



Application for Approval of Municipal Setting Designation

APPLICANT INFORMATION

Applicant's Name: Harris County Flood Control District

Individual Private Entity Public Entity Non-Profit Entity Other _____

Address: 9900 Northwest Freeway Houston TX 77092
(Street) (City) (State) (Zip)

Phone No.: (713) 684-4000 Fax No.: _____

Email: _____

Contact Information

Name of Contact: Michael D. Talbott, P.E.

Title: Director

Address: 9900 Northwest Freeway Houston TX 77092
(Street) (City) (State) (Zip)

Phone No.: (713) 684-4000 Fax No.: (713) 684-4102

Email: hcfcd@hcfcd.org

SITE INFORMATION

Site HCAD No(s): 040-035-000-002

Site Name: 6.445 acre tract (V 3171, P 125 HCDR), 0.3258 acre tract (V 2970 P 580 HCDR), 1.581 acre tract (V 2970, P 586 HCDR), 6,353 square feet tract (V 4787, P 135 HCDR), and 0.5320 acre tract (V 2970, P 577 HCDR).

Site Size: 9.293 Acres

Site Address: White Oak Bayou – Between Shepherd Drive and Patterson Street, Houston, TX
(Street) (City) (State) (Zip)

(List all owners – additional sheet is attached, if needed)

Owner: Harris County Flood Control District

Owner Address: 9900 Northwest Freeway Houston TX 77092
(Street) (City) (State) (Zip)

Name of Contact: Glenn W. Laird

Title: Director of Environmental Services Division

Organization: Harris County Flood Control District

Phone No.: (713) 684-4192 Fax No.: _____

Email: hcfcd@hcfcd.org

EXECUTIVE SUMMARY

The designated property (the Site) consists of an approximate 9.293-acre tract of land along White Oak Bayou from Shepherd Drive to Patterson Street. The Site is undeveloped and improvements to the Site are limited to re-channelization and improvements to White Oak Bayou. The Site is bordered to the north by commercial/industrial development. The Site is bordered to the east by residential development and vacant property followed by Patterson Street with commercial/industrial developments beyond. The Site is bordered to the south by residential development, industrial development and vacant land followed by Cornish Street. The Site is bordered to the west by Shepherd Drive followed by commercial/industrial development. The Site is currently heavily vegetated, with the exception of the improved White Oak Bayou Channel. The general Site vicinity consists of commercial/industrial, undeveloped, and residential properties.

Based on review of historical aerial photos, dating back to 1930, the Site has never been developed. The Site was historically the location of an oxbow of White Oak Bayou, which was cut off and filled in the 1950's when White Oak Bayou was re-channelized into its current position in 1956.

The results of previous site assessment activities indicate that surface soils within the boundaries of the Site have been impacted by arsenic, barium, cadmium, lead, mercury and silver at concentrations which exceed applicable critical TCEQ TRRP PCLs for leaching of contaminants to groundwater ($^{GW}Soil_{Ing}$). Reported metal impacts in surface soils have not exceeded the $^{Tot}Soil_{Comb}$ PCL.

Shallow groundwater underlying the Site has been impacted by antimony, arsenic, barium, cadmium, chromium, and lead at concentrations which exceed critical TRRP PCLs for direct ingestion of groundwater ($^{GW}GW_{Ing}$). The shallow groundwater gradient and/or flow direction within the assessment area is likely influenced by the concrete lined channel of White Oak Bayou as well as seasonal groundwater fluctuations and appears to be generally to the northeast. Based on historic sampling and analysis results from a network of ten (10) permanent groundwater monitor wells over four (4) historic sampling events, maximum metal concentrations have generally been reported in groundwater samples collected from monitor well MW-01 located in the apparent contaminant source area, the interior of the former oxbow.

The proposed remedy/response action for impacted groundwater is a City of Houston Municipal Setting Designation (MSD), which would restrict access to such impacted groundwater, effectively eliminating the $^{GW}GW_{Ing}$ exposure pathway from consideration.

APPENDIX B

A description of the current use, and, to the extent know, the anticipated use(s), of the designated property and properties within 500 feet of the boundary of the designated property.

The designated property (the Site) consists of an approximate 9.293-acre tract of land along White Oak Bayou from Shepherd Drive to Patterson Street. The Site is undeveloped and improvements to the Site are limited to re-channelization and improvements to White Oak Bayou. Anticipated use of the designated property will remain unchanged.

A 500-foot field survey was previously conducted in the vicinity of the designated property. The Site is bordered to the north by commercial/industrial development. The Site is bordered to the east by residential development and vacant property, followed by Patterson Street with commercial/industrial developments beyond. The Site is bordered to the south by residential development, industrial development and vacant land followed by Cornish Street. The Site is bordered to the west by Shepherd Drive followed by commercial/industrial development. The general Site vicinity consists of commercial/industrial, undeveloped, and residential properties. Underground public utilities are recorded to be located within the limits of the designated property. Potable water within 500 feet of the designated property is provided by the City of Houston. Based on the results of the field survey, no sensitive receptors exist within a 500-foot radius of the designated property, with the exception of White Oak Bayou which transects the north-central portion of the Site. The attached **Figure B-1** depicts current property use within 500 feet of the designated property boundary.



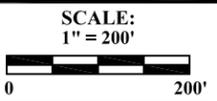
LEGEND:

- Approximate Property Boundary
- Approximate 500' Boundary

500' PROPERTY USE MAP

HARRIS COUNTY FLOOD CONTROL DISTRICT
 WHITE OAK BAYOU
 HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
 File Name: Figure B-1
 Drawn By: KO
 Approved: TAO
 Date: 1/28/2013
 Revised:



**FIGURE
 B-1**

APPENDIX C

A site map(s) showing:

- a. The location of the designated property.*
- b. The topography of the designated property as indicated on publicly available sources, which must note the watershed including the nearest surface water body and whether the designated property is located in a floodplain or floodway, as those terms are defined in Chapter 19 of the Code of Ordinances.*
- c. The detected area of groundwater contamination.*
- d. The location of all soil sampling locations and all groundwater monitoring wells.*
- e. Groundwater gradients, to the extent known, and direction of groundwater flow.*
- f. The ingestion protective concentration level exceedence zone for each contaminate of concern, to the extent known.*

See Attached Figures

Figure a1 – Site Location Map

Figure a2 – Site Map

Figure b1 – Topographic Map

Figure b2 – Flood Insurance Rate Map

Figure c1 – Detected Groundwater Contamination Map

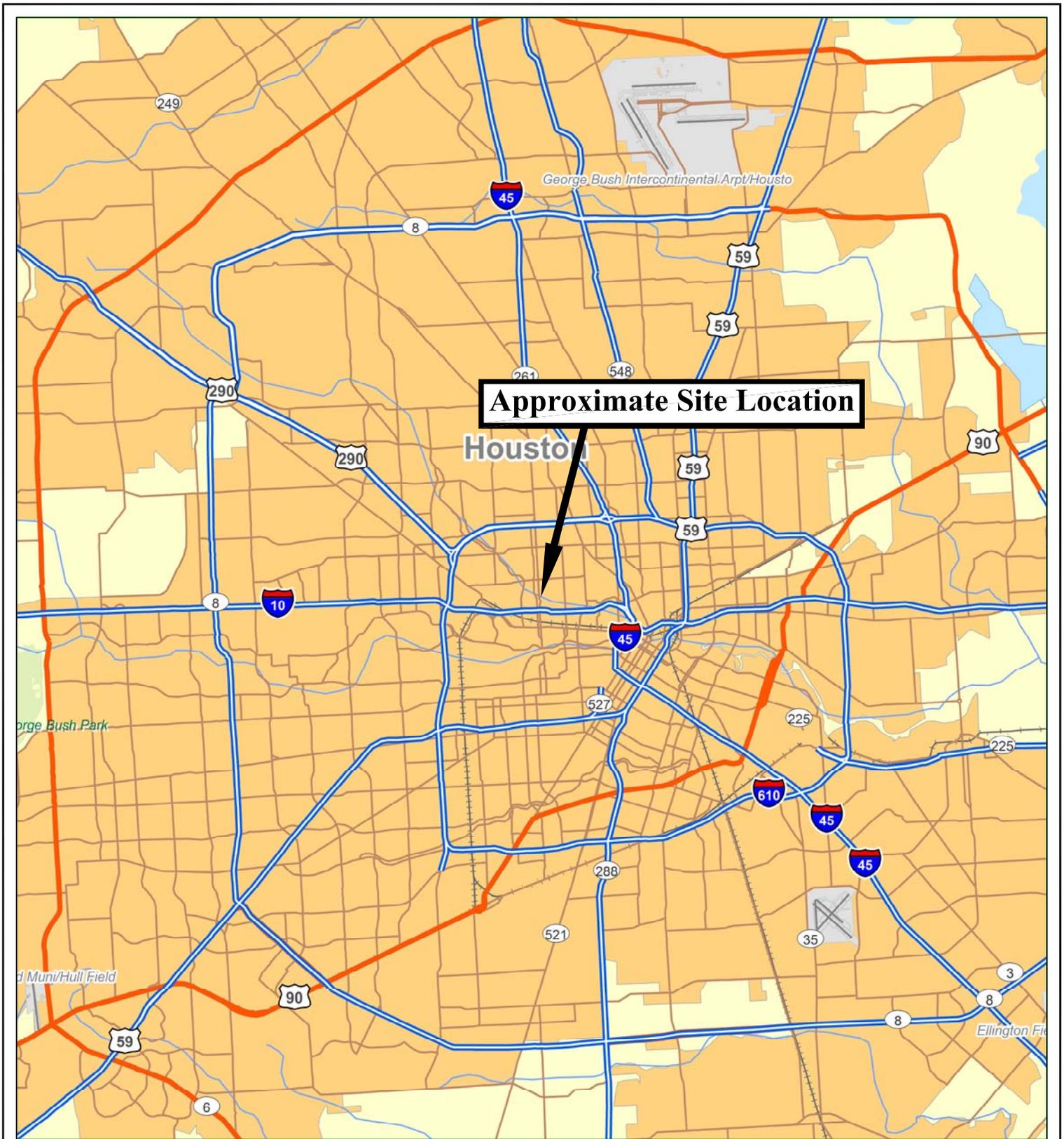
Figure d1 – Groundwater Monitor Well and Soil Boring Location Map

Figure e1 – Groundwater Gradient Map (July 2012)

Figure e2 – Groundwater Gradient Map (October 2012)

Figure e3 – Groundwater Gradient Map (February 2013)

Figure f1 – PCLE Zone Map (October 2012)



Legend:

	 <p>SCALE: 1" = 20,000'</p> 	<p>SITE LOCATION MAP</p> <p>HARRIS COUNTY FLOOD CONTROL DISTRICT WHITE OAK BAYOU HOUSTON, HARRIS COUNTY, TEXAS</p> <table border="1"> <thead> <tr> <th>Job Number</th> <th>File Name</th> <th>Drawn By</th> <th>Approved</th> <th>Date</th> <th>Revised</th> </tr> </thead> <tbody> <tr> <td>10-0122</td> <td>a1-siteloc</td> <td>LH</td> <td>DAH</td> <td>2/8/2013</td> <td></td> </tr> </tbody> </table>	Job Number	File Name	Drawn By	Approved	Date	Revised	10-0122	a1-siteloc	LH	DAH	2/8/2013		<p>FIGURE</p> <p>a1</p>
Job Number	File Name	Drawn By	Approved	Date	Revised										
10-0122	a1-siteloc	LH	DAH	2/8/2013											



LEGEND:

— Approximate Corridor/Property Boundary

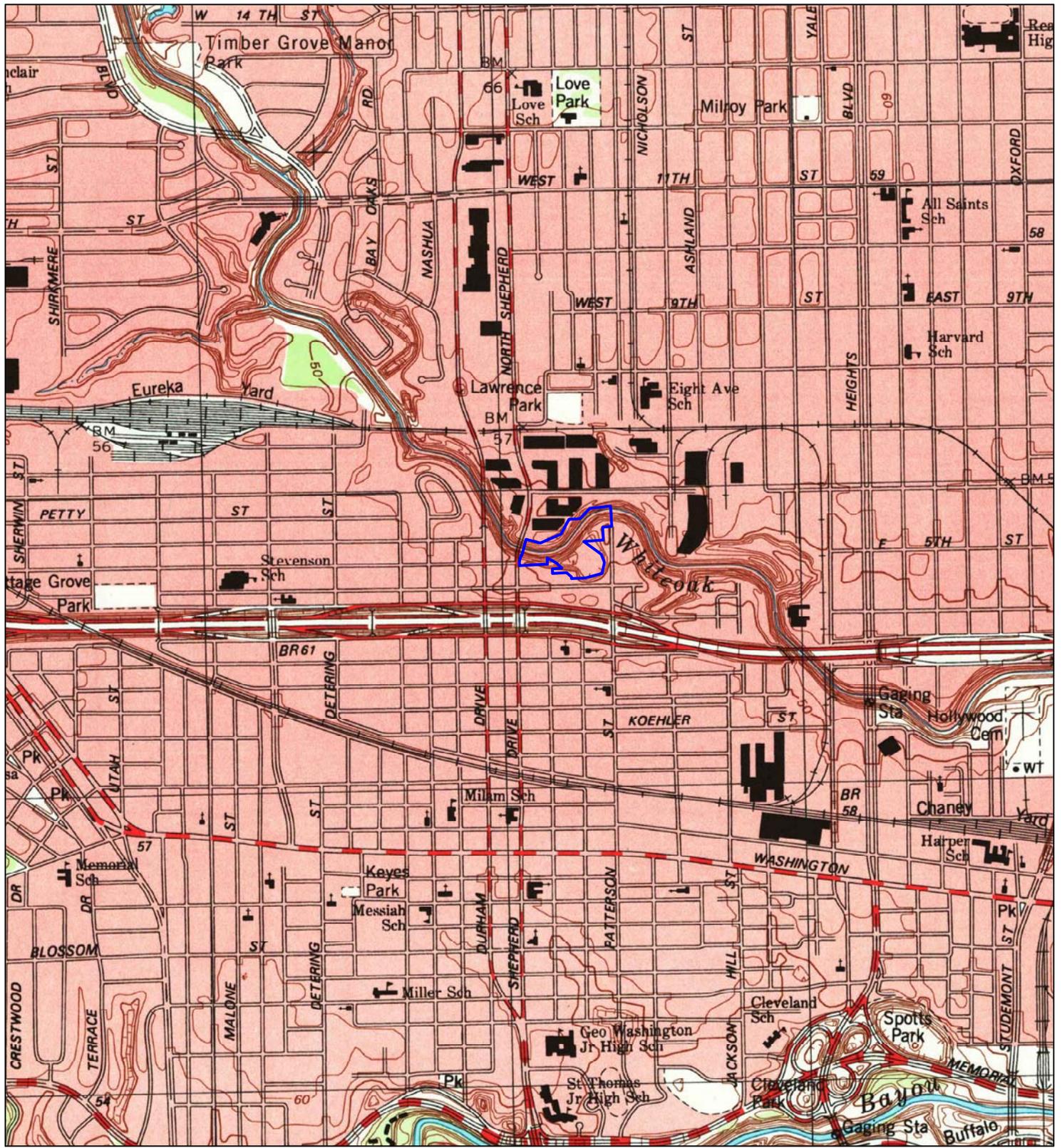
SITE MAP

HARRIS COUNTY FLOOD CONTROL DISTRICT
 WHITE OAK BAYOU
 HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
 File Name: figure a2
 Drawn By: BC
 Approved: DH
 Date: 1/23/2013
 Revised:



FIGURE
a2



LEGEND:

 Approximate Property Boundary



TOPOGRAPHIC MAP

HARRIS COUNTY FLOOD CONTROL DISTRICT
 WHITE OAK BAYOU
 HOUSTON, HARRIS COUNTY, TEXAS

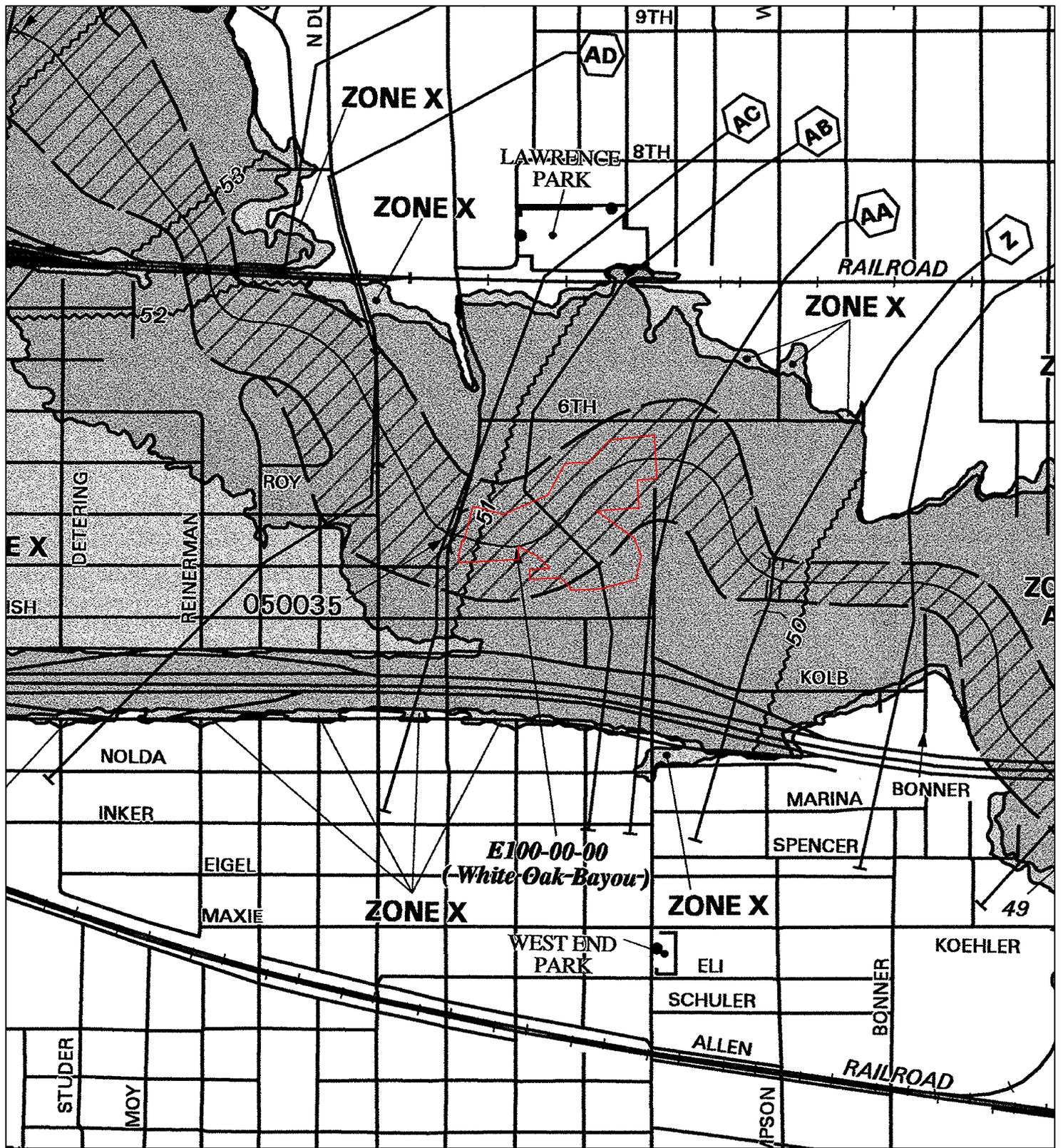
FIGURE

b1

USGS 7.5 MINUTE
 QUADRANGLE:
 HOUSTON HEIGHTS, TX 1995



Job Number	File Name	Drawn By	Approved	Date	Revised
10-0122	TOPO	LH	TAO	1/23/2013	



Legend:

- Approximate Site Boundary
- Zone X - Areas outside the 500-years floodplain
- Zone AE- Areas inside the 100-years floodplain
- Zone X - Areas inside the 500-years floodplain



SCALE:
1" = 700'



FM48201C0670L

FLOOD INSURANCE RATE MAP

HARRIS COUNTY FLOOD CONTROL DISTRICT
WHITE OAK BAYOU
HOUSTON, HARRIS COUNTY, TEXAS

Job Number	File Name	Drawn By	Approved	Date	Revised
10-0122	fema	LH	TAO	1/23/2013	

FIGURE

b2



LEGEND:

- Approximate Corridor/Property Boundary
- Structures
- Roads/Pavement
- White Oak Bayou
- Fence Line
- Permanent Monitor Well Location

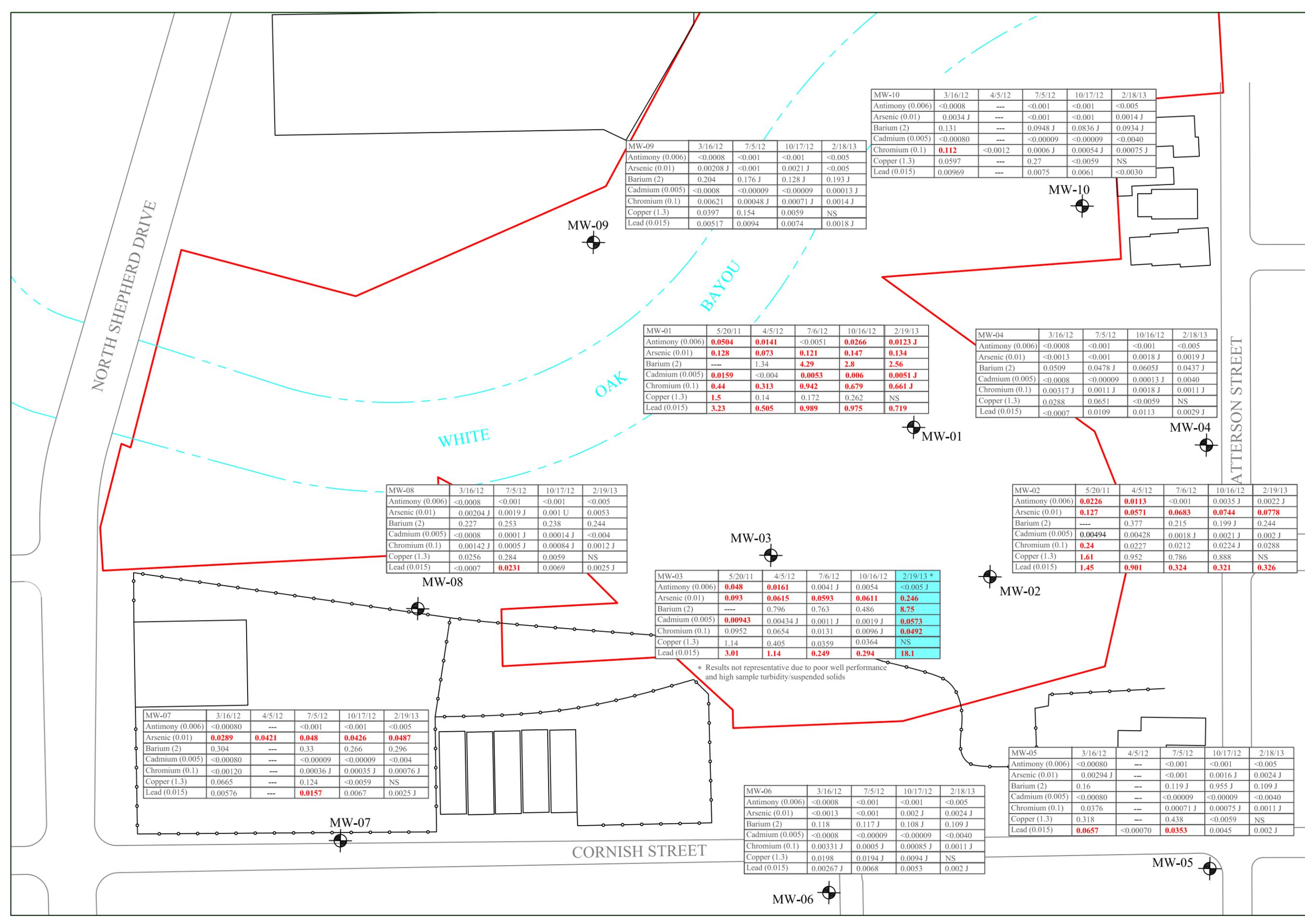
DETECTED GROUNDWATER CONCENTRATION MAP

HARRIS COUNTY FLOOD CONTROL DISTRICT
WHITE OAK BAYOU
HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
File Name: figure c1
Drawn By: LH
Approved: TAO
Date: 1/24/2013
Revised:

SCALE:
1" = 80'

FIGURE c1



MW-09	3/16/12	7/5/12	10/17/12	2/18/13
Antimony (0.006)	<0.0008	<0.001	<0.001	<0.005
Arsenic (0.01)	0.00208 J	<0.001	0.0021 J	<0.005
Barium (2)	0.204	0.176 J	0.128 J	0.193 J
Cadmium (0.005)	<0.0008	<0.00009	<0.00009	0.00013 J
Chromium (0.1)	0.00621	0.00048 J	0.00071 J	0.0014 J
Copper (1.3)	0.0397	0.154	0.0059	NS
Lead (0.015)	0.00517	0.0094	0.0074	0.0018 J

MW-10	3/16/12	4/5/12	7/5/12	10/17/12	2/18/13
Antimony (0.006)	<0.0008	---	<0.001	<0.001	<0.005
Arsenic (0.01)	0.0034 J	---	<0.001	<0.001	0.0014 J
Barium (2)	0.131	---	0.0948 J	0.0836 J	0.0934 J
Cadmium (0.005)	<0.00080	---	<0.00009	<0.00009	<0.0040
Chromium (0.1)	0.112	<0.0012	0.0006 J	0.00054 J	0.00075 J
Copper (1.3)	0.0597	---	0.27	<0.0059	NS
Lead (0.015)	0.00969	---	0.0075	0.0061	<0.0030

MW-01	5/20/11	4/5/12	7/6/12	10/16/12	2/19/13
Antimony (0.006)	0.0504	0.0141	<0.0051	0.0266	0.0123 J
Arsenic (0.01)	0.128	0.073	0.121	0.147	0.134
Barium (2)	---	1.34	4.29	2.8	2.56
Cadmium (0.005)	0.0159	<0.004	0.0053	0.006	0.0051 J
Chromium (0.1)	0.44	0.313	0.942	0.679	0.661 J
Copper (1.3)	1.5	0.14	0.172	0.262	NS
Lead (0.015)	3.23	0.505	0.989	0.975	0.719

MW-04	3/16/12	7/5/12	10/16/12	2/18/13
Antimony (0.006)	<0.0008	<0.001	<0.001	<0.005
Arsenic (0.01)	<0.0013	<0.001	0.0018 J	0.0019 J
Barium (2)	0.0509	0.0478 J	0.0605 J	0.0437 J
Cadmium (0.005)	<0.0008	<0.00009	0.00013 J	0.0040
Chromium (0.1)	0.00317 J	0.0011 J	0.0018 J	0.0011 J
Copper (1.3)	0.0288	0.0651	<0.0059	NS
Lead (0.015)	<0.0007	0.0109	0.0113	0.0029 J

MW-08	3/16/12	7/5/12	10/17/12	2/19/13
Antimony (0.006)	<0.0008	<0.001	<0.001	<0.005
Arsenic (0.01)	0.00204 J	0.0019 J	0.001 U	0.0053
Barium (2)	0.227	0.253	0.238	0.244
Cadmium (0.005)	<0.0008	0.0001 J	0.00014 J	<0.004
Chromium (0.1)	0.00142 J	0.0005 J	0.00084 J	0.0012 J
Copper (1.3)	0.0256	0.284	0.0059	NS
Lead (0.015)	<0.0007	0.0231	0.0069	0.0025 J

MW-02	5/20/11	4/5/12	7/6/12	10/16/12	2/19/13
Antimony (0.006)	0.0226	0.0113	<0.001	0.0035 J	0.0022 J
Arsenic (0.01)	0.127	0.0571	0.0683	0.0744	0.0778
Barium (2)	---	0.377	0.215	0.199 J	0.244
Cadmium (0.005)	0.00494	0.00428	0.0018 J	0.0021 J	0.002 J
Chromium (0.1)	0.24	0.0227	0.0212	0.0224 J	0.0288
Copper (1.3)	1.61	0.952	0.786	0.888	NS
Lead (0.015)	1.45	0.901	0.324	0.321	0.326

MW-03	5/20/11	4/5/12	7/6/12	10/16/12	2/19/13*
Antimony (0.006)	0.048	0.0161	0.0041 J	0.0054	<0.005 J
Arsenic (0.01)	0.093	0.0615	0.0593	0.0611	0.246
Barium (2)	---	0.796	0.763	0.486	8.75
Cadmium (0.005)	0.00943	0.00434 J	0.0011 J	0.0019 J	0.0573
Chromium (0.1)	0.0952	0.0654	0.0131	0.0096 J	0.0492
Copper (1.3)	1.14	0.405	0.0359	0.0364	NS
Lead (0.015)	3.01	1.14	0.249	0.294	18.1

* Results not representative due to poor well performance and high sample turbidity/suspended solids

MW-07	3/16/12	4/5/12	7/5/12	10/17/12	2/19/13
Antimony (0.006)	<0.00080	---	<0.001	<0.001	<0.005
Arsenic (0.01)	0.0289	0.0421	0.048	0.0426	0.0487
Barium (2)	0.304	---	0.33	0.266	0.296
Cadmium (0.005)	<0.00080	---	<0.00009	<0.00009	<0.004
Chromium (0.1)	<0.00120	---	0.00036 J	0.00035 J	0.00076 J
Copper (1.3)	0.0665	---	0.124	<0.0059	NS
Lead (0.015)	0.00576	---	0.0157	0.0067	0.0025 J

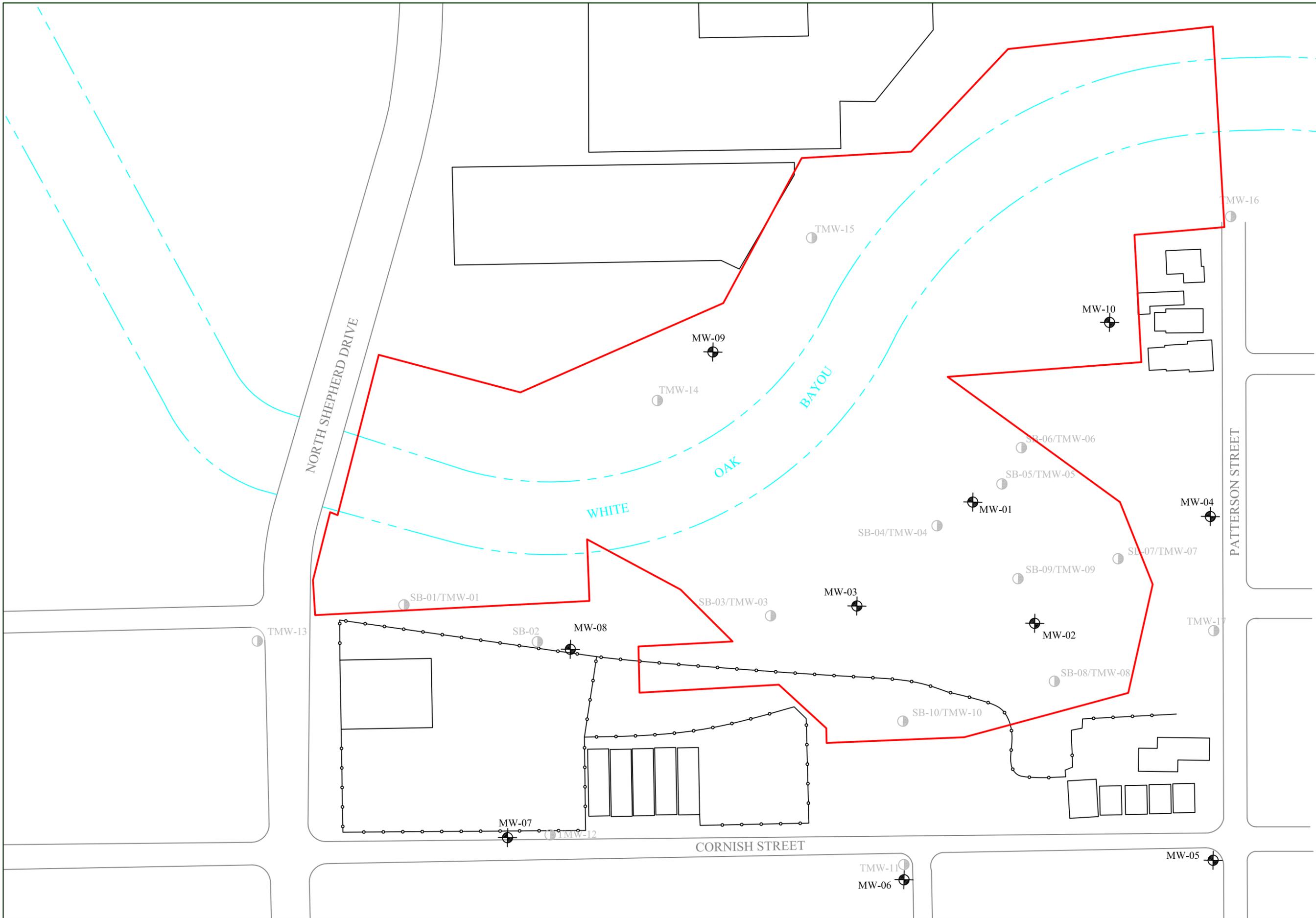
MW-06	3/16/12	7/5/12	10/17/12	2/18/13
Antimony (0.006)	<0.0008	<0.001	<0.001	<0.005
Arsenic (0.01)	<0.0013	<0.001	0.002 J	0.0024 J
Barium (2)	0.118	0.117 J	0.108 J	0.109 J
Cadmium (0.005)	<0.0008	<0.00009	<0.00009	<0.0040
Chromium (0.1)	0.00331 J	0.0005 J	0.00085 J	0.0011 J
Copper (1.3)	0.0198	0.0194 J	0.0094 J	NS
Lead (0.015)	0.00267 J	0.0068	0.0053	0.002 J

MW-05	3/16/12	4/5/12	7/5/12	10/17/12	2/18/13
Antimony (0.006)	<0.00080	---	<0.001	<0.001	<0.005
Arsenic (0.01)	0.00294 J	---	<0.001	0.0016 J	0.0024 J
Barium (2)	0.16	---	0.119 J	0.955 J	0.109 J
Cadmium (0.005)	<0.00080	---	<0.00009	<0.00009	<0.0040
Chromium (0.1)	0.0376	---	0.00071 J	0.00075 J	0.0011 J
Copper (1.3)	0.318	---	0.438	<0.0059	NS
Lead (0.015)	0.0657	<0.00070	0.0353	0.0045	0.002 J



LEGEND:

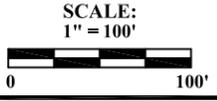
-  Approximate Corridor/Property Boundary
-  Structures
-  Roads/Pavement
-  White Oak Bayou
-  Fence Line
-  Permanent Monitor Well Location
-  Temporary Monitoring Well Location



**GROUNDWATER MONITOR WELL
AND SOIL BORING LOCATION MAP**

HARRIS COUNTY FLOOD CONTROL DISTRICT
WHITE OAK BAYOU
HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
 File Name: figure d1
 Drawn By: LH
 Approved: TAO
 Date: 1/24/2013
 Revised:



**FIGURE
d1**



LEGEND:

- Approximate Corridor/Property Boundary
- Structures
- Roads/Pavement
- - - White Oak Bayou
- Fence Line
- Permanent Monitor Well Location
- (25.69) Groundwater Elevation (ft)
- 22.5 — GW Elevation Contour (ft)
- - - Estimated GW Gradient
- GW Flow Direction

GROUNDWATER GRADIENT MAP

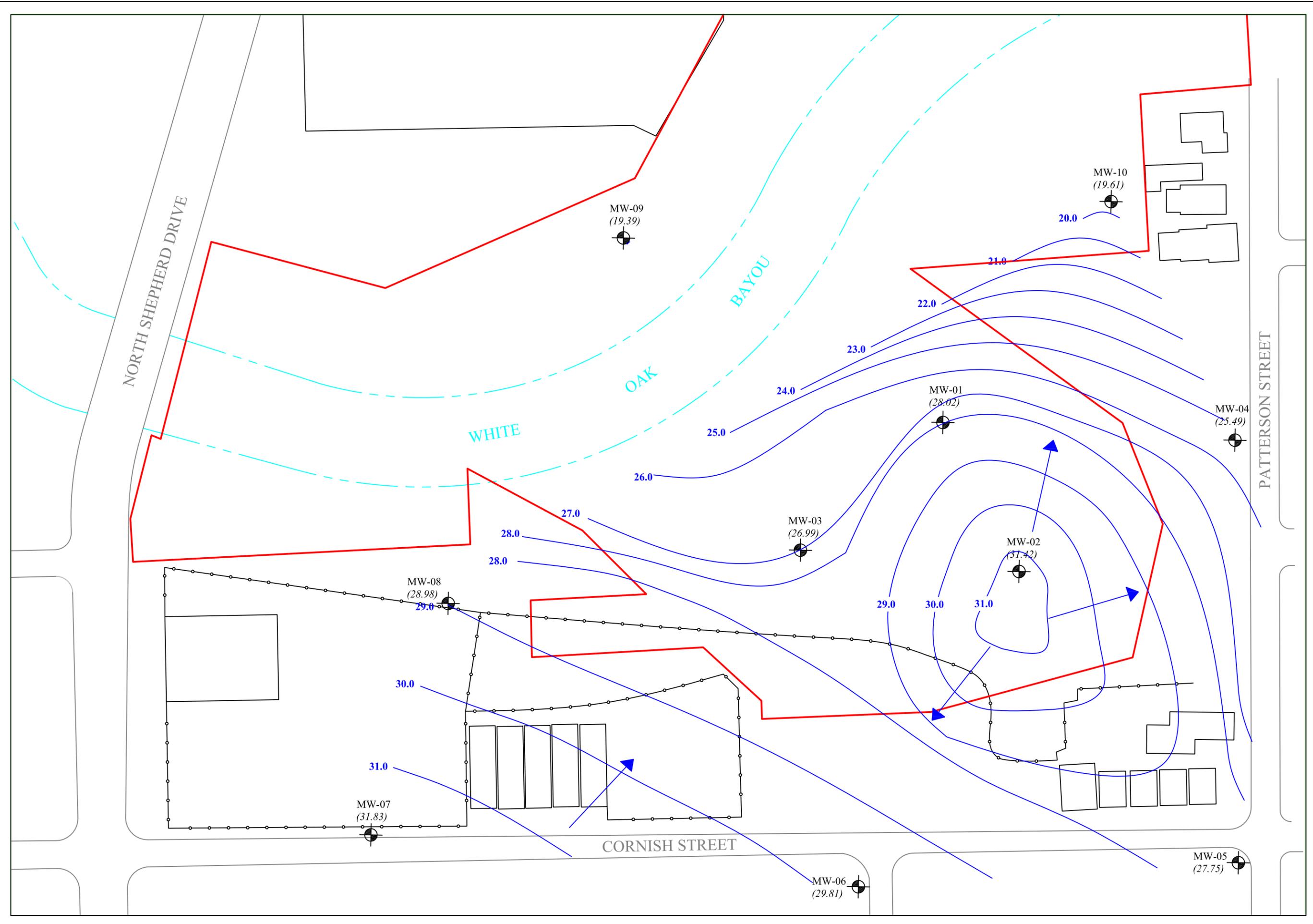
JULY 5, 2012

HARRIS COUNTY FLOOD CONTROL DISTRICT
 WHITE OAK BAYOU
 HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
 File Name: Figure E-1
 Drawn By: KO
 Approved: DH
 Date: 1/28/2013
 Revised:

SCALE:
 1" = 80'

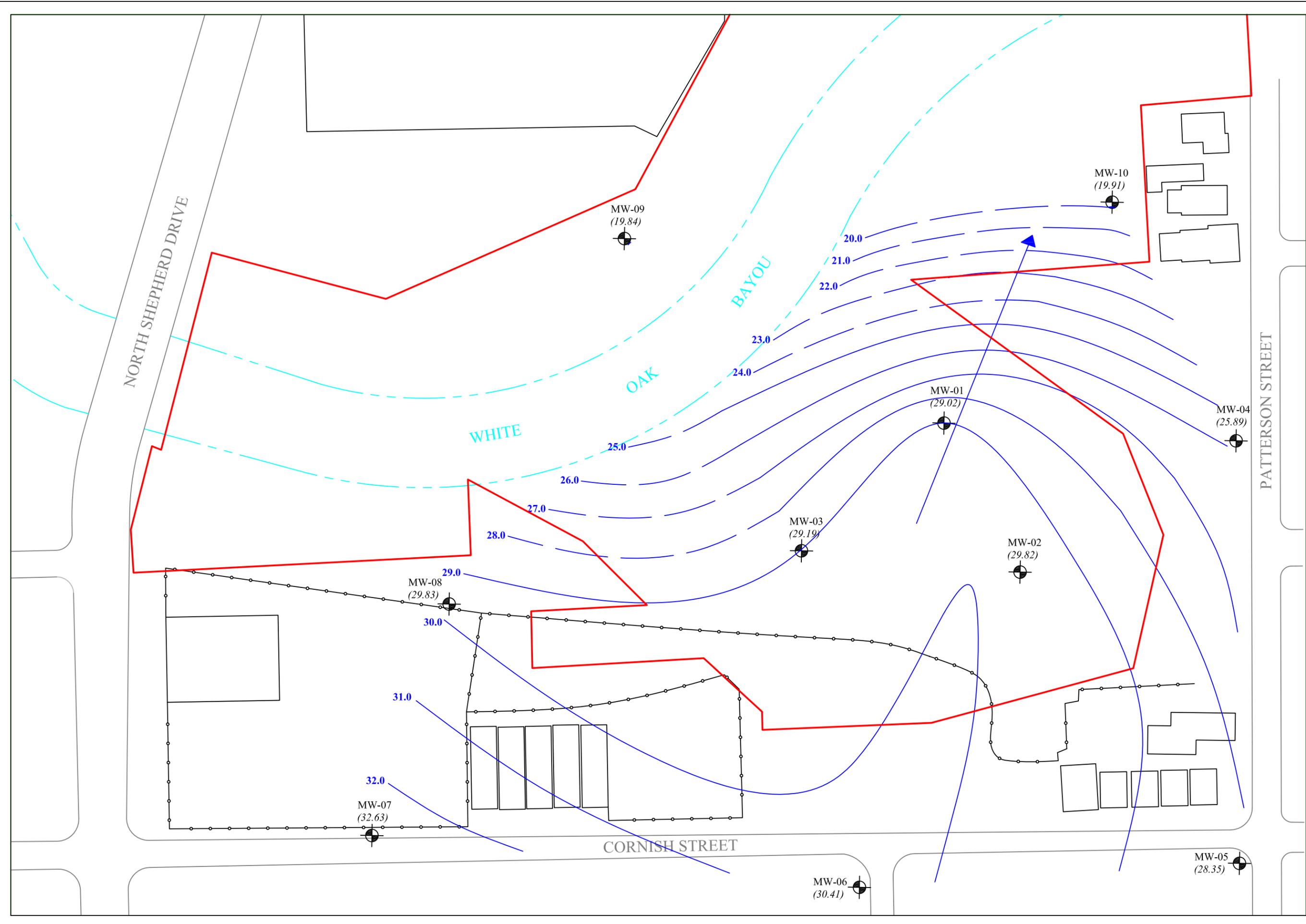
FIGURE
e1





LEGEND:

- Approximate Corridor/Property Boundary
- Structures
- Roads/Pavement
- - - White Oak Bayou
- Fence Line
- ⊕ Permanent Monitor Well Location
- (25.69) Groundwater Elevation (ft)
- GW Elevation Contour (ft)
- - - Estimated GW Gradient
- GW Flow Direction



GROUNDWATER GRADIENT MAP

OCTOBER 17, 2012

HARRIS COUNTY FLOOD CONTROL DISTRICT
 WHITE OAK BAYOU
 HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
File Name: figure e2
Drawn By: BC
Approved: TAO
Date: 1/2/2013
Revised:

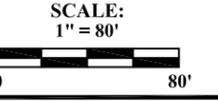


FIGURE
e2



LEGEND:

- Approximate Corridor/Property Boundary
- Structures
- Roads/Pavement
- - - White Oak Bayou
- Fence Line
- ⊕ Permanent Monitor Well Location
- (25.69) Groundwater Elevation (ft)
- 22.5 — GW Elevation Contour (ft)
- - - Estimated GW Gradient
- ↙ GW Flow Direction

GROUNDWATER GRADIENT MAP

FEBRUARY 19, 2013

HARRIS COUNTY FLOOD CONTROL DISTRICT
 WHITE OAK BAYOU
 HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
 File Name: figure e3
 Drawn By: BC
 Approved: TAO
 Date: 3/1/2013
 Revised:

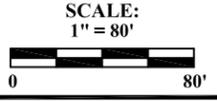
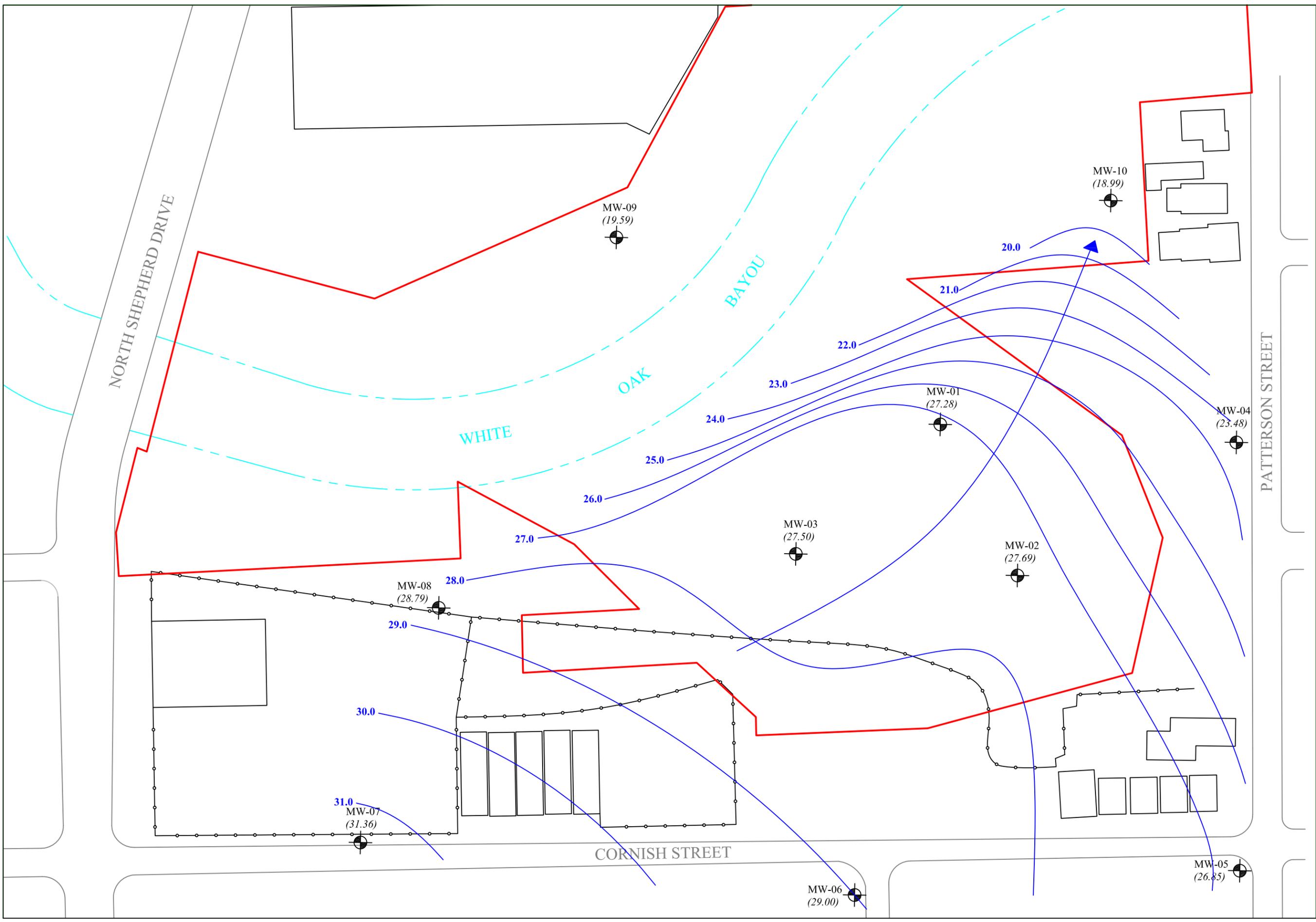
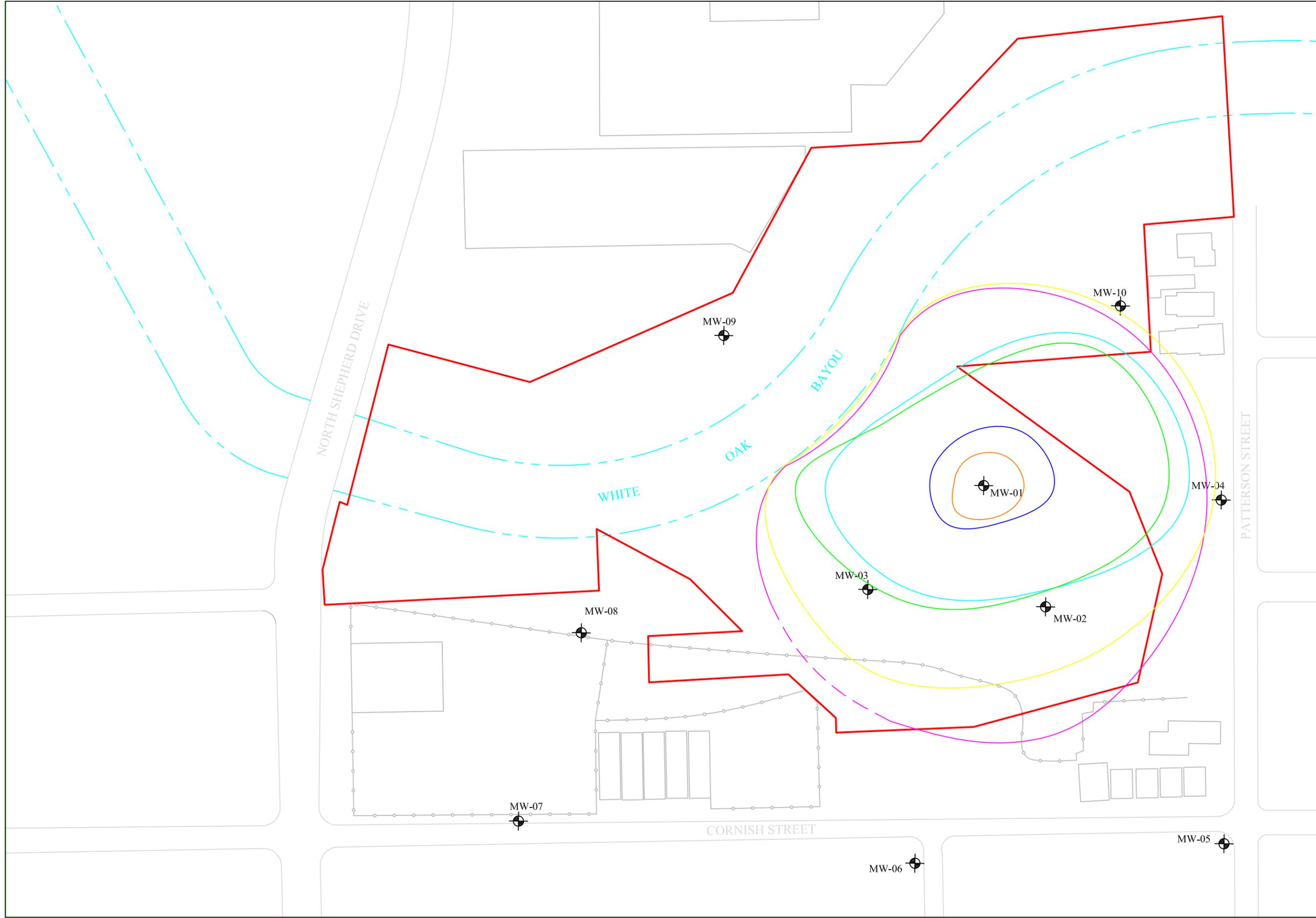


FIGURE
e3





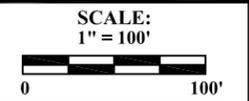
LEGEND:

- Approximate Corridor/Property Boundary
- - - White Oak Bayou
- - - Fence Line
- Permanent Monitor Well Location
- PCLE Zone Arsenic
- PCLE Zone Antimony
- PCLE Zone Barium
- PCLE Zone Cadmium
- PCLE Zone Chromium
- PCLE Zone Lead

**PCLE ZONE MAP
OCTOBER 2012**

HARRIS COUNTY FLOOD CONTROL DISTRICT
WHITE OAK BAYOU
HOUSTON, HARRIS COUNTY, TEXAS

Job Number: 10-0122
File Name: figure f1
Drawn By: LH
Approved: TAO
Date: 4/4/2013
Revised:



**FIGURE
f1**

APPENDIX D

For each contaminant of concern within the ingestion protective concentration level exceedance zone provide the following:

- a. A description of the ingestion protective concentration level exceedance zone and the non-ingestion protective concentration level exceedance zone, including a specification of the horizontal area and the minimum and maximum depth below ground surface.
- b. The level of contamination, the ingestion protective concentration level, and the non-ingestion protective concentration level, all expressed as mg/L units.
- c. Its basic geochemical properties (e.g., whether the contaminant of concern migrates with groundwater, floats or is soluble in water).

Based on environmental investigations at the designated property, antimony, arsenic, barium, cadmium, chromium, and lead have been identified in the shallow groundwater bearing unit at concentrations which exceed the ingestion protective concentration levels ($^{GW}GW_{Ing}$). No COCs have been identified in groundwater at concentrations which exceed the non-ingestion protective concentration levels. Therefore, a non-ingestion protective concentration level exceedance zone does not exist at the site. No COCs have been identified in Site soil at concentrations which exceed the TCEQ TRRP direct exposure protective concentration levels ($^{Tot}Soil_{Comb}$).

A description of each COC, the ingestion and non-ingestion PCLE zone, vertical and horizontal extent, and geochemical properties is provided below.

COC: Antimony

Maximum Concentration: 0.0504 mg/L

Ingestion-Based PCL (Residential $^{GW}GW_{Ing}$): 0.006 mg/l

Ingestion-Based PCLE Zone:

Length: 560 ft

Width: 920 ft

Min. Depth: 10 ft bgs

Max. Depth: 30 ft bgs

Total Area: 2.29 acres

Non-Ingestion - Based PCL ($^{Air}GW_{Inh-v}$): NE (no TRRP PCL Established)

Non-Ingestion - Based PCLE Zone: None

Geochemical/Physical Properties

Molecular Weight 121.75

Density/Specific Gravity 6.68 g/cm³

Solubility in Water: Insoluble

Groundwater Migration: Low

COC: Arsenic

Maximum Concentration: 0.147 mg/L

Ingestion-Based PCL (Residential $^{GW}GW_{Ing}$) 0.01 mg/L

Ingestion-Based PCLE Zone:

Length: 650 ft
Width: 600 ft
Min. Depth: 10 ft bgs
Max. Depth: 30 ft bgs
Total Area: 6.57 acres

Non-Ingestion - Based PCL (^{Air}GW_{Inh-v}): NE (no TRRP PCL Established)

Non-Ingestion - Based PCLE Zone None

Geochemical/Physical Properties

Molecular Weight 74.92
Density/Specific Gravity 5.72 g/cm³
Solubility in Water: Insoluble
Groundwater Migration: Low

COC: Barium

Maximum Concentration: 4.29 mg/L
Ingestion-Based PCL (Residential ^{GW}GW_{ing}) 2 mg/L
Ingestion-Based PCLE Zone:
Length: 220 ft
Width: 100 ft
Min. Depth: 10 ft bgs
Max Depth: 30 ft bgs
Total Area: 0.31 acres

Non-Ingestion - Based PCL (^{Air}GW_{Inh-v}): NE (no TRRP PCL Established)

Non-Ingestion - Based PCLE Zone None

Geochemical/Physical Properties

Molecular Weight 137.34
Density/Specific Gravity 3.51 g/cm³
Solubility in Water: Low Solubility
Groundwater Migration: Low

COC: Cadmium

Maximum Concentration: 0.0159 mg/L
Ingestion-Based PCL (Residential ^{GW}GW_{ing}) 0.005 mg/L
Ingestion-Based PCLE Zone:
Length: 120 ft
Width: 70 ft
Min. Depth: 10 ft bgs
Max Depth: 30 ft bgs
Total Area: 0.12 acres

Non-Ingestion - Based PCL (^{Air}GW_{Inh-v}): NE (no TRRP PCL Established)

Non-Ingestion - Based PCLE Zone None

Geochemical/Physical Properties

Molecular Weight 112.41
Density/Specific Gravity 8.642 g/cm³
Solubility in Water: Insoluble
Groundwater Migration: Low

COC: Chromium

Maximum Concentration: 0.942 mg/L

Ingestion-Based PCL (Residential ^{GW}GW_{ing}) 0.1 mg/L

Ingestion-Based PCLE Zone:

Length: 620 ft

Width: 300 ft

Min. Depth: 10 ft bgs

Max Depth: 30 ft bgs

Total Area: 2.55 acres

Non-Ingestion - Based PCL (^{Air}GW_{inh-v}): NE (no TRRP PCL Established)

Non-Ingestion - Based PCLE Zone None

Geochemical/Physical Properties

Molecular Weight 51.996

Density/Specific Gravity 7.19 g/cm³

Solubility in Water: Insoluble

Groundwater Migration: Low

COC: Lead

Maximum Concentration: 3.23 mg/L

Ingestion-Based PCL (Residential ^{GW}GW_{ing}) 0.015 mg/L

Ingestion-Based PCLE Zone:

Length: 750 ft

Width: 640 ft

Min. Depth: 10 ft bgs

Max Depth: 30 ft bgs

Total Area: 8.07 acres

Non-Ingestion - Based PCL (^{Air}GW_{inh-v}): NE (no TRRP PCL Established)

Non-Ingestion - Based PCLE Zone None

Geochemical/Physical Properties

Molecular Weight 207.21

Density/Specific Gravity 11.34 g/cm³

Solubility in Water: Insoluble

Groundwater Migration: Low

APPENDIX E

Provide for each contaminant of concern within the designated groundwater:

- a. A description of the ingestion protective concentration level exceedence zone and the non-ingestion protective concentration level exceedence zone, including a specification of the horizontal area and the minimum and maximum depth below ground surface.*
- b. The level of contamination, the ingestion protective concentration level, and the non-ingestion protective concentration level, all expressed as mg/L units.*
- c. Its basic geochemical properties (e.g., whether the contaminant of concern migrates with groundwater, floats or is soluble in water).*

A description of each COC in groundwater at the designated property, as well as those COCs that are defined by a PCLE zone, along with its basic geochemical properties, is presented in **Appendix D**. A tabular listing of the maximum concentration for each groundwater COC is provided in **Appendix F, Table 1**.

APPENDIX F

A table displaying the following information for each contaminant of concern, to the extent known:

- a. The maximum concentration level for soil and groundwater, the ingestion protective concentration level, and the non-ingestion protective concentration level, all expressed as mg/L units.*
- b. The critical protective concentration level without the municipal setting designation, highlighting any exceedences.*

Groundwater

Metals, including antimony, arsenic, barium, cadmium, chromium and lead, were detected at concentrations exceeding their respective TRRP ^{GW}GW_{Ing} Tier 1 PCLs. Based on the proposed response actions, institutional controls such as this MSD will be used to gain closure for groundwater at the designated property, thus eliminating the groundwater ingestion pathway. **Table 1** in **Appendix F** presents the maximum concentration of each COC in the groundwater at the designated property.

Table 1

COC	^{GW} GW _{Ing}		^{Air} GW _{Inh-V}		Conc
	Ingestion PCL		Non-Ingestion PCL		(mg/L)
	(mg/L)	Tier	(mg/L)	Tier	Max
Antimony	0.006	1	NE	1	0.0504
Arsenic	0.01	1	NE	1	0.147
Barium	2	1	NE	1	4.29
Cadmium	0.005	1	NE	1	0.0159
Chromium	0.1	1	NE	1	0.942
Lead	0.015	1	NE	1	3.23

Notes:

1. Yellow highlight indicates critical PCL without MSD
2. NE – Not established (No TRRP PCL defined)

Soils

Metals, including arsenic, barium, cadmium, lead, mercury and silver were detected in surface soil at concentrations exceeding the TRRP Tier 1 ^{Soil}GW_{Ing} PCLs. **Table 2** in **Appendix F** depicts the maximum soil concentration for COCs at the site.

Table 2

COC	TotSoilComb PCL			GW ^{Soil} Ing ¹ PCL			AirSoil _{Inh-V}			TSBC	Conc (mg/kg)
	(mg/kg)	Tier	Source area size (acres)	(mg/kg)	Tier	Source area size (acres)	(mg/kg)	Tier	Source area size (acres)		Max
Arsenic	24	1	0.5	5.0	1	0.5	NE	1	0.5	5.9	23.1
Barium	8100	1	0.5	440	1	0.5	NE	1	0.5	300	514
Cadmium	52	1	0.5	1.5	1	0.5	NE	1	0.5	NE	1.82
Lead	500	1	0.5	3.0	1	0.5	NE	1	0.5	15	342
Mercury	3.6	1	0.5	0.0078	1	0.5	4.6	1	0.5	0.04	1.7
Silver	97	1	0.5	0.48	1	0.5	NE	1	0.5	NE	0.728

Notes:

1. Yellow highlight indicates critical PCL without MSD
2. TSBC – TCEQ Texas Specific Background Concentration
3. NE – Not established (No TRRP PCL and/or TSBC defined)

APPENDIX G

*A statement as to whether the plume of contamination is stable (i.e. no change), or contracting, and delineated, **with the basis for that statement**. Please include historical sampling data.*

Based on the historical groundwater monitoring that has been performed, the following conclusions have been drawn for the designated property:

Groundwater is impacted by antimony, arsenic, barium, cadmium, chromium, and lead. Based on groundwater analytical results of delineating monitor wells MW-04 through MW-10, the plume of contamination is delineated. Reported arsenic concentrations in the southwest most delineating monitor well (MW-07) appear to be the result of unrelated and unassociated sources of contamination originating from the off-site property located on the northeast corner of Shepherd Drive and Cornish Street. Current and historical uses of the off-site property include an auto salvage yard, filling station with underground fuel tanks and auto repair facility. Malcolm Pirnie, on behalf of TxDOT, has documented sources of contamination on the referenced off-site property in historical site assessment reports prepared in 2010. The reported COCs include various metals in soil and arsenic in groundwater.

Surface water samples collected from White Oak Bayou at locations upstream, adjacent to, and downstream of the apparent source area reported all COCs at concentrations below the TCEQ TRRP ingestion protective concentration levels and EPA Drinking Water Maximum Contaminant Levels (MCLs). Therefore, reported COCs in the shallow groundwater bearing unit within the apparent source area do not appear to be impacting surface water within the concrete lined channel of White Oak Bayou. Based on surveyed elevation data provided by HCFCD, the bottom of the concrete lined channel of White Oak Bayou in the vicinity of the apparent source area is at an elevation of 15 feet above mean sea level. Based on the observed lithology from soil borings associated with monitor wells MW-01 through MW-03, the top of the groundwater bearing unit is at an elevation of approximately 22 feet above mean sea level.

Based on the results of Mann-Kendall Statistical Tests performed for the four sampling events conducted from May 2011 to October 2012, concentrations of COCs, including antimony arsenic, barium, cadmium, chromium, and lead demonstrate stable to decreasing trends in the source area monitoring wells (MW-01 through MW-03). Mann-Kendall Models incorporating the most recent (February 2013) groundwater sampling data reported similar results for monitor wells MW-01 and MW-02. Due to the non-representative analytical results caused by poor well performance and high sample turbidity/suspended solids in the groundwater sample, a Mann-Kendall model incorporating the most recent (Feb 2013) groundwater data was not run for monitor well MW-03. ***Results of Mann-Kendall Statistical Tests are provided on the following pages.***

State of Wisconsin

Department of Natural Resources

Remediation and Redevelopment Program

**Mann-Kendall Statistical Test
Form 4400-215 (2/2001)**

notice: This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name = **White Oak Bayou - Between Shepherd and Patterson** BRRTS No. = **10-0122** Well Number = **MW-1**

Event Number	Compound -> Sampling Date (most recent last)	antimony Concentration (leave blank if no data)	arsenic Concentration (leave blank if no data)	barium Concentration (leave blank if no data)	cadmium Concentration (leave blank if no data)	chromium Concentration (leave blank if no data)	lead Concentration (leave blank if no data)
1							
2							
3							
4							
5							
6	20-May-11	0.05	0.13		0.02	0.44	3.23
7	5-Apr-12	0.01	0.07	1.34	0.00	0.31	0.51
8	6-Jul-12	0.01	0.12	4.29	0.01	0.94	0.99
9	16-Oct-12	0.03	0.15	2.80	0.01	0.68	0.98
10	19-Feb-13	0.01	0.13	2.56	0.01	0.66	0.72
Mann Kendall Statistic (S) =		-4.0	4.0	0.0	-2.0	2.0	-4.0
Number of Rounds (n) =		5	5	4	5	5	5
Average =		0.02	0.12	2.75	0.01	0.61	1.28
Standard Deviation =		0.018	0.028	1.211	0.005	0.242	1.106
Coefficient of Variation(CV)=		0.821	0.234	0.441	0.673	0.399	0.862

Error Check, Blank if No Errors Detected

Trend ≥ 80% Confidence Level	No Trend						
Trend ≥ 90% Confidence Level	No Trend						
Stability Test, If No Trend Exists at 80% Confidence Level	CV ≤ 1 STABLE						

Data Entry By = **TO** Date = **1-Mar-13** Checked By = **TO**

State of Wisconsin

Department of Natural Resources

Remediation and Redevelopment Program

**Mann-Kendall Statistical Test
Form 4400-215 (2/2001)**

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instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name = **White Oak Bayou - Between Shepherd and Patterson** BRRTS No. = **10-0122** Well Number = **MW-2**

Event Number	Compound -> Sampling Date (most recent last)	antimony Concentration (leave blank if no data)	arsenic Concentration (leave blank if no data)	barium Concentration (leave blank if no data)	cadmium Concentration (leave blank if no data)	chromium Concentration (leave blank if no data)	lead Concentration (leave blank if no data)
1							
2							
3							
4							
5							
6	20-May-11	0.02	0.13		0.00	0.24	1.45
7	5-Apr-12	0.01	0.06	0.38	0.00	0.02	0.90
8	6-Jul-12	0.00	0.07	0.22	0.00	0.02	0.32
9	16-Oct-12	0.00	0.07	0.20	0.00	0.02	0.32
10	19-Feb-13	0.00	0.08	0.24	0.00	0.03	0.33
Mann Kendall Statistic (S) =		-6.0	2.0	-2.0	-6.0	-2.0	-6.0
Number of Rounds (n) =		5	5	4	5	5	5
Average =		0.01	0.08	0.26	0.00	0.07	0.66
Standard Deviation =		0.009	0.027	0.081	0.001	0.097	0.505
Coefficient of Variation(CV)=		1.113	0.333	0.313	0.486	1.444	0.761

Error Check, Blank if No Errors Detected

Trend ≥ 80% Confidence Level	DECREASING	No Trend	No Trend	DECREASING	No Trend	DECREASING
Trend ≥ 90% Confidence Level	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Stability Test, If No Trend Exists at 80% Confidence Level	NA	CV ≤ 1 STABLE	CV ≤ 1 STABLE	NA	CV > 1 NON-STABLE	NA

Data Entry By = **TO** Date = **1-Mar-13** Checked By = **TO**

State of Wisconsin

Department of Natural Resources

Remediation and Redevelopment Program

**Mann-Kendall Statistical Test
Form 4400-215 (2/2001)**

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instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name = **White Oak Bayou - Between Shepherd and Patterson** BRRTS No. = **10-0122** Well Number = **MW-3**

Event Number	Compound -> Sampling Date (most recent last)	antimony Concentration (leave blank if no data)	arsenic Concentration (leave blank if no data)	barium Concentration (leave blank if no data)	cadmium Concentration (leave blank if no data)	chromium Concentration (leave blank if no data)	lead Concentration (leave blank if no data)
1							
2							
3							
4							
5							
6							
7	20-May-11	0.05	0.09		0.01	0.10	3.01
8	5-Apr-12	0.02	0.06	0.80	0.00	0.07	1.14
9	6-Jul-12	0.00	0.06	0.76	0.00	0.01	0.25
10	16-Oct-12	0.01	0.06	0.49	0.00	0.01	0.29
Mann Kendall Statistic (S) =		-4.0	-4.0	-3.0	-4.0	-6.0	-4.0
Number of Rounds (n) =		4	4	3	4	4	4
Average =		0.02	0.07	0.68	0.00	0.05	1.17
Standard Deviation =		0.020	0.016	0.170	0.004	0.042	1.291
Coefficient of Variation(CV)=		1.112	0.236	0.250	0.895	0.909	1.101

Error Check, Blank if No Errors Detected n<4

Trend ≥ 80% Confidence Level **DECREASING** **DECREASING** n<4 **DECREASING** **DECREASING** **DECREASING**

Trend ≥ 90% Confidence Level No Trend No Trend n<4 No Trend **DECREASING** No Trend

Stability Test, If No Trend Exists at 80% Confidence Level NA NA n<4 NA NA NA

Data Entry By = **TO** Date = **24-Jan-13** Checked By = **TO**