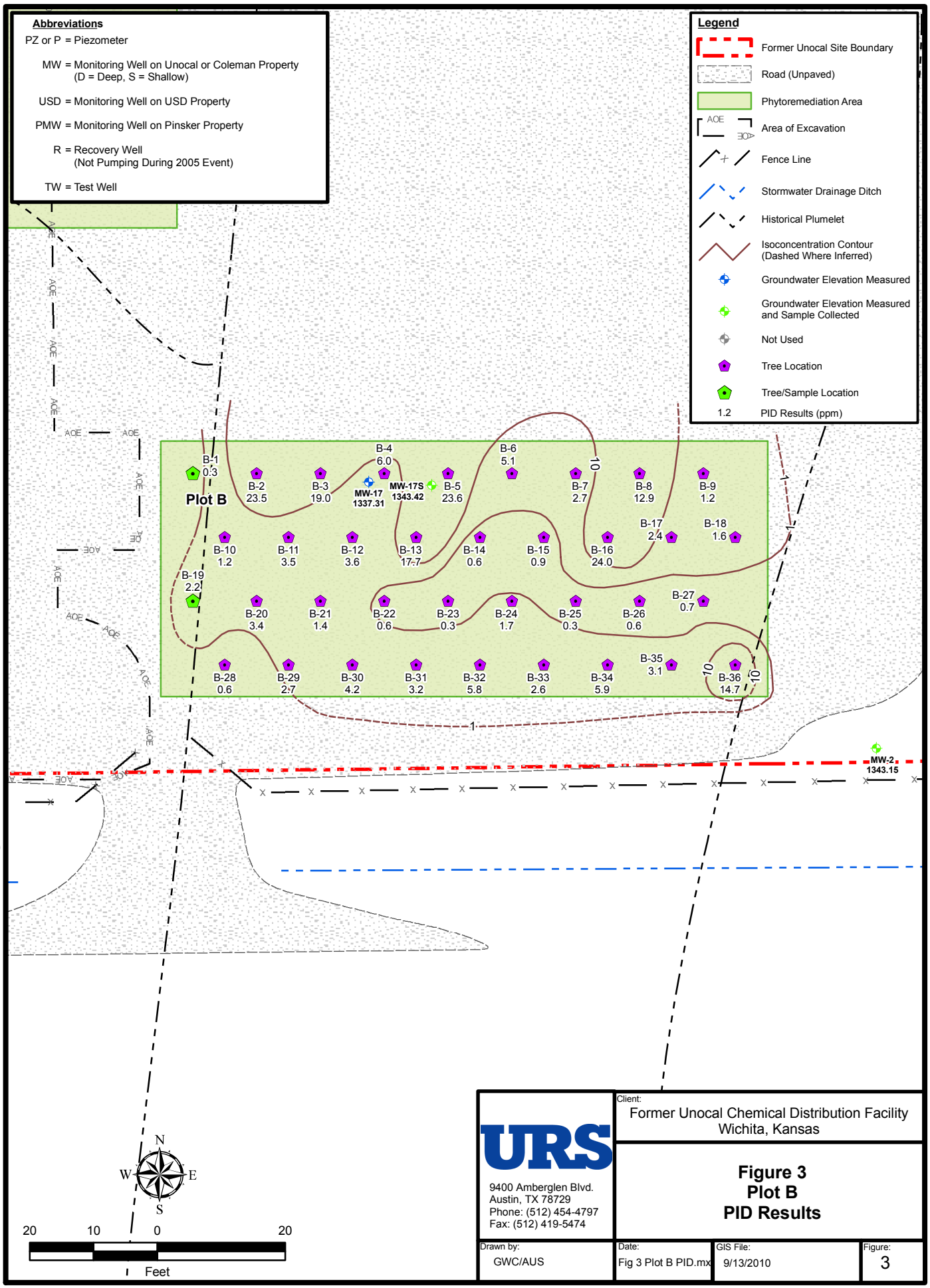

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Figure 3
Plot B
PID Results

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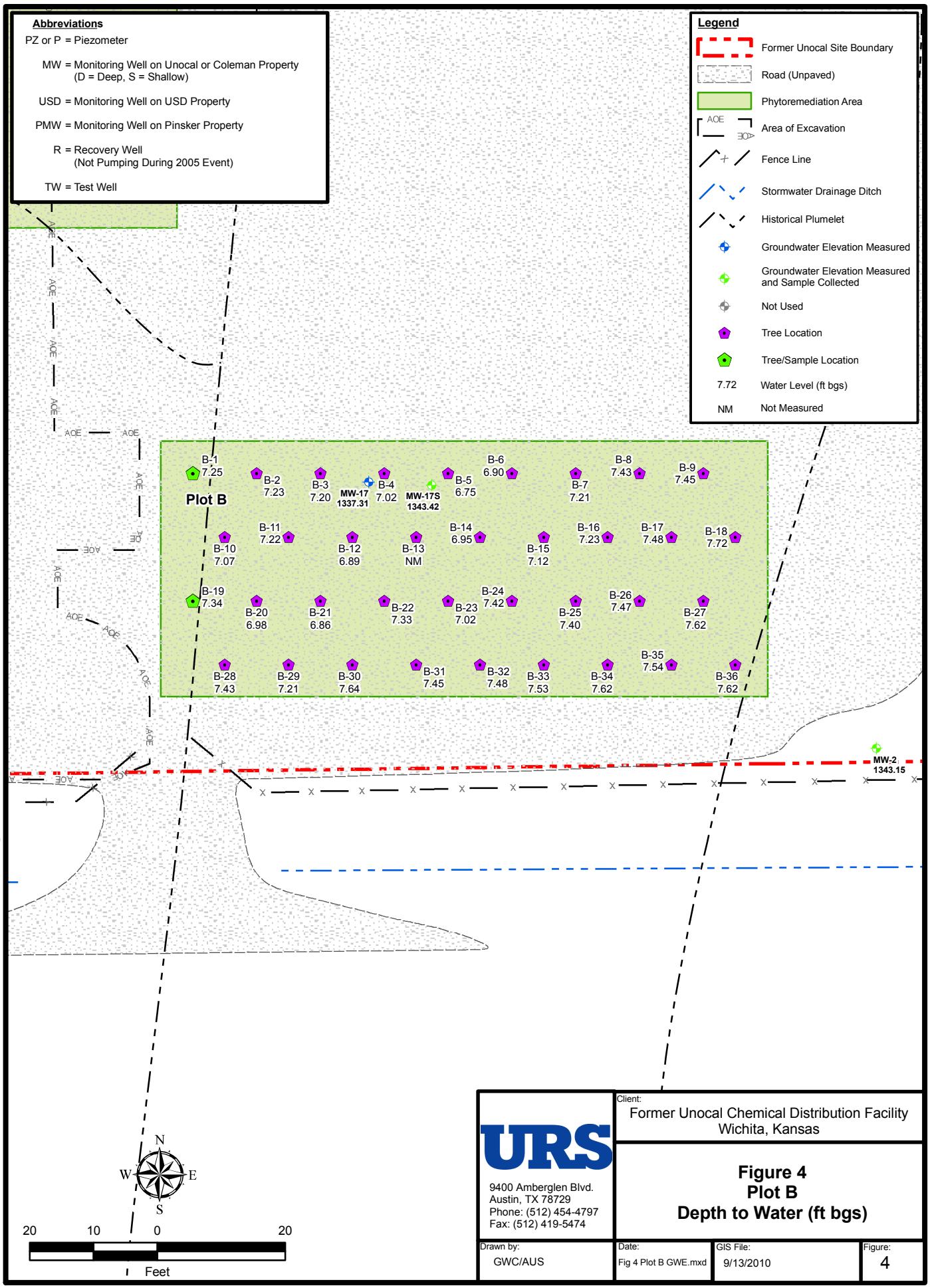

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Figure 4
Plot B
Depth to Water (ft bgs)

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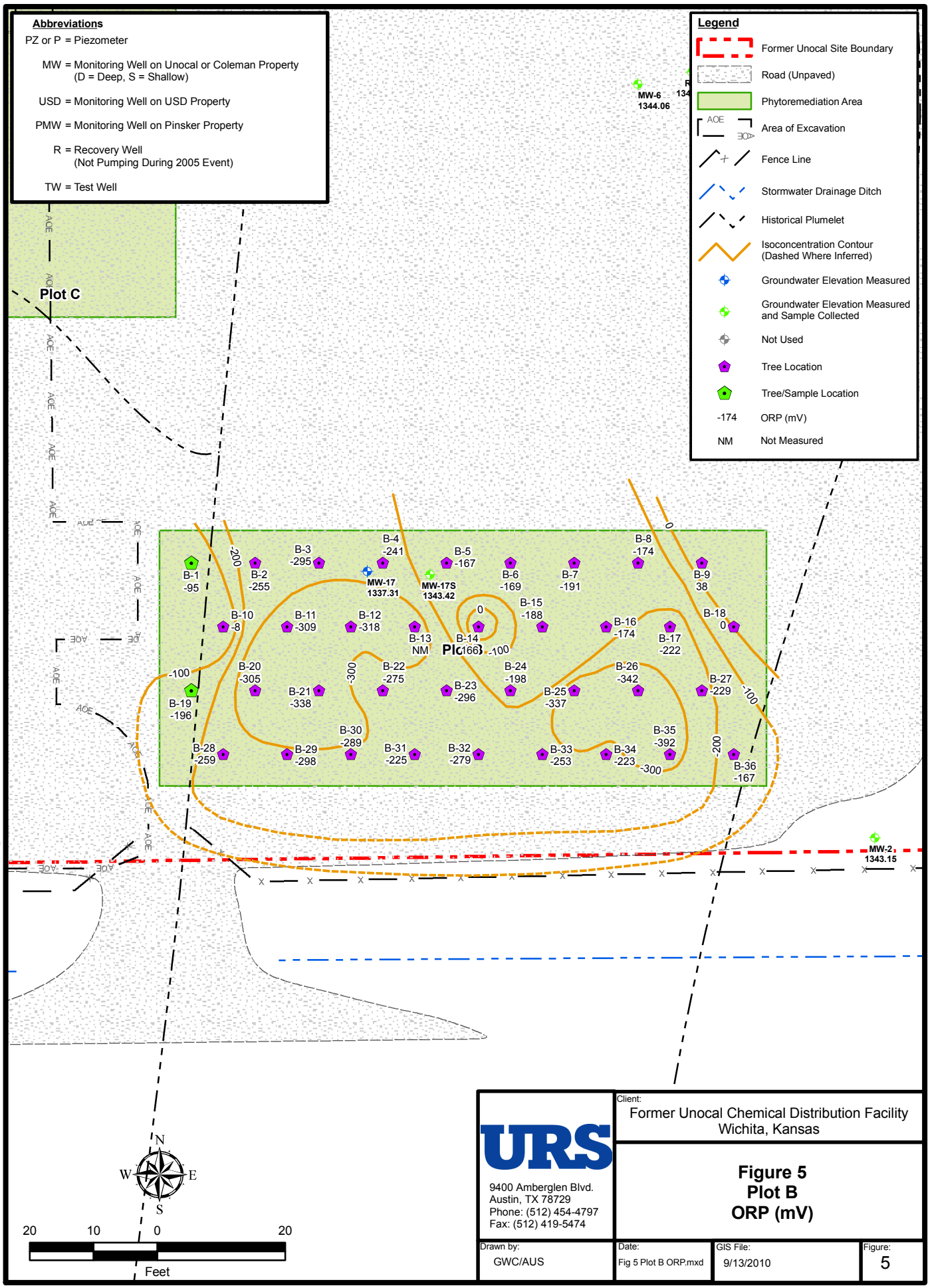

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Figure 5
Plot B
ORP (mV)

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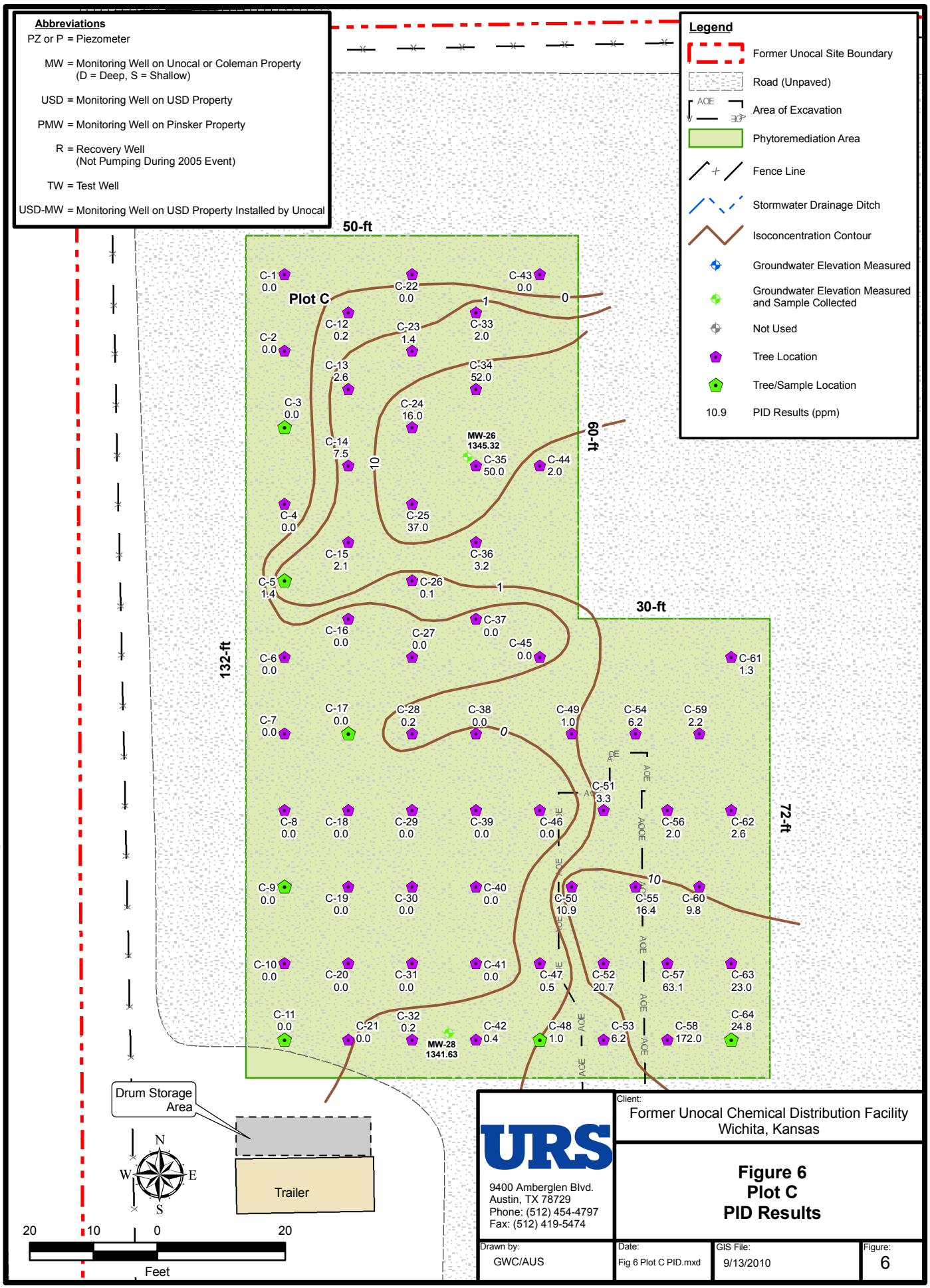
Abbreviations
PZ or P = Piezometer
MW = Monitoring Well on Unocal or Coleman Property (D = Deep, S = Shallow)
USD = Monitoring Well on USD Property
PMW = Monitoring Well on Pinsker Property
R = Recovery Well (Not Pumping During 2005 Event)
TW = Test Well
USD-MW = Monitoring Well on USD Property Installed by Unocal
Legend
Former Unocal Site Boundary
Road (Unpaved)
Area of Excavation
Phytoremediation Area
Fence Line
Stormwater Drainage Ditch
Isoconcentration Contour
Groundwater Elevation Measured
Groundwater Elevation Measured and Sample Collected
Not Used
Tree Location
Tree/Sample Location
10.9 PID Results (ppm)
Plot C
50-ft
60-ft
30-ft
72-ft
132-ft
MW-26 1345.32
MW-28 1341.63
Drum Storage Area
Trailer
N
S
E
W
20 10 0 20
Feet
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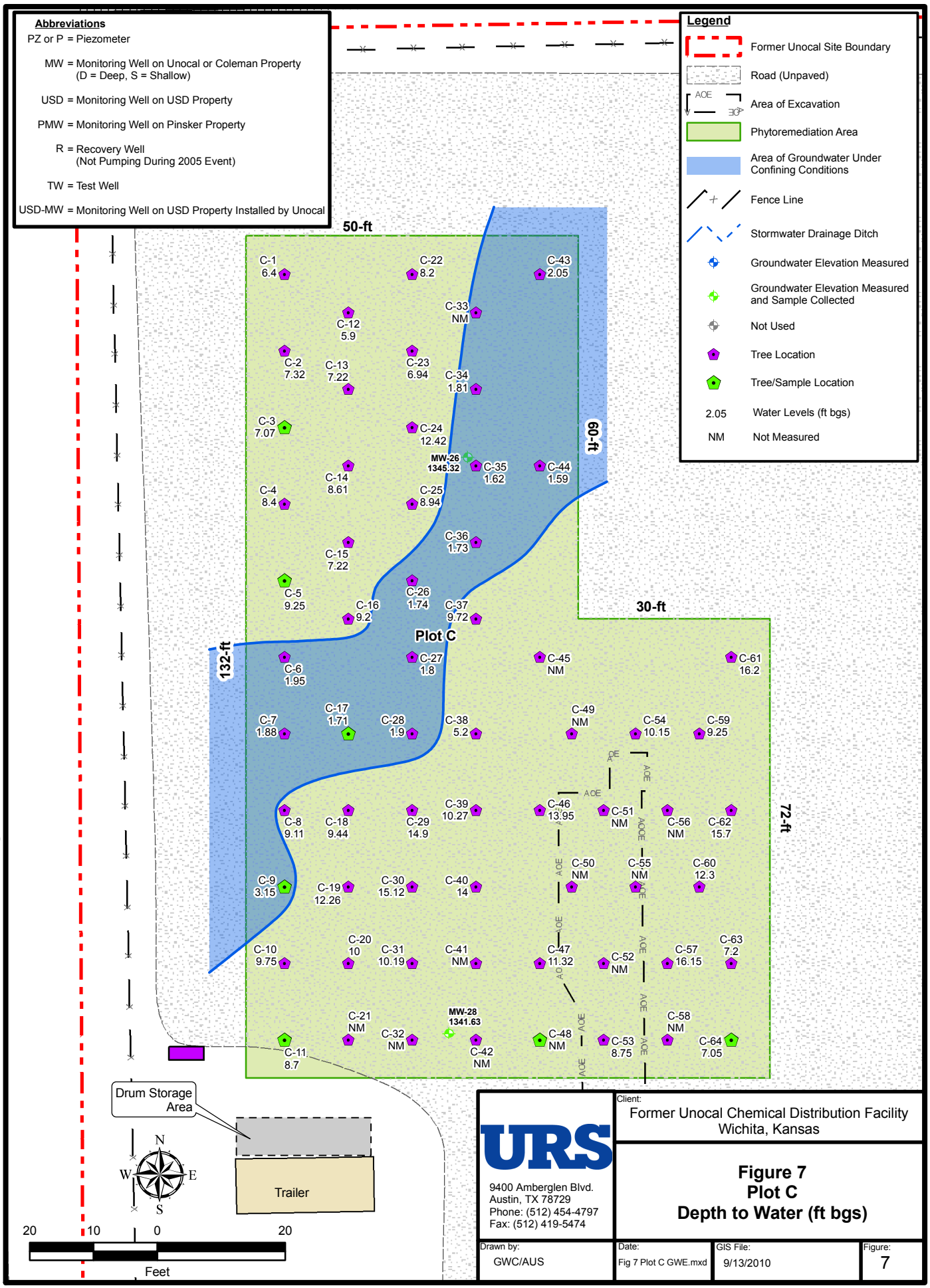
Figure 6
Plot C
PID Results
Drawn by: GWC/AUS
Date: Fig 6 Plot C PID.mxd
GIS File: 9/13/2010
Figure: 6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R = Recovery Well (Not Pumping During 2005 Event)
TW = Test Well
USD-MW = Monitoring Well on USD Property Installed by Unocal
Legend
Former Unocal Site Boundary
Road (Unpaved)
Area of Excavation
Phytoremediation Area
Area of Groundwater Under Confining Conditions
Fence Line
Stormwater Drainage Ditch
Groundwater Elevation Measured
Groundwater Elevation Measured and Sample Collected
Not Used
Tree Location
Tree/Sample Location
2.05 Water Levels (ft bgs)
NM Not Measured
50-ft
60-ft
30-ft
72-ft
132-ft
Plot C
C-1 6.4
C-22 8.2
C-43 2.05
C-33 NM
C-12 5.9
C-2 7.32
C-13 7.22
C-23 6.94
C-34 1.81
C-3 7.07
C-24 12.42
MW-26 1345.32
C-35 1.62
C-44 1.59
C-14 8.61
C-4 8.4
C-25 8.94
C-36 1.73
C-15 7.22
C-5 9.25
C-26 1.74
C-16 9.2
C-37 9.72
C-6 1.95
C-27 1.8
C-45 NM
C-61 16.2
C-17 1.71
C-7 1.88
C-28 1.9
C-38 5.2
C-49 NM
C-54 10.15
C-59 9.25
C-8 9.11
C-18 9.44
C-29 14.9
C-39 10.27
C-46 13.95
C-51 NM
C-56 NM
C-62 15.7
C-9 3.15
C-19 12.26
C-30 15.12
C-40 14
C-50 NM
C-55 NM
C-60 12.3
C-10 9.75
C-20 10
C-31 10.19
C-41 NM
C-47 11.32
C-52 NM
C-57 16.15
C-63 7.2
C-21 NM
MW-28 1341.63
C-32 NM
C-42 NM
C-48 NM
C-53 8.75
C-58 NM
C-64 7.05
C-11 8.7
AOE
Drum Storage Area
Trailer
N
S
E
W
20 10 0 20
Feet
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Figure 7
Plot C
Depth to Water (ft bgs)
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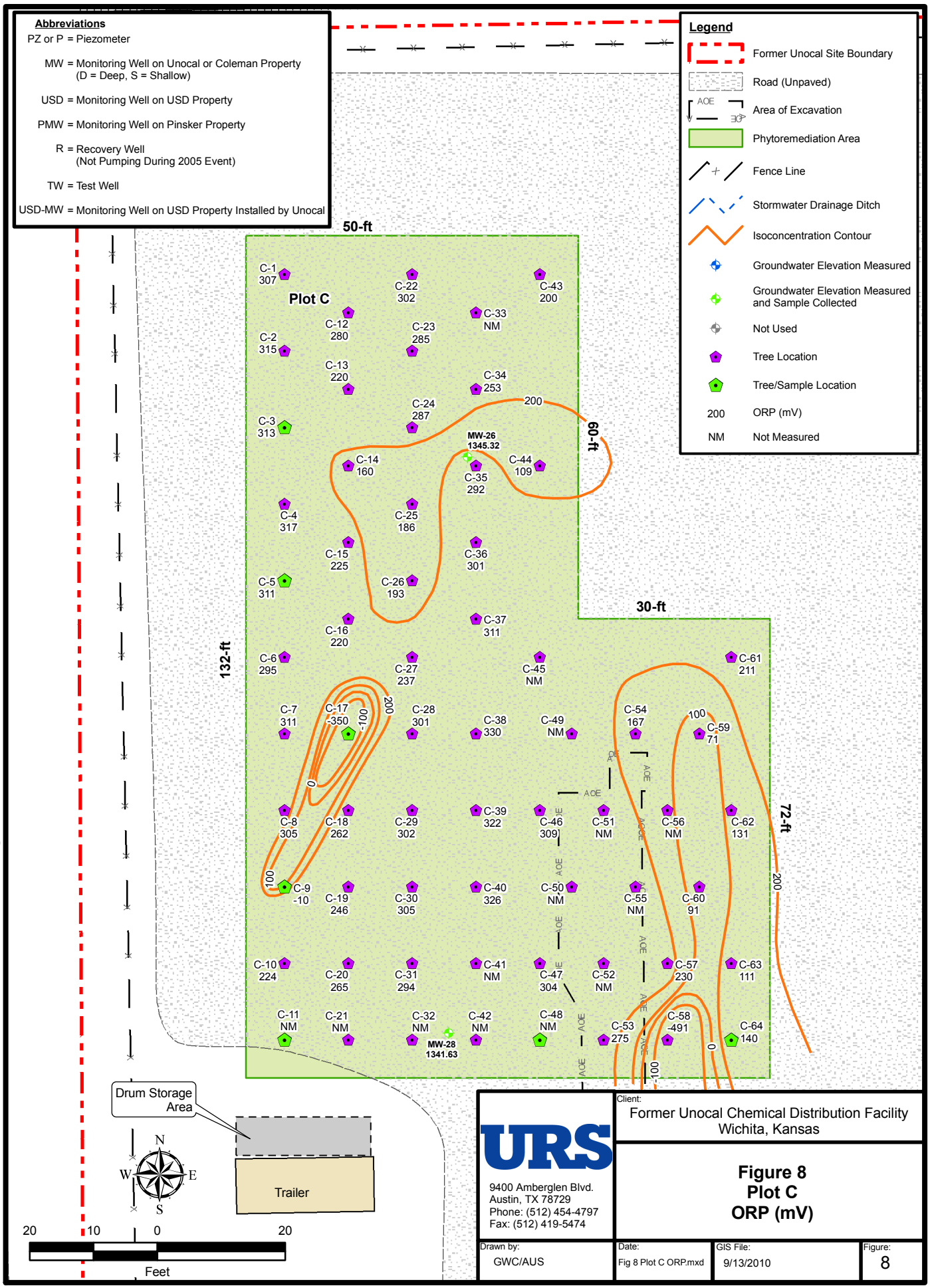

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Figure 8
Plot C
ORP (mV)

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PHOTOGRAPHS

June 2010 Photos

North from Southwest Corner of Plot C

North from MW-28, Plot C

Typical Shorter Tree, Plot C

South View Across Plot B, West End

South View Across Plot B, East End

Typical Mid-Sized Tree, Plot B

July 2010 Photos

Northwest to Southeast Across Plot B

Northern Portion of Plot C, Looking Northwest

Plot C Southwest to Northeast