CITY OF HOUSTON

PUBLIC WORKS AND ENGINEERING
PLANNING & DEVELOPMENT DIVISION

Application for Approval of Municipal Setting Designation

APPLICANT INFORMATION

Applicant's Name: Heights Block 39 LLC

☐Individual ☑Private Entity ☐Public Entity ☐Non-Profit Entity ☐Other _____

Address: 4708 Caroline Street Houston TX 77004
(Street) (City) (State) (Zip)

Phone No.: 713-524-3347 Fax No.: 713-524-1845

Email: jg@gman.com

Contact Information

Name of Contact: Jonathan Grenader

Title: Manager

Address: same as above
(Street) (City) (State) (Zip)

Phone No.: _____ Fax No.: _____

Email: _____

SITE INFORMATION

Site HCAD No(s): 0200350000001

Site Name: Block 39

Site Size: 3.6 Acres

Site Address: 502 W. 25th Street Houston TX 77008
(Street) (City) (State) (Zip)

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

Owner: Heights Block 39 LLC

Owner Address: 4708 Caroline Street Houston TX 77004
(Street) (City) (State) (Zip)

Name of Contact: Jonathan Grenader

Title: Manager

Organization: Heights Block 39 LLC

Phone No.: 713-524-3347 Fax No.: 713-524-1845

Email: jg@gman.com

Additional Owner List

(Cont'd from pg. 2)

Owner: _____

Owner Address: _____
(Street) (City) (State) (Zip)

Name of Contact: _____

Title: _____

Organization: _____

Phone No.: _____ Fax No.: _____

Email: _____

Owner: _____

Owner Address: _____
(Street) (City) (State) (Zip)

Name of Contact: _____

Title: _____

Organization: _____

Phone No.: _____ Fax No.: _____

Email: _____

Owner: _____

Owner Address: _____
(Street) (City) (State) (Zip)

Name of Contact: _____

Title: _____

Organization: _____

Phone No.: _____ Fax No.: _____

Email: _____

Owner: _____

Owner Address: _____
(Street) (City) (State) (Zip)

Name of Contact: _____

Title: _____

Organization: _____

Phone No.: _____ Fax No.: _____

Email: _____

CITY OF HOUSTON

PUBLIC WORKS AND ENGINEERING
PLANNING & DEVELOPMENT DIVISION

EXECUTIVE SUMMARY

The designated Municipal Setting Designation (MSD) property is Block 39 which is bounded by W. 24th Street, W. 25th Street, Lawrence Street and Nicholson Street in Houston, Harris County, Texas (Figure B1). The listed address utilized to identify the property is 502 W. 25th Street. The site has been improved with eight office/warehouse buildings totaling approximately 139,000 square feet. Since the mid-1970s, the buildings have been occupied by various commercial businesses and storage facilities which are not identified as potential environmental concerns.

The site is located in a mixed commercial and residential area within the municipal boundaries of the City of Houston (COH) that has been developed since about the 1920s. Currently, the land use of the surrounding area within 500 feet of the site is commercial to the northeast and southwest of the site, residential to the north and south, and mixed residential and commercial to the west and east of the site.

The site is located within the Buffalo Bayou Watershed (Figure C2). According to the Flood Insurance Rate Map, the site is located outside the 100-year floodplain (Figure C1).

Site and Surrounding Area Land Use History

The southern tract of the site was developed with a pickle packing facility in 1922 while the northern tract was undeveloped until the early 1950s when the existing warehouse buildings were constructed on both tracts of land. A railroad spur serving the property was located in the 38-foot wide alley transecting the two tracts. The railroad spur was decommissioned in the early 1980s. Two gasoline underground storage tanks (USTs) were formerly present on the site, one tank located on the west side of the alley and one tank located near the northeast corner of the site. Figure J1 shows the historical land use of the site and surrounding area.

Several historic onsite facility operations of potential environmental concern from the 1950s through the late 1960s or early 1970s were identified, including machine shops, a paint spray area, a stain dipping area, and printing machines. The historic onsite facility operations of potential concern have not been present for at least 30 to 40 years

The primary offsite sources of potential environmental concern Identified are a former machine shop and former tire repair/service facility located at 542 and 546 W. 24th Street, respectively, immediately downgradient of the site. These two former facilities operated from the mid-1980s through the late 1990s.

Site Sensitive Receptor Survey

No surface water bodies or sensitive receptors were identified within 0.25-mile of the designated MSD site. No domestic drinking water wells are present on the site or within 0.5-mile of the site. Two City of Houston municipal water wells located between 600 feet and 0.25-mile of the affected property do not produce from the affected shallow groundwater-bearing unit and are not threatened by the onsite release since the production zones are greater than 1,000 feet below ground surface (bgs).

Site Assessment

The primary objectives of the site assessment was to investigate the soil and groundwater at the site, identify the chemicals of concern (COCs), and define the soil and groundwater COC Protective Concentration Limit Exceedance (PCLE) zones as part of the process to obtain closure under Texas Risk Reduction Rules (TRRP) Texas Administration Code (TAC) 30 §350 through the Texas Commission on Environmental Quality (TCEQ) Corrective Action (CA) Section.

Site investigations were performed by Terracon in the identified areas of concern (historical onsite operations, former railroad spur, former UST locations) and to delineate the affected groundwater between April 2008 and June 2011. The site investigations consisted of advancing 13 shallow soil borings and 19 deep soil borings, advancing 18 membrane interface probe (MIP) soil borings, and installing two temporary monitoring wells and 15 onsite and offsite permanent monitoring wells (Figure C4). The soil samples and groundwater samples collected from the onsite soil borings and monitoring wells were analyzed for total petroleum hydrocarbons (TPH) using Texas Commission on Environmental Quality (TCEQ) Method Texas 1005 (TX1005), volatile organic compounds (VOCs) using Environmental Protection Agency (EPA) Method 8260B, and/or the 8-listed Resource Conservation and Recovery Act (RCRA) metals using EPA Method 6020/7471. The soil and groundwater samples collected from the offsite soil borings and monitoring wells were analyzed for VOCs using EPA Method 8260B.

Investigation Findings and Conclusions

- Based on site investigation findings, COC concentrations, and review of historical land use, two potential sources for the COCs present in the shallow groundwater were identified: 1) an onsite source near monitor well MW-1 (historical onsite operations present near the southwest corner of the site) and 2) an offsite source near monitor well MW-7 (former machine shop and tire repair/service facility at 542 and 546 W. 24th Street). The onsite historical sources were removed between 30 and 40 years ago while the offsite sources were removed between 10 and 15 years ago. Further discussion of the two sources of groundwater contamination is provided in Appendix J.

  Since the offsite affected groundwater plume is not associated with an onsite source and not included in the designated MSD site, there is no further discussion of the offsite groundwater plume and associated PCLE Zones in this MSD Application. The monitoring wells associated with the onsite plume are MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-8, MW-9, and MW-12. The analytical results for the offsite groundwater investigation are provided on tables in Appendix F and figures in Appendix J for informational purposes.

- The COCs identified in the onsite groundwater plume that exceed the applicable $^{GW}GW_{Ing}$ PCLs are trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and 1,2-dichloroethane (1,2-DCA). The COC plume centered around MW-1 and MW-4 primarily consists of low levels of TCE, 1,1-DCE, and cis-1,2-DCE while the plume centered around MW-12 contains primarily 1,2-DCA.

- The affected groundwater in the onsite plume has been delineated horizontally and vertically to TCEQ residential Ingestion PCLs (Figure C3). The PCLE Zones for the groundwater COCs are vertically confined to the shallow groundwater zone encountered between approximately 14 feet and 40 feet bgs. The ingestion PCLE Zones for TCE, c-1,2-DCE, and 1,1-DCE appears to be limited to the southwest corner of the site in a plume approximately 180 feet long by 60 feet wide (Figure C6). The Ingestion PCLE Zone for 1,2-DCA is confined to the area around MW-12 in a plume approximately 30 feet long by 60 feet wide (Figure C6).

- The COC concentrations in the shallow groundwater DO NOT exceed Non-Ingestion PCLs.

- The onsite groundwater plume is considered relatively stable or decreasing and the COCs are undergoing dechloronization (Graphs G1, G2 and G3 in Appendix G). Onsite sources of contamination have not been present for between 30 and 40 years.

APPENDIX B – PROPERTY USE

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 MSD property (site) is Block 39 which is bounded by W. 24th, W. 25th, Lawrence, and Nicholson Streets in Houston, Harris County, Texas. The listed address utilized to identify the property is 502 W. 25th Street. The site is composed of two tracts of land transected by an alley and totaling approximately 3.6 acres. The site has been improved with eight office/warehouse buildings totaling approximately 139,000 square feet. The buildings are currently occupied by various commercial businesses and storage facilities which have been present since the early 1970s . Historical addresses associated with the site are: 2400 and 2402 Lawrence; 539 W. 24th Street, 2401 Nicholson; and 506, 514, 518, and 520 W. 25th Street. The buildings occupy approximately 85% of the property. The remaining 15% of the Site consists of a paved alley, parking areas, and landscaping.

The site is located in a mixed commercial and residential area within the municipal boundaries of the City of Houston (COH) that has been developed since about the 1920s. Currently, the land use of the surrounding area within 500 feet of the site is commercial to the northeast and southwest of the site, residential to the north, south, northwest, and southeast of the site, and mixed commercial and residential to the east and west of the site. The site is immediately bounded by W. 25th Street and residential development to the north, a former foundation steel and wire manufacturer and National Flame and Forge (oilfield-related equipment manufacturer) to the northeast, W. 24th Street and residential development to the south, Nicholson Street and mixed commercial and residential development to the east, Lawrence Street and mixed commercial and residential development to the west, and a Fiesta Grocery Store to the southwest. Figure B1 shows the site and the surrounding land use within 500 feet of the site.

The anticipated site land use is not expected to change in the near future; however, potential future site development could include mulit-family and/or single family residences. The anticipated land use of the properties within 500 feet of the designated site boundary is not expected to change.

Aerial Photograph
(Dated 5/3/2010)

Source: TNRIS
Photo ID No: N/A

APPROXIMATE SCALE 1"= 500'

0 250' 500'

Prepared By: REW

Approved By: MHN

N

Terracon
Consulting Engineers & Scientists

BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS

TERRACON PROJECT NO. 92097202

FIGURE B1:
LAND USE MAP

N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 Topo.dwg : 2010 Aerial

APPENDIX C – SITE MAPS

A site map showing.

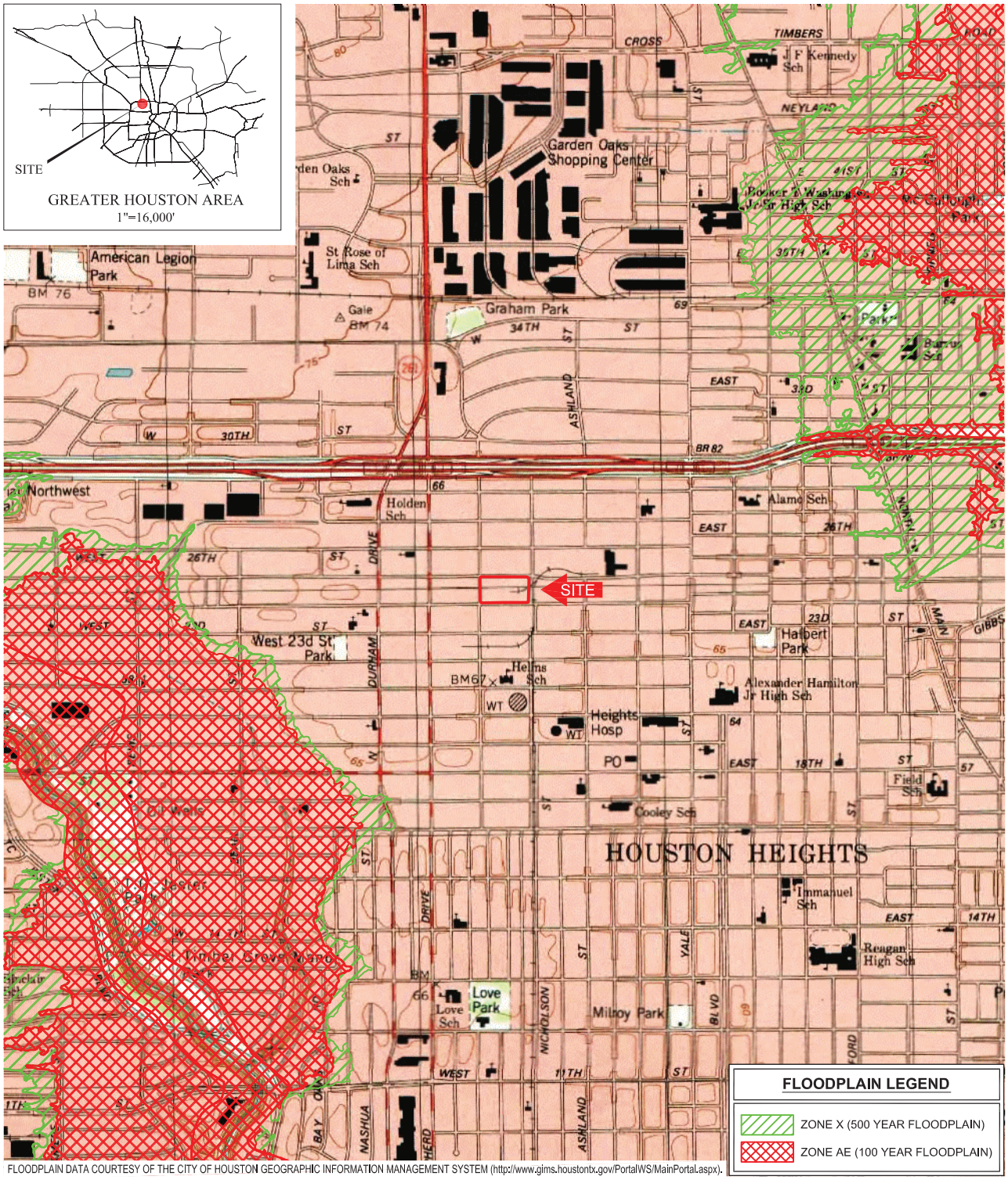
a. The location of the designated property.
b. The topography of the designated property as indicated on publicly available sources, which must note the watershed including the nearest surface water body and whether the designated property is located in a floodplain or floodway, as those terms are defined 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.

The figures in this section provide information required under Appendix C. The site maps depict the property location and topography, the area of groundwater contamination, the location of all soil sampling points and groundwater monitoring wells, the groundwater gradient, and the groundwater ingestion PCL exceedence (PCLE) zones.

The following is a list of figures included in Appendix C:

Figure C1 – Site Location and Flood Plain Map (shown on a topographic map)
Figure C2 – Watershed Map
Figure C3 – Detected Area of Onsite Groundwater Contamination – May 12, 2012
Figure C4 – Soil Boring and Monitoring Well Location Map
Figure C5-1 – Groundwater Gradient Map – June 27,2008
Figure C5-2 – Groundwater Gradient Map – September 30,2009
Figure C5-3 – Groundwater Gradient Map – December 9, 2009
Figure C5-4 – Groundwater Gradient Map – July 13, 2010
Figure C5-5 – Groundwater Gradient Map – June 15, 2011
Figure C5-6 – Groundwater Gradient Map – September 20, 2011
Figure C5-7 – Groundwater Gradient Map – May 22, 2012
Figure C6 – Groundwater COC Ingestion PCLE Zone Map

The site is not located in the 100-year floodplain (Figure C1). The subject property is located within the White Oak Creek watershed (Figure C2).



FLOODPLAIN DATA COURTESY OF THE CITY OF HOUSTON GEOGRAPHIC INFORMATION MANAGEMENT SYSTEM (http://www.gims.houstontx.gov/PortalWS/MainPortal.aspx).

USGS TOPOGRAPHIC QUADRANGLE MAP

Houston Heights, Texas

Terracon
Consulting Engineers & Scientists

Revised: 1995

APPROXIMATE SCALE 1"= 2000'

0 1000' 2000'

N

BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS

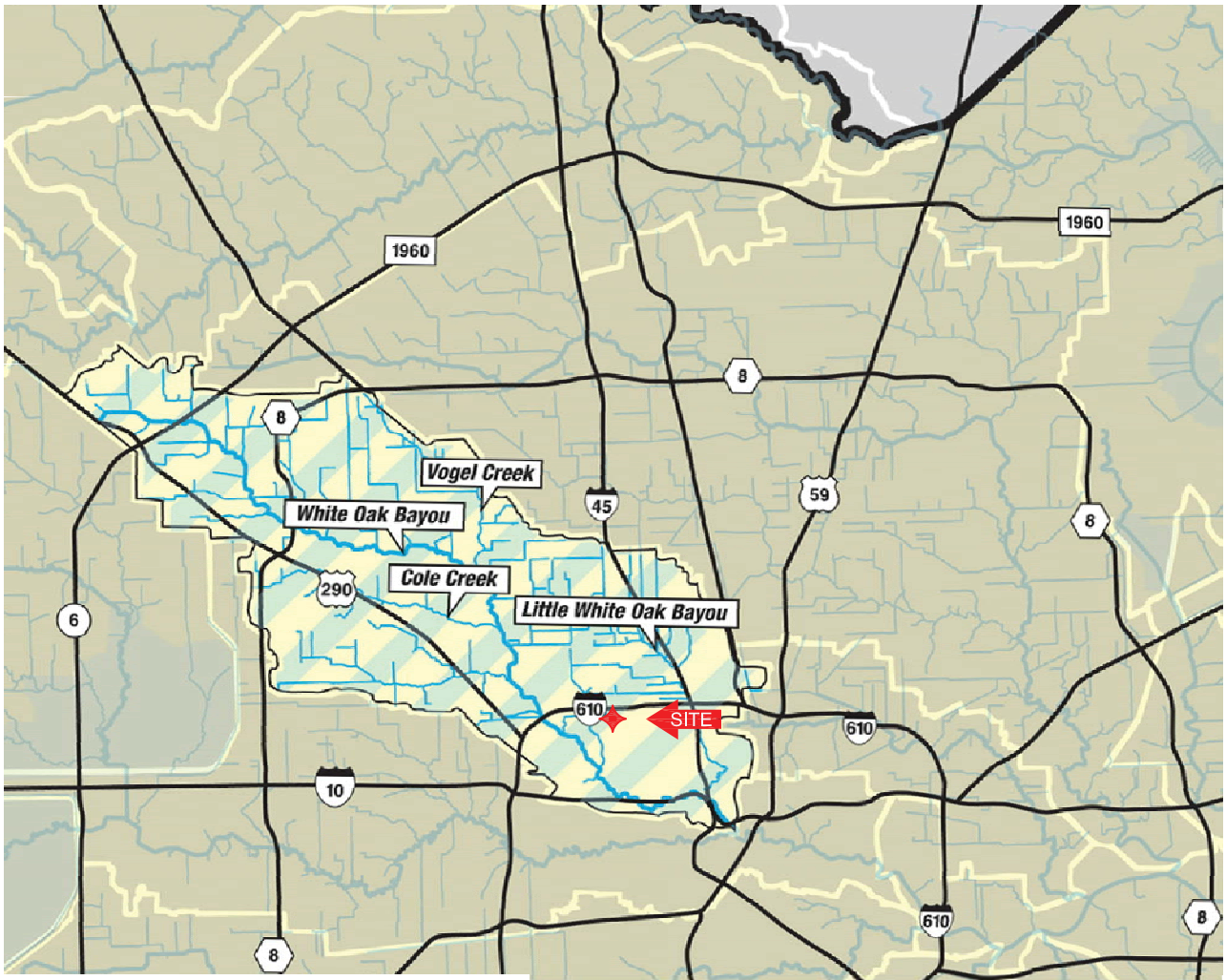
TERRACON PROJECT NO. 92097202

Prepared By: REW

Approved By: MHN

FIGURE C1:
SITE LOCATION AND FLOODPLAIN MAP

N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 Topo.dwg : 1995 Topo Floodplain



Drainage Area:
111 Sq. Miles

Watershed Population:
416,067

Open Stream Miles:
151 Miles

Primary Streams:
White Oak Bayou
Little White Oak Bayou
Cole Creek
Vogel Creek

HARRIS COUNTY FLOOD CONTROL DISTRICT
WATERSHED MAP
White Oak Bayou, Harris County, Texas

Terracon
Consulting Engineers & Scientists

Revised: 2007

APPROXIMATE SCALE 1"= 5 Miles
0 2.5 5

N

BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS

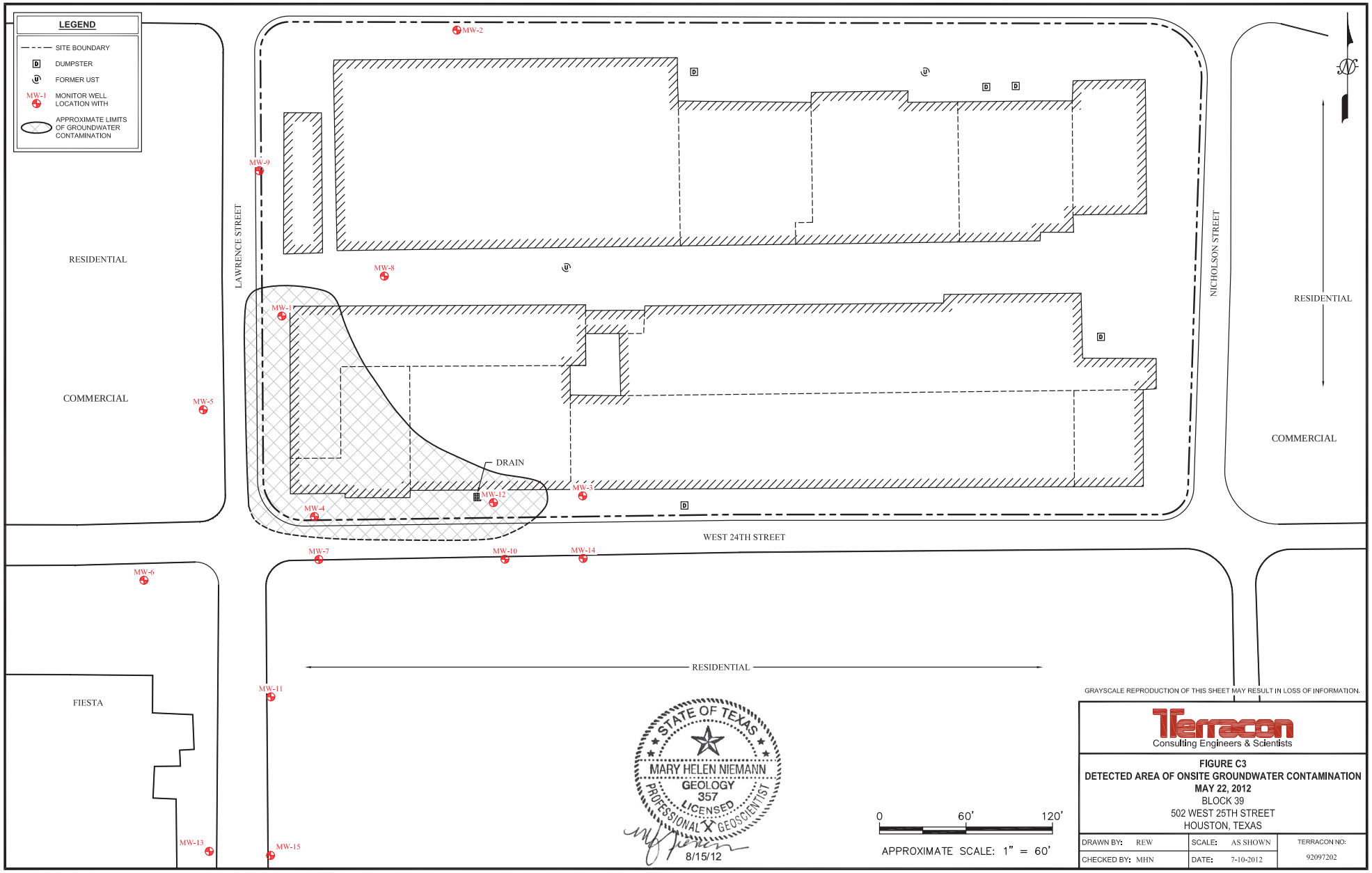
TERRACON PROJECT NO. 92097202

Prepared By: REW

Approved By: MHN

FIGURE C2:
WATERSHED MAP

N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 Topo.dwg : 2007 Watershed



GRAYSCALE REPRODUCTION OF THIS SHEET MAY RESULT IN LOSS OF INFORMATION.

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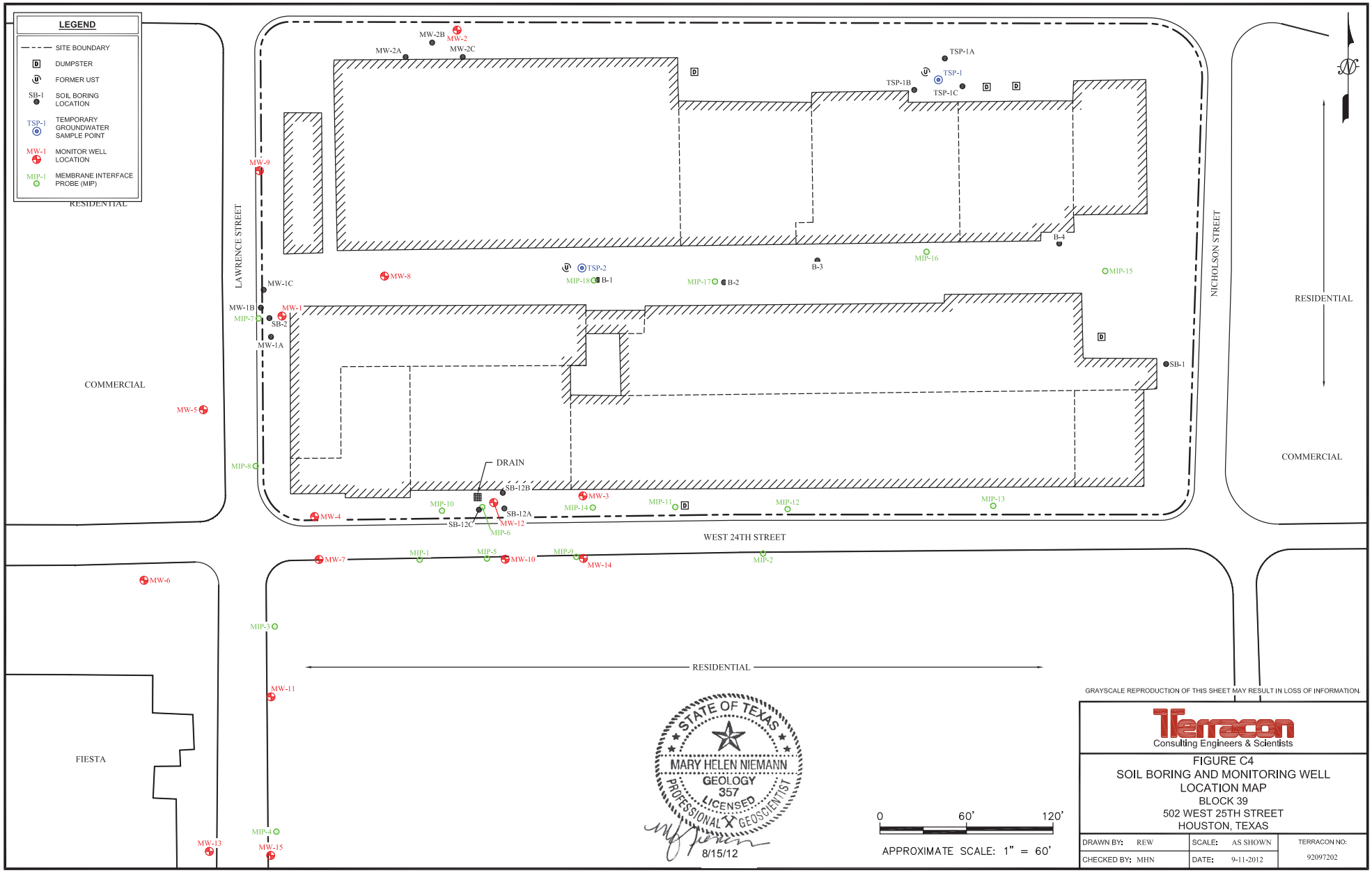
FIGURE C3
DETECTED AREA OF ONSITE GROUNDWATER CONTAMINATION
MAY 22, 2012
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS

DRAWN BY: REW	SCALE: AS SHOWN	TERRACON NO: 92097202
CHECKED BY: MHN	DATE: 7-10-2012	

N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GW Contamination Map.dwg



GRAYSCALE REPRODUCTION OF THIS SHEET MAY RESULT IN LOSS OF INFORMATION.

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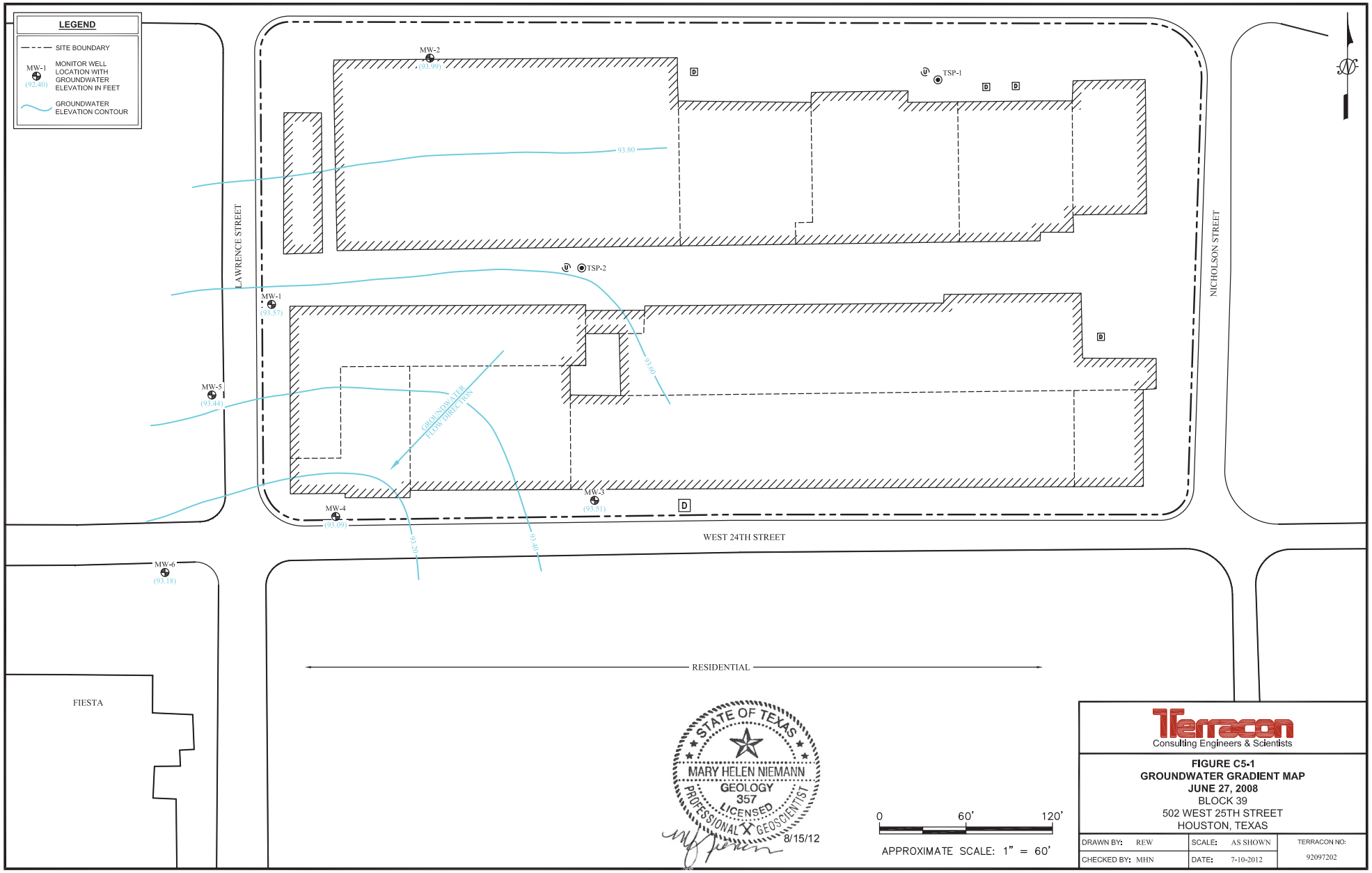
FIGURE C4
SOIL BORING AND MONITORING WELL LOCATION MAP
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS

DRAWN BY: REW	SCALE: AS SHOWN	TERRACON NO: 92097202
CHECKED BY: MHN	DATE: 9-11-2012	

N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 Samples.dwg



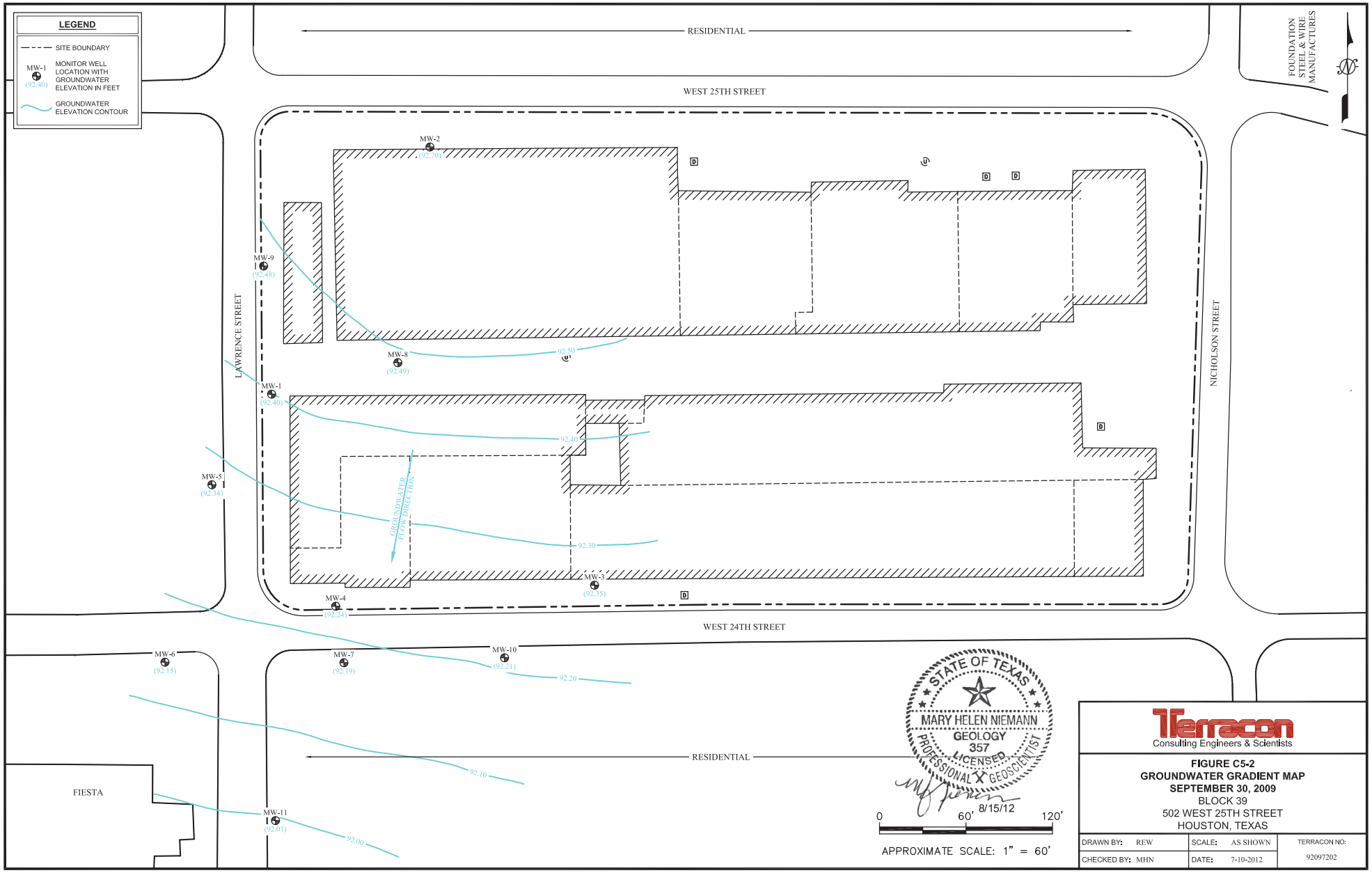
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12

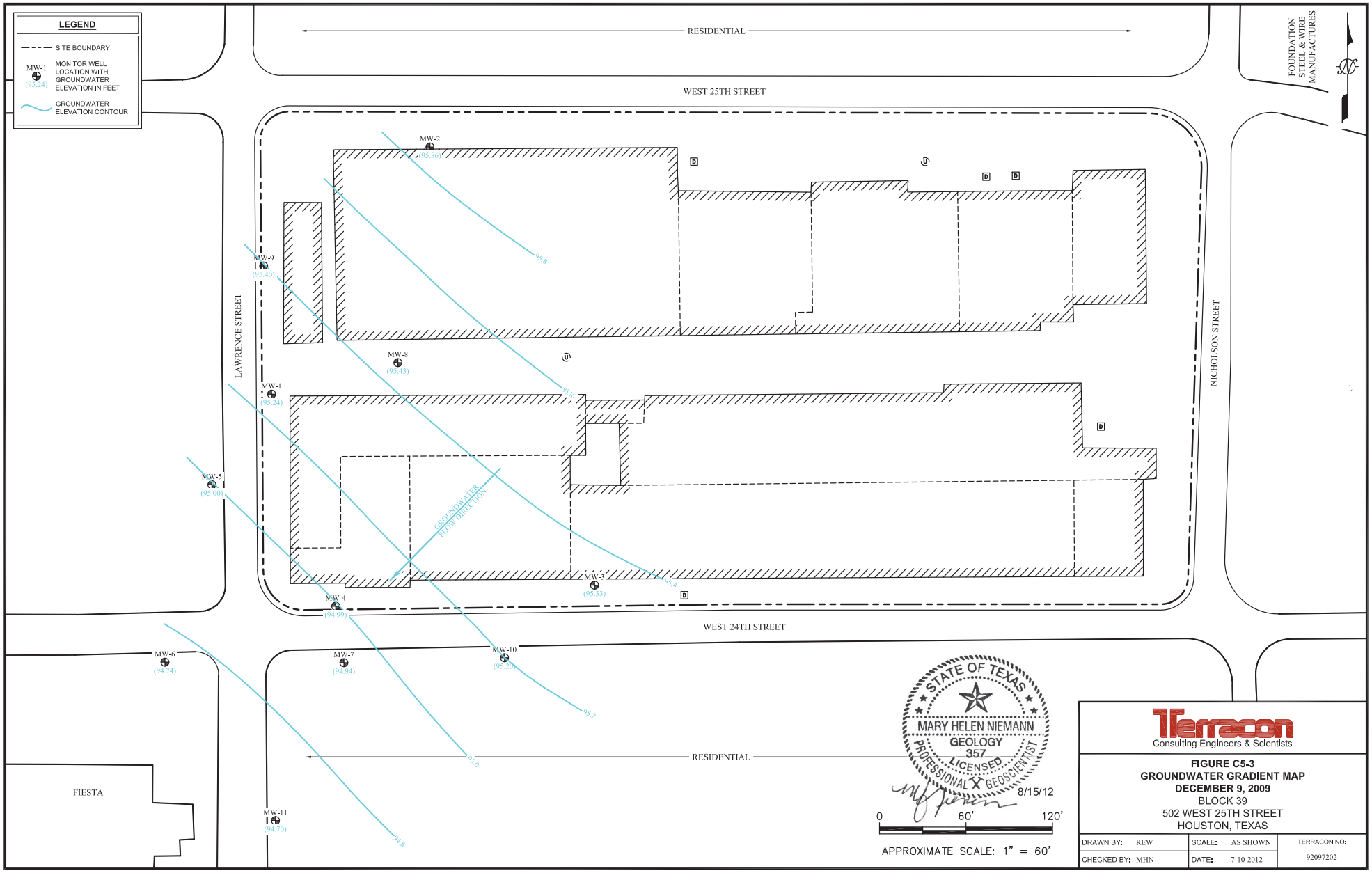
Terracon
Consulting Engineers & Scientists

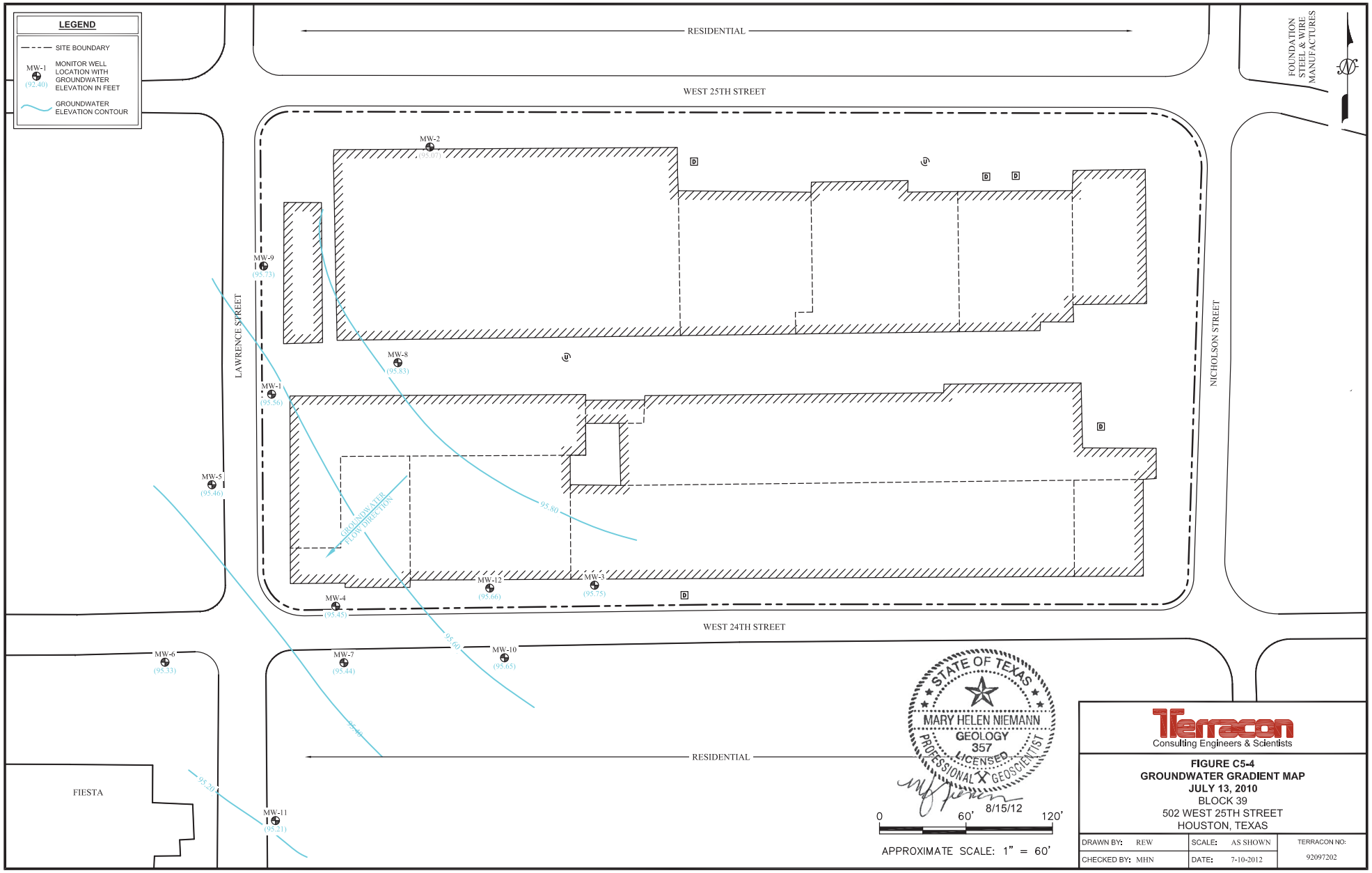
FIGURE C5-1
GROUNDWATER GRADIENT MAP
JUNE 27, 2008
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS

DRAWN BY: REW	SCALE: AS SHOWN	TERRACON NO: 92097202
CHECKED BY: MHN	DATE: 7-10-2012	

N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GWGM 2008-06-27.dwg : 17x11L


LEGEND
SITE BOUNDARY
MW-1 (92.40) MONITOR WELL LOCATION WITH GROUNDWATER ELEVATION IN FEET
GROUNDWATER ELEVATION CONTOUR
RESIDENTIAL
WEST 25TH STREET
FOUNDATION STEEL & WIRE MANUFACTURES
LAWRENCE STREET
NICHOLSON STREET
WEST 24TH STREET
FIESTA
MW-1 (92.40)
MW-2 (92.70)
MW-3 (92.35)
MW-4 (92.24)
MW-5 (92.34)
MW-6 (92.15)
MW-7 (92.19)
MW-8 (92.49)
MW-9 (92.48)
MW-10 (92.21)
MW-11 (92.01)
92.50
92.40
92.30
92.20
92.10
92.00
GROUNDWATER FLOW DIRECTION
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12
0
60'
120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE C5-2
GROUNDWATER GRADIENT MAP
SEPTEMBER 30, 2009
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 7-10-2012
N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GWGM 2009-09-30.dwg : Hand (rev fig C5-2)


LEGEND
SITE BOUNDARY
MW-1 (95.24) MONITOR WELL LOCATION WITH GROUNDWATER ELEVATION IN FEET
GROUNDWATER ELEVATION CONTOUR
RESIDENTIAL
WEST 25TH STREET
FOUNDATION STEEL & WIRE MANUFACTURES
LAWRENCE STREET
NICHOLSON STREET
WEST 24TH STREET
FIESTA
MW-2 (95.86)
MW-9 (95.40)
MW-8 (95.43)
MW-1 (95.24)
MW-5 (95.00)
MW-3 (95.33)
MW-4 (94.99)
MW-6 (94.74)
MW-7 (94.94)
MW-10 (95.20)
MW-11 (94.70)
95.8
95.6
95.4
95.2
95.0
94.8
GROUNDWATER FLOW DIRECTION
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12
0 60' 120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE C5-3
GROUNDWATER GRADIENT MAP
DECEMBER 9, 2009
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 7-10-2012
N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GWGM 2009-12-30.dwg : Hand (rev fig C5-3)


LEGEND
SITE BOUNDARY
MW-1 (92.40) MONITOR WELL LOCATION WITH GROUNDWATER ELEVATION IN FEET
GROUNDWATER ELEVATION CONTOUR
RESIDENTIAL
WEST 25TH STREET
FOUNDATION STEEL & WIRE MANUFACTURES
LAWRENCE STREET
NICHOLSON STREET
WEST 24TH STREET
FIESTA
MW-2 (95.07)
MW-9 (95.73)
MW-8 (95.83)
MW-1 (95.56)
MW-5 (95.46)
MW-12 (95.66)
MW-3 (95.75)
MW-4 (95.45)
MW-6 (95.33)
MW-7 (95.44)
MW-10 (95.65)
MW-11 (95.21)
95.80
95.60
95.40
95.20
GROUNDWATER FLOW DIRECTION
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12
0
60'
120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE C5-4
GROUNDWATER GRADIENT MAP
JULY 13, 2010
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 7-10-2012
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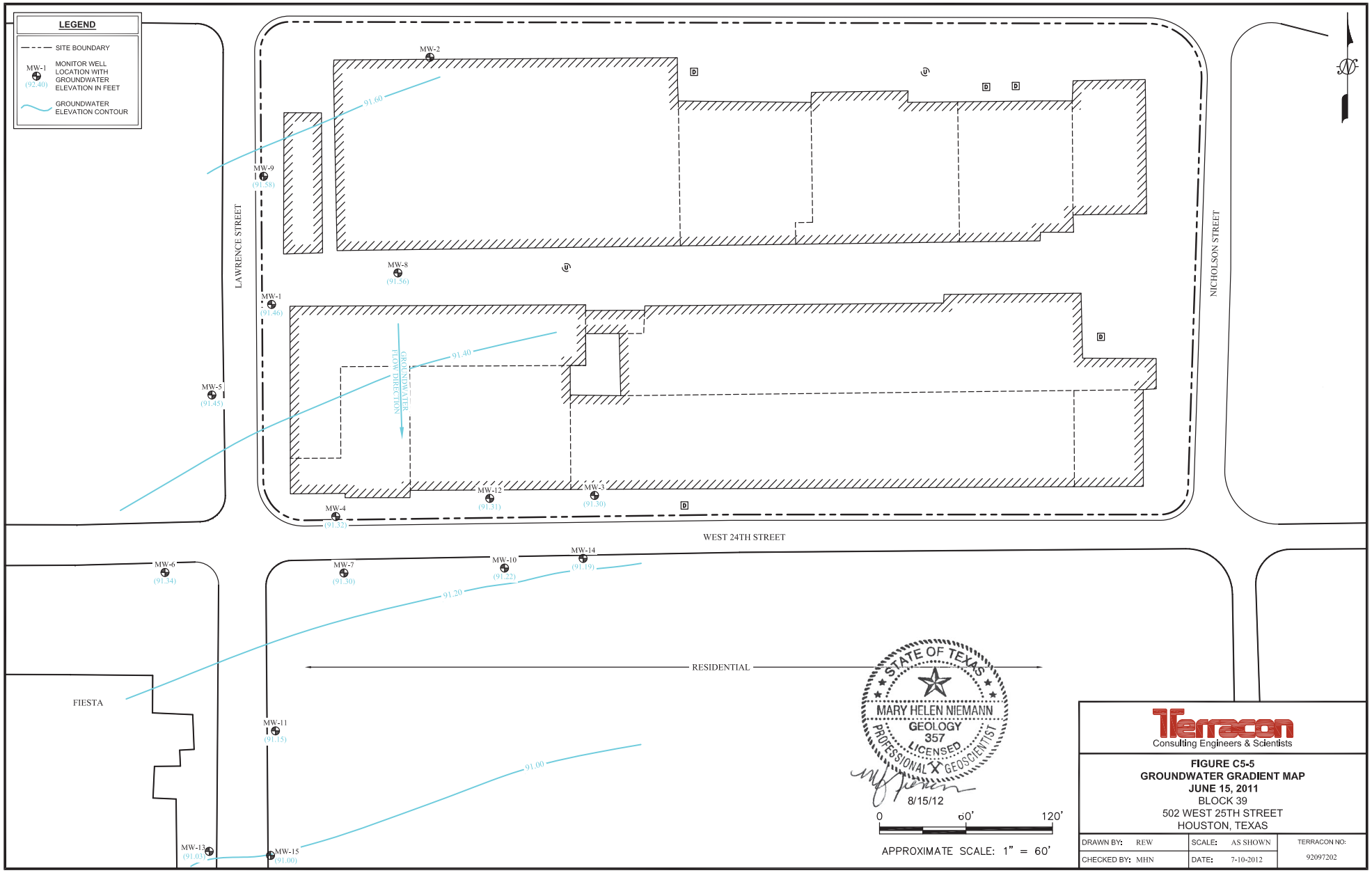
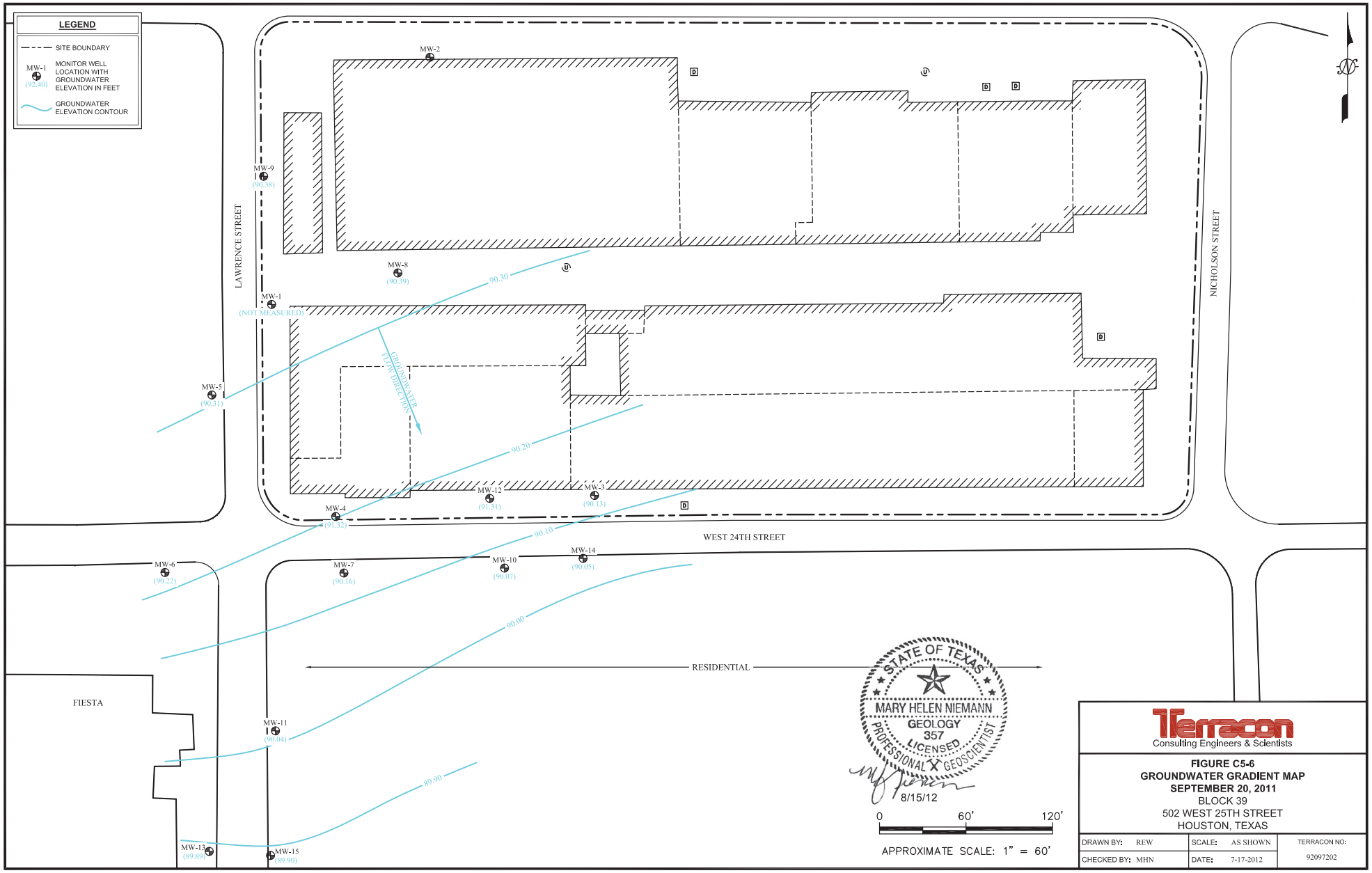
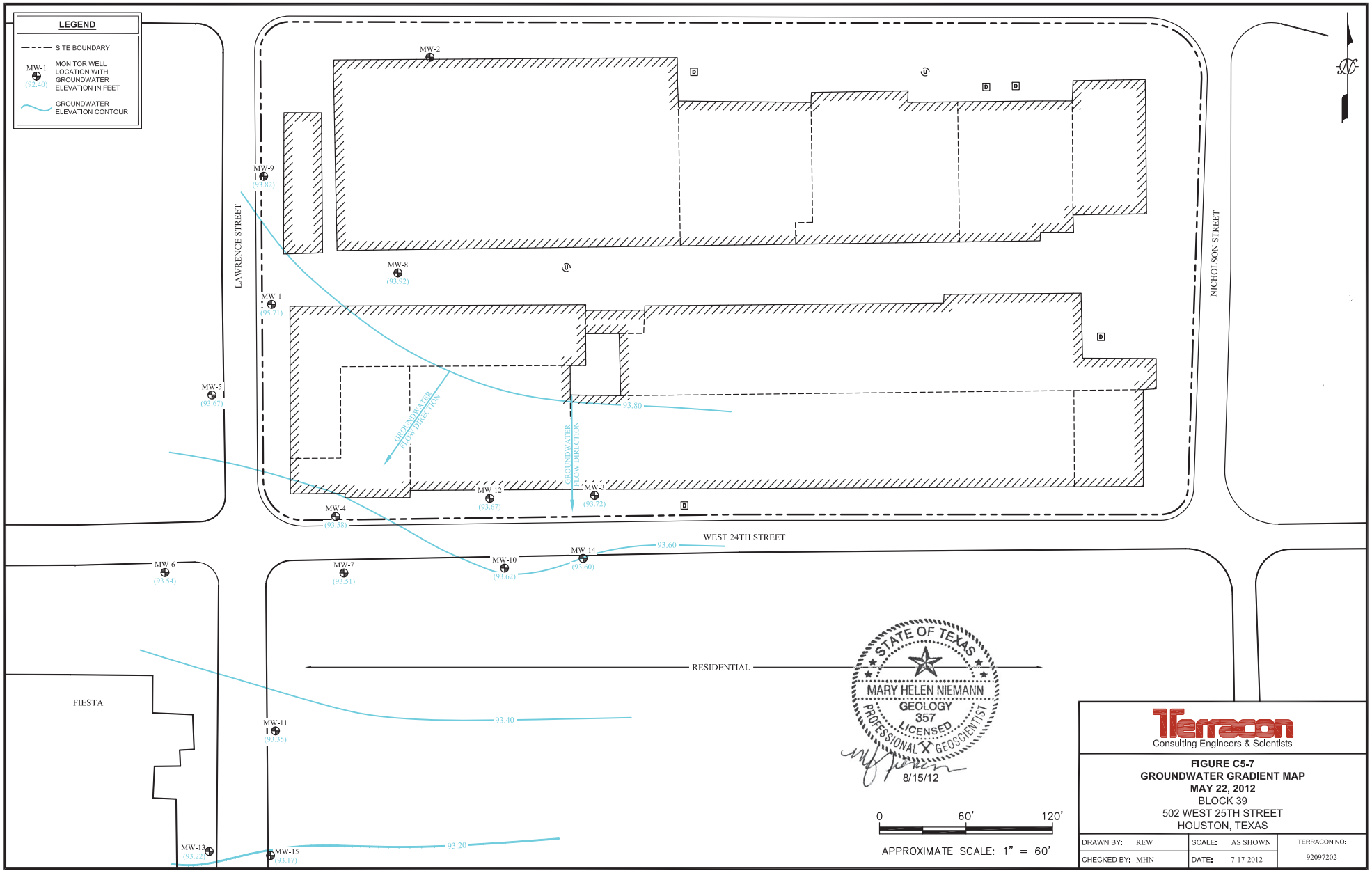
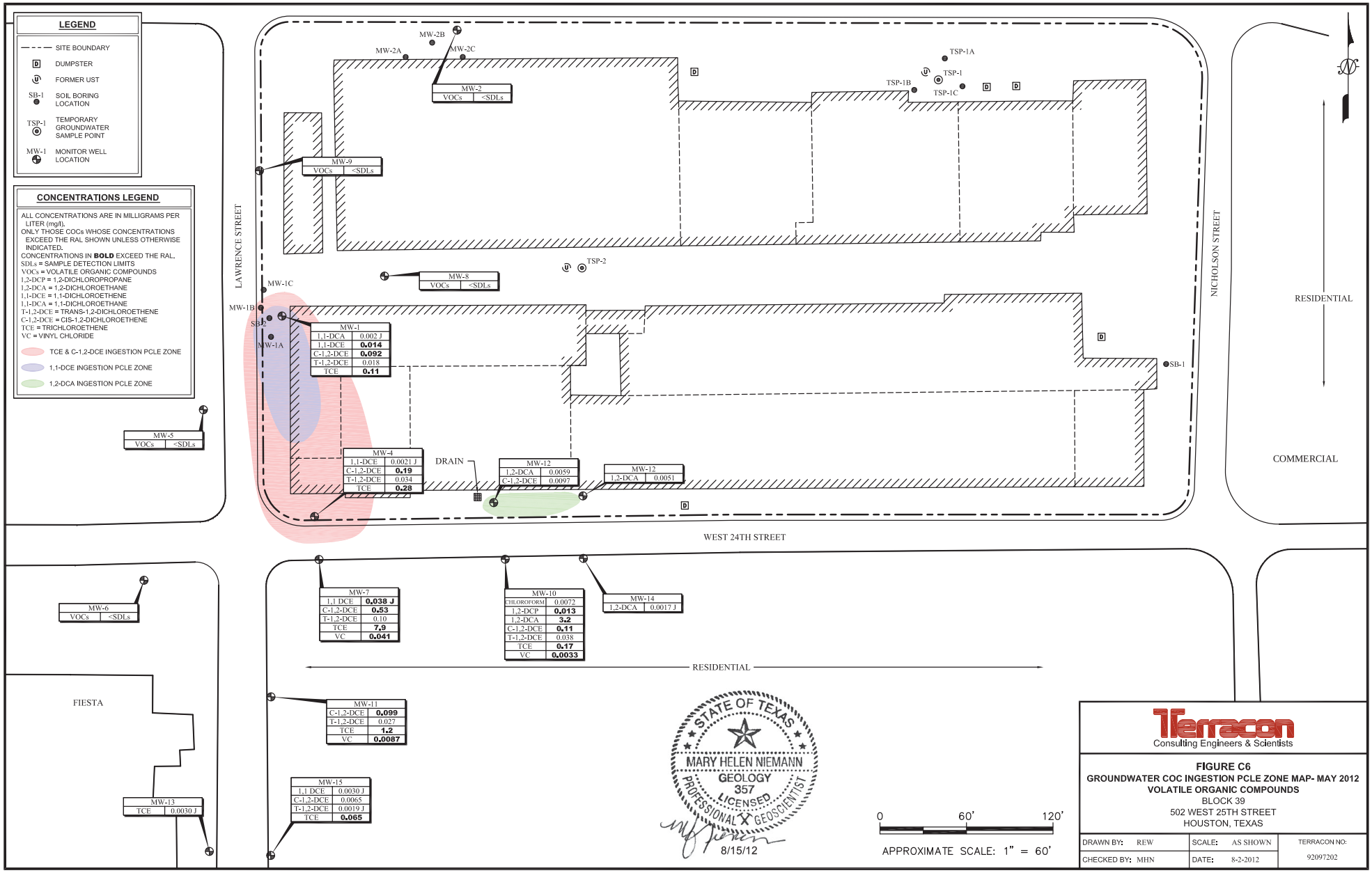

LEGEND
SITE BOUNDARY
MW-1 (92.40) MONITOR WELL LOCATION WITH GROUNDWATER ELEVATION IN FEET
GROUNDWATER ELEVATION CONTOUR
MW-2
MW-9 (91.58)
MW-8 (91.56)
MW-1 (91.46)
MW-5 (91.45)
MW-12 (91.31)
MW-3 (91.30)
MW-4 (91.32)
MW-6 (91.34)
MW-7 (91.30)
MW-10 (91.22)
MW-14 (91.19)
MW-11 (91.15)
MW-13 (91.03)
MW-15 (91.00)
91.60
91.40
91.20
91.00
GROUNDWATER FLOW DIRECTION
LAWRENCE STREET
NICHOLSON STREET
WEST 24TH STREET
RESIDENTIAL
FIESTA
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12
0 60' 120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE C5-5
GROUNDWATER GRADIENT MAP
JUNE 15, 2011
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 7-10-2012
N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GWGM 2011-06-15.dwg : Hand


LEGEND
SITE BOUNDARY
MW-1 (92.40) MONITOR WELL LOCATION WITH GROUNDWATER ELEVATION IN FEET
GROUNDWATER ELEVATION CONTOUR
MW-2
MW-9 (90.38)
MW-8 (90.39)
MW-1 (NOT MEASURED)
MW-5 (90.31)
MW-12 (91.31)
MW-3 (90.13)
MW-4 (91.32)
MW-6 (90.22)
MW-7 (90.16)
MW-10 (90.07)
MW-14 (90.05)
MW-11 (90.04)
MW-13 (89.89)
MW-15 (89.90)
90.30
90.20
90.10
90.00
89.90
GROUNDWATER FLOW DIRECTION
LAWRENCE STREET
NICHOLSON STREET
WEST 24TH STREET
RESIDENTIAL
FIESTA
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12
0 60' 120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE C5-6
GROUNDWATER GRADIENT MAP
SEPTEMBER 20, 2011
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 7-17-2012
N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GWGM 2011-09-20.dwg : Hand


LEGEND
SITE BOUNDARY
MW-1 (92.40) MONITOR WELL LOCATION WITH GROUNDWATER ELEVATION IN FEET
GROUNDWATER ELEVATION CONTOUR
MW-2
MW-9 (93.82)
MW-8 (93.92)
MW-1 (95.71)
MW-5 (93.67)
MW-12 (93.67)
MW-3 (93.72)
MW-4 (93.58)
MW-6 (93.54)
MW-7 (93.51)
MW-10 (93.62)
MW-14 (93.60)
MW-11 (93.35)
MW-13 (93.22)
MW-15 (93.17)
LAWRENCE STREET
NICHOLSON STREET
WEST 24TH STREET
FIESTA
RESIDENTIAL
GROUNDWATER FLOW DIRECTION
GROUNDWATER FLOW DIRECTION
93.80
93.60
93.40
93.20
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12
0 60' 120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE C5-7
GROUNDWATER GRADIENT MAP
MAY 22, 2012
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 7-17-2012
N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GWGM 2012-05-22.dwg : Hand


LEGEND
SITE BOUNDARY
DUMPSTER
FORMER UST
SB-1 SOIL BORING LOCATION
TSP-1 TEMPORARY GROUNDWATER SAMPLE POINT
MW-1 MONITOR WELL LOCATION
CONCENTRATIONS LEGEND
ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/l).
ONLY THOSE COCs WHOSE CONCENTRATIONS EXCEED THE RAL SHOWN UNLESS OTHERWISE INDICATED.
CONCENTRATIONS IN BOLD EXCEED THE RAL.
SDLs = SAMPLE DETECTION LIMITS
VOCs = VOLATILE ORGANIC COMPOUNDS
1,2-DCP = 1,2-DICHLOROPROPANE
1,2-DCA = 1,2-DICHLOROETHANE
1,1-DCE = 1,1-DICHLOROETHENE
1,1-DCA = 1,1-DICHLOROETHANE
T-1,2-DCE = TRANS-1,2-DICHLOROETHENE
C-1,2-DCE = CIS-1,2-DICHLOROETHENE
TCE = TRICHLOROETHENE
VC = VINYL CHLORIDE
TCE & C-1,2-DCE INGESTION PCLE ZONE
1,1-DCE INGESTION PCLE ZONE
1,2-DCA INGESTION PCLE ZONE
MW-2B
MW-2A
MW-2C
MW-2 VOCs <SDLs
TSP-1A
TSP-1
TSP-1B
TSP-1C
MW-9 VOCs <SDLs
TSP-2
MW-8 VOCs <SDLs
MW-1C
MW-1B
SB-2
MW-1A
MW-1 1,1-DCA 0.002 J 1,1-DCE 0.014 C-1,2-DCE 0.092 T-1,2-DCE 0.018 TCE 0.11
SB-1
MW-5 VOCs <SDLs
MW-4 1,1-DCE 0.0021 J C-1,2-DCE 0.19 T-1,2-DCE 0.034 TCE 0.28
DRAIN
MW-12 1,2-DCA 0.0059 C-1,2-DCE 0.0097
MW-12 1,2-DCA 0.0051
LAWRENCE STREET
NICHOLSON STREET
RESIDENTIAL
COMMERCIAL
WEST 24TH STREET
MW-6 VOCs <SDLs
MW-7 1,1 DCE 0.038 J C-1,2-DCE 0.53 T-1,2-DCE 0.10 TCE 7.9 VC 0.041
MW-10 CHLOROFORM 0.0072 1,2-DCP 0.013 1,2-DCA 3.2 C-1,2-DCE 0.11 T-1,2-DCE 0.038 TCE 0.17 VC 0.0033
MW-14 1,2-DCA 0.0017 J
RESIDENTIAL
FIESTA
MW-11 C-1,2-DCE 0.099 T-1,2-DCE 0.027 TCE 1.2 VC 0.0087
MW-15 1,1 DCE 0.0030 J C-1,2-DCE 0.0065 T-1,2-DCE 0.0019 J TCE 0.065
MW-13 TCE 0.0030 J
STATE OF TEXAS
MARY HELEN NIEMANN
GEOLOGY
357
LICENSED
PROFESSIONAL GEOSCIENTIST
8/15/12
0 60' 120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE C6
GROUNDWATER COC INGESTION PCLE ZONE MAP- MAY 2012
VOLATILE ORGANIC COMPOUNDS
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 8-2-2012
N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GW Injestion PCLE Zone 2012-05.dwg

APPENDIX D – PCLE ZONE DISCUSSION

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

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) Based on site investigation findings, review of COC concentrations and historical land use, two sources for the COCs present in the shallow groundwater were identified: an on-site source near monitor well MW-1 and an off-site source near monitor well MW-7. The monitoring wells associated with the onsite plume are MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-8, MW-9, and MW-12. Further discussion of the two sources of COCs in the shallow groundwater is provided in Appendix J. *Since the offsite affected groundwater plume is not associated with an on-site source and not included in the designated MSD site, there is no further discussion of the offsite groundwater plume and associated PCLE Zones in this MSD Application. However, the concentrations of the COCs in the offsite soil and groundwater are included in Tables F3-1, F3-2, F4-1, F4-2, F5, and F6 and on Figures 4A-1, 4A-2, 4B-1, 4B-2, and 5B-1 for informational purposes. The offsite VOC concentrations in the groundwater also do not exceed Non-Ingestion PCLs.*

A comparison of the most recent groundwater sampling results (May 2012) to applicable Texas Risk Reduction Program (TRRP) Tier 1 residential groundwater Ingestion protective concentration levels (PCLs) ($^{GW}GW_{Ing}$ PCLs) indicates that the COCs in the onsite groundwater plume that exceed the applicable $^{GW}GW_{Ing}$ PCLs are trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and 1,2-dichloroethane (1,2-DCA) (Table D-1).

Comparison of the most recent groundwater sampling results from the onsite plume with applicable Non-Ingestion PCLs ($^{Air}GW_{Inh-V}$) indicates that the groundwater samples do not report a COC concentration above the $^{Air}GW_{Inh-V}$ PCLs (Table D-1). Therefore, there are no Non-Ingestion PCLE Zones within the proposed MSD boundary.

The affected groundwater in the onsite plume has been delineated horizontally and vertically. The Ingestion PCLE Zones for the groundwater COCs are confined vertically to the shallow groundwater zone encountered between approximately 14 feet and 40 feet bgs.

The ingestion PCLE Zones for TCE, c-1,2-DCE, and 1,1-DCE appears to be limited to the southwest corner of the site in a plume approximately 180 feet long by 60 feet wide (Figure C6). The PCLE Zone for 1,2-DCA is confined to the area around MW-12 in a plume approximately 30 feet long by 60 feet wide (Figure C6).

Based on review of boring logs, the shallow groundwater zone was encountered in MW-1, MW-4, MW-5, and MW-6 between approximately 14 and 27 feet bgs and is comprised of a clayey silt with occasional very thin (<1 foot thick) clayey sand layers. The shallow groundwater zone in onsite monitoring wells MW-3 and MW-12 and the remaining offsite monitoring wells was encountered between approximately 20 and 40 feet bgs and is comprised of a silty/clayey sand or sand .

B) The following table represents the groundwater PCL exceedances that were reported for the monitoring wells associated with the onsite groundwater plume from the most recent groundwater sampling event (May 2012):

TABLE D-1 – Groundwater PCL Exceedences

		VOCs (EPA 8260B)			
		1,2-Dichloroethane (1,2-DCA)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene (c-1,2-DCE)	Trichloroethene (TCE)
Tier 1 $^{GW}GW_{Ing}$ Critical PCL (without MSD)		0.005	0.007	0.07	0.005
Tier 1 $^{Air}GW_{Inh-v}$ Critical PCL (with MSD)		33	1,700	1,200	120
Sample Location	Sample Date	Concentration (mg/L)			
MW-1	5/22/12	<0.0010	**0.014**	**0.092**	**0.11**
MW-2	5/22/12	<0.0010	<0.0013	<0.0025	<0.0011
MW-3	5/22/12	0.0051	<0.0013	<0.0025	<0.0011

		VOCs (EPA 8260B)			
		1,2-Dichloroethane (1,2-DCA)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene (c-1,2-DCE)	Trichloroethene (TCE)
Tier 1 $^{GW}GW_{Ing}$ Critical PCL (without MSD)		0.005	0.007	0.07	0.005
Tier 1 $^{Air}GW_{Inh-v}$ Critical PCL (with MSD)		33	1,700	1,200	120
Sample Location	Sample Date	Concentration (mg/L)			
MW-4	5/22/12	<0.0010	0.0021 J	**0.19**	**0.28**
MW-5	5/22/12	<0.0010	<0.0013	<0.0025	<0.0011
MW-6	5/22/12	<0.0010	<0.0013	<0.0025	<0.0011
MW-8	5/22/12	<0.0010	<0.0013	<0.0025	<0.0011
MW-9	5/22/12	<0.0010	<0.0013	<0.0025	<0.0011
MW-12	5/22/12	**0.0059**	<0.0013	0.0097	<0.0011

Note: Values in **Bold** exceed $^{GW}GW_{Ing}$ PCL (ingestion PCL)

C) The COCs detected in groundwater samples (TCE, cis-1,2-DCE, 1,1-DCE, and 1,2-DCA) are chlorinated VOCs associated with historical onsite operations on the proposed MSD site.

Chlorinated VOCs are characterized by their high volatilities, high densities, low viscosities, low interfacial tension, low absolute solubilities, high relative solubilities, low portioning to soil materials and low degradability. Chlorinated VOCs will dissolve in water at low concentrations but once the groundwater has reached the saturation limit for that compound, the chlorinated VOC will form a separate phase in equilibrium with the water. Because chlorinated VOCs have higher densities relative to water, the separate phase will "sink". These compounds are referred to as "dense non-aqueous phase liquids" (DNAPLs). In

high concentrations DNAPLs will be able to penetrate the water table and form “pools” on the top of less permeable layers. Historically, DNAPL has not been identified in any of the monitor wells installed on and around the site and is not expected to be present onsite given the relatively low concentration of chlorinated solvents detected in the groundwater samples collected from the onsite monitoring wells. Based on the field observations and laboratory results, it appears that the COCs are primarily dissolved in the shallow groundwater and would migrate with the groundwater flow.

Information on the geochemical properties of each COC is included on Table D2.

APPENDIX D

TABLE D2: GEOCHEMCIAL PROPERTIES of COCs

Block 39

502 West 25th Street

Houston, Texas

(all concentrations are in milligrams per liter)

COC: 1,1-Dichloroethene (1,1-DCE)		
Ingestion-Based PCL (Residential $^{GW}GW_{Ing}$)		0.007
Ingestion-Based PCLE Zone:	Length (ft):	90
	Width (ft):	30
	Total Area (ft^2):	2,700
Non-Ingestion-Based PCL ($^{Air}GW_{Inh-V}$)		1700
Non-Ingestion-Based PCLE Zone		None
Geochemical/Physical Properties		
Molecular Weight:	96.94	
Specfic Gravity:	1.213	
Solubility in Water:	2,400 mg/l	
COC: 1,2-Dichloroethane (1,2-DCA)		
Ingestion-Based PCL (Residential $^{GW}GW_{Ing}$)		0.005
Ingestion-Based PCLE Zone:	Length (ft):	60
	Width (ft):	30
	Total Area (ft^2):	1,800
Non-Ingestion-Based PCL ($^{Air}GW_{Inh-V}$)		33
Non-Ingestion-Based PCLE Zone		None
Geochemical/Physical Properties		
Molecular Weight:	98.96	
Specfic Gravity:	1.23	
Solubility in Water:	8,700	
COC: cis 1,2-Dichloroethene (cis-1,2-DCE)		
Ingestion-Based PCL (Residential $^{GW}GW_{Ing}$)		0.07
Ingestion-Based PCLE Zone:	Length (ft):	180
	Width (ft):	60
	Total Area (ft^2):	10,800
Non-Ingestion-Based PCL ($^{Air}GW_{Inh-V}$)		1,200
Non-Ingestion-Based PCLE Zone		None
Geochemical/Physical Properties		
Molecular Weight:	96.95	
Specfic Gravity:	1.284	
Solubility in Water:	5,090 mg/l	
COC: Trichloroethene (TCE)		
Ingestion-Based PCL (Residential $^{GW}GW_{Ing}$)		0.005
Ingestion-Based PCLE Zone:	Length (ft):	180
	Width (ft):	60
	Total Area (ft^2):	10,800
Non-Ingestion-Based PCL ($^{Air}GW_{Inh-V}$)		120
Non-Ingestion-Based PCLE Zone		None
Geochemical/Physical Properties		
Molecular Weight:	131.39	
Specfic Gravity:	1.46	
Solubility in Water:	1,100 mg/l	

1,1-DCE affected groundwater from 15 to 25 feet bgs, monitor well MW-1
1,2-DCA affected groundwater from 25 to 34 feet bgs, monitor well MW-12
cis-1,2-DCE affected groundwater from 15 to 25 feet bgs, monitor well MW-1
TCE affected groundwater from 13 to 25 feet bgs, monitor wells MW-1 and MW-4

APPENDIX E – COCs WITHIN DESIGNATED GROUNDWATER DISCUSSION

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) Refer to Appendix D for a discussion of each groundwater COC defined by an ingestion PCLE Zone. Current groundwater sampling results indicate that there are four identified COCs (TCE, cis-1,2-DCE, 1,1-DCE, and 1,2-DCA) that exceed the Critical Ingestion PCLs on the designated MSD site.

B) Tabular listings of the comparison of current COC concentrations with the respective Critical Ingestion and Non-Ingestion PCLs for each groundwater COC are provided in Appendix D.

C) Refer to Appendix D for a discussion of the basic geochemical properties of the COCs in the Ingestion PCLE Zones.

APPENDIX F – SUMMARY OF SOIL AND GROUNDWATER CONCENTRATION DATA

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

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

A) Tables F1 and F2 present the maximum concentrations for soil and groundwater and the Critical Ingestion and Non-Ingestion PCLs.

B) Tables F3-1, F3-2, F4-1, and F4-2 summarize the constituent concentrations in soil and Tables F5 and F6 summarize the current and historical constituent concentrations in the groundwater. The tables include the concentration level, the Critical residential Ingestion PCLs assuming no MSD is in place ($^{GW}Soil_{Ing}$ for soil and $^{GW}GW_{Ing}$ for groundwater) and the Critical residential Non-Ingestion PCLs assuming that an MSD is in place ($^{Tot}Soil_{Comb}$ and $^{Air}Soil_{Inh\text{-}V}$ for soil and $^{Air}GW_{Inh\text{-}V}$ for groundwater). Please note that the analytical data summary tables have been divided into subtables based on the COC such as VOCs, TPH, RCRA 8 metals, etc. *Also, although the soil and groundwater COCs associated with the offsite affected groundwater plume are not included or discussed in this MSD application, the COC concentrations are included in Tables F3-1, F3-2, F4-1, F4-2, F5 and F6 and on Figure F1 for informational purposes.*

<u>Groundwater</u>

The TCE, 1,1-DCE, cis-1,2-DCE, and 1,2-DCA concentrations in the shallow onsite groundwater exceed the applicable Critical Ingestion PCLs ($^{GW}GW_{Ing}$). The COC Ingestion PCL exceedences in the shallow groundwater have been delineated vertically and horizontally to the applicable Ingestion PCLs.

The COC concentrations in the groundwater do not exceed the applicable Critical Non-Ingestion PCLs

<u>Surface Soil</u>

The TCE concentration in one surface soil sample (MW-12 (4-5')) exceeds the Critical Ingestion PCL ($^{GW}Soil_{Ing}$). The TCE Ingestion PCL exceedence in the surface soils have been delineated vertically and horizontally to the Ingestion PCL. The TCE concentrations in the surface soils do not exceed the Critical Non-Ingestion PCL

The arsenic concentration in one surface soil sample (B-2 (1-2')) exceeds the Critical Ingestion PCL ($^{GW}Soil_{Ing}$) and Non-Ingestion PCL ($^{Tot}Soil_{Comb}$). The arsenic Ingestion and Non-Ingestion PCL exceedence in the surface soil is located in the alley around the former railroad spur beneath concrete cover and is not an exposure concern. In addition, the arsenic concentration exceedence is limited to the upper two feet of soil and appears to be groundwater protective since arsenic has not been detected in the groundwater at concentrations exceeding the Ingestion PCL. The arsenic Ingestion and Non-Ingestion PCL exceedence in the surface soils has been delineated vertically and horizontally to the Tier 1 residential Ingestion PCL.

Subsurface Soil

The TCE concentration in one subsurface soil sample (SB-2 (MW-1) 15-16')) exceeds the Critical Ingestion PCL ($^{GW}Soil_{Ing}$). The TCE Ingestion PCL exceedence is present within the capillary fringe zone and not representative of the nonsaturated soil zone. The TCE Ingestion PCL exceedence in the subsurface soils have been delineated vertically and horizontally to the Ingestion PCL. The COC concentrations in the subsurface soils do not exceed the applicable Critical Non-Ingestion PCLs

The following is a listing of tables included in Appendix F:

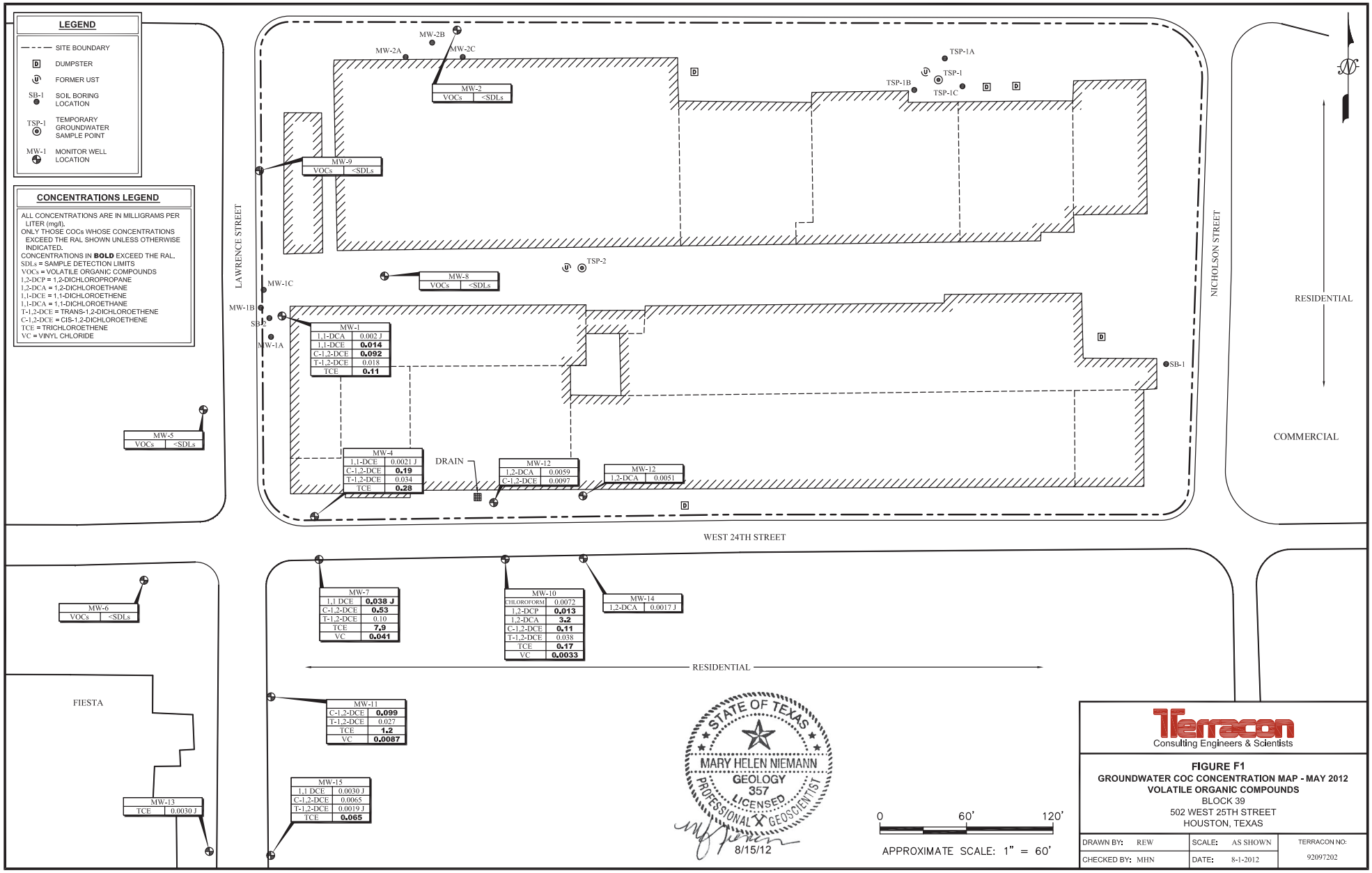
Table F1 – Summary of COCs in Soil – Maximum Concentrations
Table F2 – Summary of COCs in Groundwater – Maximum Concentrations

Table F3-1 – Summary of COCs in Surface Soil – VOCs
Table F3-2 – Summary of COCs in Surface Soil – TPH and Metals

Table F4-1 – Summary of COCs in Subsurface Soil – VOCs
Table F4-2 – Summary of COCs in Subsurface Soil – TPH and Metals

Table F5 – Summary of COCs in Groundwater – VOCs
Table F6 – Summary of COCs in Groundwater – TPH and Metals

Table F7 – TRRP Tier 2 PCL Calculation (Arsenic, Barium, Lead, Mercury)


LEGEND
SITE BOUNDARY
DUMPSTER
FORMER UST
SB-1 SOIL BORING LOCATION
TSP-1 TEMPORARY GROUNDWATER SAMPLE POINT
MW-1 MONITOR WELL LOCATION
CONCENTRATIONS LEGEND
ALL CONCENTRATIONS ARE IN MILLIGRAMS PER LITER (mg/l).
ONLY THOSE COCs WHOSE CONCENTRATIONS EXCEED THE RAL SHOWN UNLESS OTHERWISE INDICATED.
CONCENTRATIONS IN BOLD EXCEED THE RAL.
SDLs = SAMPLE DETECTION LIMITS
VOCs = VOLATILE ORGANIC COMPOUNDS
1,2-DCP = 1,2-DICHLOROPROPANE
1,2-DCA = 1,2-DICHLOROETHANE
1,1-DCE = 1,1-DICHLOROETHENE
1,1-DCA = 1,1-DICHLOROETHANE
T-1,2-DCE = TRANS-1,2-DICHLOROETHENE
C-1,2-DCE = CIS-1,2-DICHLOROETHENE
TCE = TRICHLOROETHENE
VC = VINYL CHLORIDE
MW-2A
MW-2B
MW-2C
MW-2 VOCs <SDLs
MW-9 VOCs <SDLs
MW-8 VOCs <SDLs
MW-1C
MW-1B
SB-2
MW-1A
MW-1 1,1-DCA 0.002 J 1,1-DCE 0.014 C-1,2-DCE 0.092 T-1,2-DCE 0.018 TCE 0.11
MW-5 VOCs <SDLs
MW-4 1,1-DCE 0.0021 J C-1,2-DCE 0.19 T-1,2-DCE 0.034 TCE 0.28
DRAIN
MW-12 1,2-DCA 0.0059 C-1,2-DCE 0.0097
MW-12 1,2-DCA 0.0051
TSP-1A
TSP-1
TSP-1B
TSP-1C
TSP-2
SB-1
LAWRENCE STREET
NICHOLSON STREET
RESIDENTIAL
COMMERCIAL
WEST 24TH STREET
MW-6 VOCs <SDLs
MW-7 1,1 DCE 0.038 J C-1,2-DCE 0.53 T-1,2-DCE 0.10 TCE 7.9 VC 0.041
MW-10 CHLOROFORM 0.0072 1,2-DCP 0.013 1,2-DCA 3.2 C-1,2-DCE 0.11 T-1,2-DCE 0.038 TCE 0.17 VC 0.0033
MW-14 1,2-DCA 0.0017 J
RESIDENTIAL
FIESTA
MW-11 C-1,2-DCE 0.099 T-1,2-DCE 0.027 TCE 1.2 VC 0.0087
MW-13 TCE 0.0030 J
MW-15 1,1 DCE 0.0030 J C-1,2-DCE 0.0065 T-1,2-DCE 0.0019 J TCE 0.065
STATE OF TEXAS
MARY HELEN NIEMANN
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8/15/12
0 60' 120'
APPROXIMATE SCALE: 1" = 60'
Terracon
Consulting Engineers & Scientists
FIGURE F1
GROUNDWATER COC CONCENTRATION MAP - MAY 2012
VOLATILE ORGANIC COMPOUNDS
BLOCK 39
502 WEST 25TH STREET
HOUSTON, TEXAS
DRAWN BY: REW
SCALE: AS SHOWN
TERRACON NO: 92097202
CHECKED BY: MHN
DATE: 8-1-2012
N:\ENV\dox\2009\Drafting\92097202\MSD 2012\92097202 GW COC VOCs - 2012-05.dwg

APPENDIX F

TABLE F1: MAXIMUM CONCENTRATIONS TABLE - SOIL

Block 39
502 West 25th Street
Houston, Texas
(all concentrations are in milligrams per kilogram)

Contaminants of Concern (COCs)	Residential Use (0.5-acre source area)			Sample ID	Sample Depth (ft)	Sample Date	Maximum COC Concentrations (mg/Kg)
	Critical Ingestion-Based PCL	Critical Non Ingestion-Based PCLs					
	${}^{GW}Soil_{Ing}$ (without MSD)	${}^{Tot}Soil_{Comb}$ (with MSD)	${}^{Air}Soil_{Inh-V}$ (with MSD)				
Trichloroethene (TCE)	0.034	120	150	SB-12	4-5	3/9/10	**0.066**
TPH (>C12-28)	880 *	2,300	15,000	MW-2	10-11	5/21/08	880
TPH (>C28-35)	550 *	2,300	15,000	MW-2	10-11	5/21/08	550
Arsenic	34.4 **	24	NE	B-2	1-2	1/24/10	**57.9**
Barium	2,084 **	8,100	NE	B-1	1-2	1/24/10	1,250
Lead	549 **	500	NE	MW-3	24-25	5/21/08	417
Mercury	7.61 **	3.6	4.6	B-3	1-2	1/24/10	0.271

Notes:
1. Shaded concentrations represent the critical protective concentration levels without the MSD
2. Shaded and **bolded** concentrations represent the *exceedence* of critical protective concentration levels without the MSD

* = Ingestion-based PCL based on TRRP §350.75(i)(7)C demonstration of groundwater-protectiveness and calculated site-specific Tier 2 PCL..

** = Calculated site-specific Tier 2 ingestion-based PCL.

NE = not established

APPENDIX F

TABLE F2: MAXIMUM CONCENTRATIONS TABLE - GROUNDWATER

Block 39
502 West 25th Street
Houston, Texas
(all concentrations are in milligrams per liter)

Contaminants of Concern (COCs)	Ingestion-Based PCL	Non-Ingestion-Based PCL	Sample ID	Sample Date	Maxium COC Concentrations (mg/l)
	${}^{GW}Soil_{Ing}$ (without MSD)	${}^{Air}GW_{Inh-V}$ (with MSD)			
1,1-Dichloroethene (1,1-DCE)	0.007	1,700	MW-1	3/25/2010	**0.027**
1,2-Dichloroethane (1,2-DCA)	0.005	33	MW-12	7/13/2010	**0.054**
cis 1,2-Dichloroethene (cis-DCE)	0.7	1,200	MW-4	6/15/2011	**0.280**
Trichloroethene (TCE)	0.005	120	MW-4	6/15/2011	**0.560**

Notes:
1. Shaded concentrations represent the critical protective concentration levels without the MSD
2. Shaded and **bolded** concentrations represent the *exceedence* of critical protective concentration levels without the MSD
3. "Sample Date" column represents the most current date for the maximum concentration for instances where the COC is detected on multiple dates.

TABLE F3-1
SUMMARY OF SURFACE SOIL ANALYTICAL RESULTS - VOCs
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per kilogram except when indicated otherwise)

Sample Location	Sample Depth (ft)	Sample Date	VOCs (EPA 8260B)												
			2-Butanone (Methyl Ethyl Ketone (MEK))	2-Hexanone	4-Methyl-2-pentanone (Methyl Isobutyl Ketone (MIBK))	Acetone	Benzene	Carbon Tetrachloride	cis-1,2-Dichloroethene	Methylene Chloride	Methyl Tertiary Butyl Ether (MTBE)	Naphthalene	Toluene	Tetrachloroethene (PCE)	Trichloroethene (TCE)
Tier 1 $^{GW}Soil_{Ing}$ Critical PCL without MSD			**29**	**3.9**	**4.9**	**43**	**0.026**	**0.062**	**0.25**	**0.013**	**0.62**	**31**	**8.2**	**0.05**	**0.034**
Tier 1 $^{Tot}Soil_{Comb}$ Critical PCL with MSD			**4,000**	**270**	**5,900**	**66,000**	**120**	**35**	**140**	**390**	**800**	**220**	**5,900**	**100**	**120**
ONSITE GROUNDWATER PLUME															
TSP-1	9-10	3/14/08	<0.00086	<0.0012	<0.0012	**0.0041 J**	<0.00074	<0.00074	<0.00098	<0.0037	<0.00098	<0.00074	<0.00074	<0.00074	<0.00074
TSP-2	9-10	3/17/08	<0.00083	<0.0012	<0.0012	<0.0024	<0.00071	<0.00071	<0.00095	<0.0035	<0.00095	<0.00071	<0.00071	<0.00071	<0.00071
MW-2	1-2	5/21/08	**0.038**	**0.025**	**0.025**	**0.039**	<0.00062	<0.00062	<0.00074	<0.0017	**0.0034 J**	**0.0015 J**	<0.00062	<0.00062	<0.00062
	10-11	5/21/08	<0.0022	<0.0013	<0.0012	<0.0058	**0.0028 J**	<0.00058	<0.00069	<0.0016	<0.00058	<0.00058	**0.0037 J**	<0.00058	<0.00058
MW-3	1-2	5/21/08	<0.0023	<0.0013	<0.0012	<0.00061	<0.00061	<0.00061	<0.00073	<0.0017	<0.00061	<0.00061	<0.00061	<0.00061	<0.00061
MW-4	12	6/26/08	<0.0024	<0.0014	<0.0013	<0.0064	<0.00064	<0.00064	<0.00076	<0.0018	<0.00064	<0.00064	**0.0027 J**	**0.018**	<0.00064
MW-5	13	6/26/08	<0.0022	<0.0013	<0.0012	<0.0058	<0.00058	<0.00058	<0.00070	<0.0016	<0.00058	<0.00058	<0.00058	<0.00058	<0.00058
MW-6	13	6/26/08	<0.0023	<0.0013	<0.0012	**0.0075 J**	<0.00059	<0.00059	<0.00071	<0.0017	<0.00059	<0.00059	<0.00059	**0.011**	<0.00059
MW-8	1-2	6/15/09	<0.0016	<0.0012	<0.0012	<0.0023	<0.00059	<0.00059	<0.00059	<0.0012	<0.00059	<0.00059	<0.00059	<0.00070	<0.00059
MW-9	3-4	6/16/09	<0.0017	<0.0012	<0.0012	<0.0025	<0.00061	<0.00061	<0.00061	<0.0012	<0.00061	<0.00061	<0.00061	<0.00073	<0.00061
MW-12	4-5	3/9/10	<0.0016	<0.0011	<0.0011	<0.0023	<0.00057	**0.012**	**0.042**	**0.0015 J**	<0.00057	<0.00057	<0.00057	<0.00069	**0.066**
	7-9	3/9/10	<0.0016	<0.0012	<0.0012	**0.010 J**	<0.00058	<0.00058	<0.00058	<0.00058	<0.00058	**0.0036 J**	<0.00058	<0.00070	**0.0041 J**
SB-12A	4-5	6/8/11	<0.0026	<0.0020	<0.0012	<0.0054	<0.00070	<0.0014	<0.0018	<0.0016	<0.0022	-----	<0.00082	<0.0012	<0.0019
SB-12B	4-5	6/8/11	<0.0025	<0.0019	<0.0011	<0.0052	<0.00068	<0.0014	<0.0017	<0.0016	<0.0021	-----	<0.00079	<0.0011	<0.0018
SB-12C	4-5	6/8/11	<0.0025	<0.0020	<0.0011	**0.012 J**	<0.00069	<0.0014	<0.0017	**0.0025 J**	<0.0022	-----	<0.00080	<0.0011	<0.0018

TABLE F3-1
SUMMARY OF SURFACE SOIL ANALYTICAL RESULTS - VOCs
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per kilogram except when indicated otherwise)

Sample Location	Sample Depth (ft)	Sample Date	VOCs (EPA 8260B)												
			2-Butanone (Methyl Ethyl Ketone (MEK))	2-Hexanone	4-Methyl-2-pentanone (Methyl Isobutyl Ketone (MIBK))	Acetone	Benzene	Carbon Tetrachloride	cis-1,2-Dichloroethene	Methylene Chloride	Methyl Tertiary Butyl Ether (MTBE)	Naphthalene	Toluene	Tetrachloroethene (PCE)	Trichloroethene (TCE)
Tier 1 $^{GW}Soil_{Ing}$ Critical PCL without MSD			**29**	**3.9**	**4.9**	**43**	**0.026**	**0.062**	**0.25**	**0.013**	**0.62**	**31**	**8.2**	**0.05**	**0.034**
Tier 1 $^{Tot}Soil_{Comb}$ Critical PCL with MSD			**4,000**	**270**	**5,900**	**66,000**	**120**	**35**	**140**	**390**	**800**	**220**	**5,900**	**100**	**120**
OFFSITE GROUNDWATER PLUME															
MW-7	5-7	6/15/09	<0.0016	<0.0012	<0.0012	<0.0023	**0.00064 J**	<0.00058	<0.00074	<0.0012	<0.00058	<0.00058	<0.00058	<0.00069	<0.00058
	10-11	6/15/09	<0.0016	<0.0013	<0.0013	<0.0023	<0.00058	<0.00058	<0.00058	<0.0012	<0.00058	<0.00058	<0.00058	<0.00070	<0.00058
MW-10	3-5'	9/24/09	<0.0016	<0.0012	<0.0012	<0.0023	<0.00059	<0.00059	<0.00059	<0.0012	<0.00059	<0.00059	<0.00059	<0.00070	<0.00059
MW-11	3-5'	9/24/09	<0.0016	<0.0011	<0.0011	<0.0022	<0.00056	<0.00056	<0.00056	<0.0011	<0.00056	<0.00056	<0.00056	<0.00067	**0.0020 J**
MW-14	13-14	6/7/11	<0.0030	<0.0024	<0.0014	<0.0064	**0.0011 J**	<0.0017	<0.0021	**0.0034 J**	<0.0026	-----	<0.00097	<0.0014	<0.0022

Note: Only those VOCs detected in at least one soil sample are included on the table.
BOLD results indicate concentrations above the laboratory sample detection limits.
BOLD and SHADED results exceed the indicated Critical PCL for a 0.5-acre source area.

J - concentration detected bewteeen the SDL and the method quantitation limit (MQL) and is estimated
< - not detected at concentrations above the sample detection limit (SDL)
----- - not analyzed
VOCs - volatile organic compounds
TCEQ - Texas Commission on Environmental Quality
EPA - Environmental Protection Agency

TABLE F3-2
SUMMARY OF SUBSURFACE SOIL ANALYTICAL RESULTS - VOCs
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per kilogram except when indicated otherwise)

Sample Location	Sample Depth (ft)	Sample Date		VOCs (EPA 8260B)							
			1,2-Dichloroethane	Acetone	Benzene	cis-1,2-Dichloroethene	Methylene Chloride	Naphthalene	trans-1,2-Dichloroethene	Toluene	Trichloroethene (TCE)
Tier 1 $^{GW}Soil_{Ing}$ Critical PCL without MSD			**0.014**	**43**	**0.026**	**0.25**	**0.013**	**31**	**0.49**	**8.2**	**0.034**
Tier 1 $^{Air}Soil_{Inh-v}$ Critical PCL with MSD			**14**	**660,000**	**160**	**920**	**760**	**270**	**920**	**6,300**	**150**
ONSITE GROUNDWATER PLUME											
SB-1	15-16	3/17/08	<0.00058	<0.0024	<0.00073	<0.00098	**0.0041 J**	<0.00097	<0.0012	<0.00073	<0.00073
SB-2 (MW-1)	15-16	3/17/08	<0.00058	<0.0023	<0.00070	**0.061**	<0.0035	<0.00070	**0.0066**	<0.00070	**0.051**
TSP-1	19-20	3/14/08	<0.00058	<0.0023.	<0.00068	<0.00091	<0.0034	<0.00068	<0.0011	<0.00068	<0.00068
MW-1	27	6/15/09	<0.00058	**0.018 J**	<0.00058	<0.00058	<0.0012	<0.00058	<0.00058	<0.00058	<0.00058
MW-3	24-25	5/21/08	<0.00058	**0.0072 J**	<0.00056	<0.00067	<0.0016	<0.00056	<0.00056	**0.00067 J**	<0.00056
MW-8	23-24	6/15/09	<0.00058	<0.0025	<0.00062	<0.00062	**0.0036 J**	<0.00062	<0.00062	<0.00062	<0.00062
	34	6/15/09	<0.00058	<0.0026	<0.00065	**0.0062 J**	<0.0013	<0.00065	<0.00065	<0.00065	**0.0050 J**
MW-9	16-17	6/16/09	<0.00058	<0.0025	<0.00061	<0.00061	<0.0012	<0.00061	<0.00061	<0.00061	<0.00061
MW-12	38	3/9/10	<0.00061	<0.0024	<0.00061	**0.0017 J**	**0.0012 J**	**0.0040 J**	<0.00061	<0.00061	**0.0052 J**
OFFSITE GROUNDWATER PLUME											
MW-7	28	6/15/09	<0.00058	<0.0025	**0.00080 J**	**0.0043**	<0.0013	<0.00063	<0.00063	<0.00063	**0.0028 J**
MW-10	24'	9/24/09	**0.076**	<0.0025	<0.00062	<0.00062	<0.0012	<0.00062	<0.00062	<0.00062	**0.0030 J**
	27'	9/24/09	**0.33**	<0.0026	<0.00065	**0.0037 J**	<0.0013	<0.00065	<0.00065	<0.00065	**0.0088**
MW-10A	31	3/9/10	**0.013**	<0.0024	<0.00060	**0.00063 J**	**0.0013 J**	**0.0038 J**	<0.00060	<0.00060	**0.0040 J**
MW-11	24'	9/24/09	<0.00059	<0.0024	<0.00059	**0.0027 J**	<0.0012	<0.00059	<0.00059	<0.00059	**0.069**
	34'	9/24/09	<0.00060	<0.0024	<0.00060	**0.0062 J**	<0.0012	<0.00060	<0.00060	<0.00060	<0.00060
MW-13	20-21	6/7/11	<0.00071	<0.0055	<0.00071	<0.0018	**0.0032 J**	NA	<0.0011	<0.00083	<0.0019
	28-29	6/7/11	<0.00079	<0.0060	**0.0011 J**	<0.0020	**0.0037 J**	NA	<0.0012	<0.00092	**0.0054 J**
MW-14	22-23	6/7/11	<0.00071	<0.0055	**0.00093 J**	<0.0018	**0.0031 J**	NA	<0.0011	<0.00083	<0.0019
	25-26	6/7/11	<0.00073	<0.0056	<0.00073	<0.0018	**0.0030 J**	NA	<0.0011	<0.00085	<0.0019
MW-15	24-25	6/7/11	<0.00074	<0.0057	**0.0010 J**	<0.0019	**0.0057 J**	NA	<0.0011	<0.00087	<0.0020
	35-36	6/7/11	<0.00077	**0.014 J**	**0.0022 J**	<0.0019	**0.0041 J**	NA	<0.0012	<0.0090	<0.0021

Note: Only those VOCs detected in at least one soil sample are included on the table.
BOLD results indicate concentrations above the laboratory sample detection limits.
BOLD and SHADED results exceed the indicated Critical PCL for a 0.5-acre source area.

J - concentration detected bewteeen the SDL and the method quantitation limit (MQL) and is estimated
< - not detected at concentrations above the sample detection limit (SDL)
----- - not analyzed
VOCs - volatile organic compounds
TCEQ - Texas Commission on Environmental Quality
EPA - Environmental Protection Agency

TABLE F4-1
SUMMARY OF SURFACE SOIL ANALYTICAL RESULTS - TPH and METALS
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per kilogram except when indicated otherwise)

Sample Location	Sample Depth (ft)	Sample Date	TPH (TCEQ TX 1005)			RCRA Metals (EPA 6020/7471A)								pH (pH units)
			C_6 - C_{12} Carbon Range	C_{12} - C_{28} Carbon Range	C_{28} - C_{35} Carbon Range	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
Tier 1 $^{GW}Soil_{Ing}$ Critical PCL without MSD			**65**	**880 ***	**550 ***	**34.4 ***	**2,084***	**1.5**	**2400**	**549 ***	**7.61 ***	**2.3**	**0.48**	**NA**
Tier 1 $^{Tot}Soil_{Comb}$ Critical PCL with MSD			**1,600**	**2,300**	**2,300**	**24**	**8,100**	**52**	**33,000**	**500**	**3.6**	**310**	**97**	**NA**
ONSITE GROUNDWATER PLUME														
SB-1	0-2	3/14/08	-----	-----	-----	**0.863**	**30.8**	<0.032	**5.21**	**5.53**	**0.0221**	**0.497 J**	**0.0516 J**	**-----**
	15-16	3/17/08	<19	<19	<19	-----	-----	-----	-----	-----	-----	-----	-----	-----
SB-2 (MW-1)	0-2	3/14/08	-----	-----	-----	**9.28**	**8.75**	**0.049 J**	**2.95**	**7.71**	**0.0148 J**	<0.20	**0.0396 J**	**-----**
	2-4	3/14/08	-----	-----	-----	**14.3**	-----	-----	-----	-----	-----	-----	-----	**7.87**
	15-16	3/17/08	<19	<19	<19	**0.187 J**	-----	-----	-----	**2.04**	-----	-----	-----	-----
MW-1-SA	2-4	9/24/09	-----	-----	-----	**2.37**	-----	-----	-----	**8.20**	-----	-----	-----	-----
MW-1-SB	2-4	9/24/09	-----	-----	-----	**0.513**	-----	-----	-----	**4.77**	-----	-----	-----	-----
MW-1-SC	2-4	9/24/09	-----	-----	-----	**2.66**	-----	-----	-----	**8.40**	-----	-----	-----	-----
TSP-1	0-2	3/14/08	-----	-----	-----	**20.3**	**28**	**0.0578 J**	**3.52**	**11.6**	**0.0382**	**0.382 J**	**0.0652 J**	**-----**
	2-4	3/14/08	-----	-----	-----	**14.5**	-----	-----	-----	-----	-----	-----	-----	-----
	9-10	3/14/08	<20	<20	<20	**1.75**	-----	-----	-----	-----	-----	-----	-----	-----
TSP-1-SA	2-4	9/24/09	-----	-----	-----	**1.92**	-----	-----	-----	-----	-----	-----	-----	-----
TSP-1-SB	2-4	9/24/09	-----	-----	-----	**0.974**	-----	-----	-----	-----	-----	-----	-----	-----
TSP-1-SC	2-4	9/24/09	-----	-----	-----	**1.47**	-----	-----	-----	-----	-----	-----	-----	-----
TSP-2	2.5	3/17/08	-----	-----	-----	**3.51**	**30.1**	**0.120 J**	**7.94**	**37.7**	**0.0313**	**0.689**	**0.134 J**	-----
	3-4	3/17/08	-----	-----	-----	-----	-----	-----	-----	**28.4**	-----	-----	-----	-----
	9-10	3/17/08	<18	<18	<18	**0.8**	-----	-----	-----	**4.19**	-----	-----	-----	-----
MW-2	1-2	5/21/08	<19	<19	<19	**1.03**	**47.3**	<0.034	**3.76**	**7.75**	<0.0017	**0.878**	<0.023	**-----**
	10-11	5/21/08	<18	**880**	**550**	**19.7**	**66.1**	<0.032	**5.13**	**7.09**	**0.0130 J**	**0.891**	<0.022	-----
MW-2-SA	11-12	9/24/09	<19	<19	<19	**0.860**	-----	-----	-----	-----	-----	-----	-----	-----
MW-2-SB	11-12	9/24/09	<19	<19	<19	**0.626**	-----	-----	-----	-----	-----	-----	-----	-----
MW-2-SC	11-12	9/24/09	<19	<19	<19	**0.519 J**	-----	-----	-----	-----	-----	-----	-----	-----
MW-3	1-2	5/21/08	<19	<19	<19	**5.54**	**55.5**	**0.0494 J**	**6.17**	**12.7**	<0.0016	**0.845**	<0.024	**-----**

TABLE F4-1
SUMMARY OF SURFACE SOIL ANALYTICAL RESULTS - TPH and METALS
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per kilogram except when indicated otherwise)

Sample Location	Sample Depth (ft)	Sample Date	TPH (TCEQ TX 1005)			RCRA Metals (EPA 6020/7471A)								pH (pH units)
			C_6 - C_{12} Carbon Range	C_{12} - C_{28} Carbon Range	C_{28} - C_{35} Carbon Range	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	
Tier 1 $^{GW}Soil_{Ing}$ Critical PCL without MSD			**65**	**880 ***	**550 ***	**34.4 ***	**2,084***	**1.5**	**2400**	**549 ***	**7.61 ***	**2.3**	**0.48**	**NA**
Tier 1 $^{Tot}Soil_{Comb}$ Critical PCL with MSD			**1,600**	**2,300**	**2,300**	**24**	**8,100**	**52**	**33,000**	**500**	**3.6**	**310**	**97**	**NA**
B-1	1-2	1/24/10	-----	-----	-----	**5.73**	**1,250**	**1.41**	**124**	**333**	**0.105**	**0.378 J**	**0.0965 J**	-----
	4-6	1/24/10	-----	-----	-----	**-----**	**30.1**	**-----**	**-----**	**6.12**	**0.0284**	**-----**	**-----**	-----
B-2	1-2	1/24/10	-----	-----	-----	**57.9**	**77.4**	**0.608**	**29.2**	**91.5**	**0.175**	**1.84**	**0.0629 J**	-----
	4-6	1/24/10	-----	-----	-----	**0.539 J**	**-----**	**-----**	**-----**	**5.04**	**0.00677**	**-----**	**-----**	-----
B-3	1-2	1/24/10	-----	-----	-----	**8.41**	**86.4**	**1.39**	**110**	**118**	**0.271**	**0.281 J**	**0.163 J**	-----
	4-6	1/24/10	-----	-----	-----	**0.859**	**-----**	**-----**	**-----**	**7.12**	**0.0156**	**-----**	**-----**	-----
B-4	1-2	1/24/10	-----	-----	-----	**7.08**	**48.6**	**0.456 J**	**59.1**	**52.7**	**0.102**	<0.27	**0.0883 J**	-----
	4-6	1/24/10	-----	-----	-----	**0.886**	**-----**	**-----**	**-----**	**11.6**	**0.0122**	**-----**	**-----**	-----

Note: **BOLD** results indicate concentrations above the laboratory sample detection limits
BOLD and SHADED results exceed the indicated Critical PCL for a 0.5-acre source area.

* - Critical PCL based on TRRP §350.75(i)(7)C demonstration of groundwater-protectiveness, calculated site-specific Tier 2 PCL, or $^{Tot}Soil_{Comb}$ PCL.

Critical PCL - Tier 1 or Tier 2 protective concentration level (PCL) for a residential site with 0.5-acre source area
TPH - total petroleum hydrocarbons
TCEQ - Texas Commission on Environmental Quality
RCRA - Resource Conservation and Recovery Act
EPA - Environmental Protection Agency
J - concentration detected bewteeen the SDL and the method quantitation limit (MQL) and is estimatec
< - not detected at concentrations above the sample detection limit (SDL)

TABLE F4-2
SUMMARY OF SUBSURFACE SOIL ANALYTICAL RESULTS - TPH and METALS
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per kilogram except when indicated otherwise)

Sample Location	Sample Depth (ft)	Sample Date	TPH (TCEQ TX 1005)			RCRA Metals (EPA 6020/7471A)							
			C_6 - C_{12} Carbon Range	C_{12} - C_{28} Carbon Range	C_{28} - C_{35} Carbon Range	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
Tier 1 $^{GW}Soil_{Ing}$ Critical PCL without MSD			**65**	**880 ***	**550 ***	**34.4 ***	**2,084***	**1.5**	**2400**	**549 ***	**7.61 ***	**2.3**	**0.48**
Tier 1 $^{Air}Soil_{Inh-v}$ Critical PCL with MSD			**3,100**	**15,000**	**15,000**	**-----**	**-----**	**-----**	**-----**	**-----**	**4.6**	**-----**	**-----**
ONSITE GROUNDWATER PLUME													
SB-1	15-16	3/17/08	<19	<19	<19	-----	-----	-----	-----	-----	-----	-----	-----
SB-2 (MW-1)	15-16	3/17/08	<19	<19	<19	**0.187 J**	-----	-----	-----	**2.04**	-----	-----	-----
TSP-1	19-20	3/14/08	<18	<18	<18	-----	-----	-----	-----	-----	-----	-----	-----
MW-3	24-25	5/21/08	<18	<18	<18	**34.4**	**39.7**	**0.210 J**	**3.65**	**417**	**0.0534**	**0.507**	**0.0611**

Note: **BOLD** results indicate concentrations above the laboratory sample detection limits.
BOLD and SHADED results exceed the indicated Critical PCL for a 0.5-acre source area.

* - Critical PCL based on TRRP §350.75(i)(7)C demonstration of groundwater-protectiveness or calculated groundwater protective site-specific Tier 2 PCL.

Critical PCL - Tier 1 or Tier 2 protective concentration level (PCL) for a residential site with 0.5-acre source area
TPH - total petroleum hydrocarbons
TCEQ - Texas Commission on Environmental Quality
RCRA - Resource Conservation and Recovery Act
EPA - Environmental Protection Agency
J - concentration detected bewteeen the SDL and the method quantitation limit (MQL) and is estimated
< - not detected at concentrations above the sample detection limit (SDL)

TABLE F5
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - VOCs
ONSITE GROUNDWATER PLUME
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per liter (mg/l))

Sample Location	Sample Date	VOCs (EPA/8260B)									
		Chloroform	1,2-Dichloropropane	1,1-Dichloroethane (1,1-DCA)	1,2-Dichloroethane (1,2-DCA)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene	Tetrachloroethene (PCE)	trans-1,2-Dichloroethene	Trichloroethene (TCE)	Vinyl Chloride (VC)
Tier 1 $^{GW}GW_{Ing}$ Critical PCL without MSD		**0.24**	**0.005**	**4.9**	**0.005**	**0.007**	**0.07**	**0.005**	**0.10**	**0.005**	**0.002**
Tier 1 $^{Air}GW_{Inh-v}$ Critical PCL with MSD		**20**	**120**	**43,000**	**33**	**1,700**	**1,200**	**500**	**770**	**120**	**3.8**
ONSITE GROUNDWATER PLUME											
MW-1	4/21/08	<0.00050	<0.00050	**0.0011 J**	<0.00050	**0.0053**	**0.088**	<0.00060	**0.027**	**0.20**	**0.00088 J**
	5/2/08	<0.00050	<0.00050	**0.0013 J**	<0.00050	**0.0066**	**0.083**	<0.00060	**0.021**	**0.19**	<0.00050
	6/23/09	<0.00050	<0.00050	**0.0034 J**	<0.00050	**0.017**	**0.085**	<0.00060	**0.017**	**0.13**	<0.00050
	12/9/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	3/25/10	<0.00050	<0.00050	**0.0055**	<0.00050	**0.027**	**0.088**	<0.00060	**0.011**	**0.12**	**0.00091 J**
	7/13/10	<0.00050	<0.00050	**0.0036 J**	<0.00050	**0.013**	**0.17**	<0.00060	**0.022**	**0.21**	<0.00050
	6/15/11	<0.001	<0.0009	**0.0026 J**	<0.001	**0.015**	**0.15**	<0.0017	**0.028**	**0.18**	<0.001
	5/22/12	<0.0040	<0.0040	**0.0020 J**	<0.0040	**0.014**	**0.092**	<0.0017	**0.018**	**0.11**	<0.0010
MW-2	5/22/08	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/23/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	12/9/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	3/24/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	7/13/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/15/11	<0.001	<0.0009	<0.0011	<0.001	<0.0013	<0.0025	<0.0017	<0.001	<0.0011	<0.001
	5/22/12	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
MW-3	5/22/08	<0.00050	<0.00050	<0.00050	**0.0060**	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/27/08	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/23/09	<0.00050	<0.00050	<0.00050	**0.00082 J**	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	12/10/09	<0.00050	<0.00050	<0.00050	**0.00097 J**	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	3/25/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	7/13/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/15/11	<0.001	<0.0009	<0.0011	<0.001	<0.0013	<0.0025	<0.0017	<0.001	<0.0011	<0.001
	5/23/12	<0.0010	<0.0009	<0.0011	**0.0051**	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
MW-4	6/27/08	<0.00050	<0.00050	<0.00050	<0.00050	**0.0018 J**	**0.13**	<0.00060	**0.014**	**0.54**	**0.0022**
	6/23/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	**0.039**	<0.00060	**0.016**	**0.14**	<0.00050
	12/10/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	**0.014**	<0.00060	**0.0053**	**0.021**	<0.00050
	3/25/10	<0.00050	<0.00050	<0.00050	<0.00050	**0.0011 J**	**0.14**	<0.00060	**0.016**	**0.25**	**0.00092 J**
	7/13/10	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	**0.030**	<0.00060	**0.0064**	**0.064**	<0.00050
	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	**0.0042 J**	**0.280**	<0.0017	**0.059**	**0.560**	**0.002**
	5/23/12	<0.0010	<0.0009	<0.0011	<0.0010	**0.0021 J**	**0.19**	<0.0017	**0.034**	**0.28**	<0.00050

TABLE F5
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - VOCs
ONSITE GROUNDWATER PLUME
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per liter (mg/l))

Sample Location	Sample Date	VOCs (EPA/8260B)									
		Chloroform	1,2-Dichloropropane	1,1-Dichloroethane (1,1-DCA)	1,2-Dichloroethane (1,2-DCA)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene	Tetrachloroethene (PCE)	trans-1,2-Dichloroethene	Trichloroethene (TCE)	Vinyl Chloride (VC)
Tier 1 $^{GW}GW_{Ing}$ Critical PCL without MSD		**0.24**	**0.005**	**4.9**	**0.005**	**0.007**	**0.07**	**0.005**	**0.10**	**0.005**	**0.002**
Tier 1 $^{Air}GW_{Inh-v}$ Critical PCL with MSD		**20**	**120**	**43,000**	**33**	**1,700**	**1,200**	**500**	**770**	**120**	**3.8**
MW-5	6/27/08	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	**0.00073 J**	<0.00050
	6/23/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	12/9/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	3/24/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	7/13/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
	5/22/12	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
MW-6	6/27/08	<0.00050	<0.00050	<0.00050	**0.0029 J**	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/23/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	12/9/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	3/24/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	7/13/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
	5/22/12	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
MW-8	7/20/09	<0.00050	<0.00050	<0.00050	<0.00050	**0.00068 J**	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	12/9/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	3/24/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	7/13/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
	5/22/12	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
MW-9	7/20/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	12/9/09	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	3/24/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	7/13/10	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00060	<0.00050	<0.00050	<0.00050
	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
	5/22/12	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
MW-12	3/12/10	<0.00050	<0.00050	<0.00050	**0.016**	<0.00050	**0.0019 J**	<0.00060	<0.00050	**0.0045 J**	<0.00050
	3/24/10	<0.00050	<0.00050	<0.00050	**0.018**	<0.00050	**0.0012 J**	<0.00060	<0.00050	**0.0031 J**	<0.00050
	7/13/10	<0.00050	<0.00050	<0.00050	**0.054**	<0.00050	**0.0023 J**	<0.00060	**0.00053 J**	**0.0022 J**	<0.00050
	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.001	<0.0011	<0.0010
	5/23/12	<0.0010	<0.0009	<0.0011	**0.0059**	<0.0013	**0.0097**	<0.0017	<0.001	<0.0011	<0.0010

Notes: Only those VOCs detected in at least one groundwater sample are included on the table.
BOLD results indicate concentrations above the laboratory sample detection limit.
BOLD and SHADED results exceed the indicated Critical PCL.

Critical PCL - Tier 1 protective concentration level (PCL) for a residential site
J - constituent was detected at a concentration bewteeen the SDL and the method quantitation limit (MQL) and the concentration is an estimated value.
< - not detected at concentrations above the sample detection limit (SDL)
----- - constituent not analyzed
TCEQ - Texas Commission on Environmental Quality
EPA - Environmental Protection Agency
VOCs - volatile organic compounds

TABLE F5
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - VOCs
OFFSITE GROUNDWATER PLUME
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per liter (mg/l))

Sample Location	Sample Date	VOCs (EPA/8260B)									
		Chloroform	1,2-Dichloropropane	1,1-Dichloroethane (1,1-DCA)	1,2-Dichloroethane (1,2-DCA)	1,1-Dichloroethene (1,1-DCE)	cis-1,2-Dichloroethene	Tetrachloroethene (PCE)	trans-1,2-Dichloroethene	Trichloroethene (TCE)	Vinyl Chloride (VC)
Tier 1 $^{GW}GW_{Ing}$ Critical PCL without MSD		**0.24**	**0.005**	**4.9**	**0.005**	**0.007**	**0.07**	**0.005**	**0.10**	**0.005**	**0.002**
Tier 1 $^{Air}GW_{Inh-v}$ Critical PCL with MSD		**20**	**120**	**43,000**	**33**	**1,700**	**1,200**	**500**	**770**	**120**	**3.8**
OFFSITE GROUNDWATER PLUME											
MW-7	7/20/09	<0.00050	<0.00050	**0.00093 J**	<0.00050	**0.046**	**0.42**	**0.00080 J**	**0.084**	**4.2**	**0.018**
	7/31/09	<0.00050	<0.00050	**0.0013 J**	<0.00050	**0.065**	**0.46**	**0.0013 J**	**0.090**	**7.2**	**0.034**
	12/10/09	**0.00075 J**	<0.00050	<0.00050	**0.00074 J**	**0.050**	**0.74**	**0.0011 J**	**0.091**	**8.2**	**0.030**
	3/25/10	**0.0012 J**	<0.00050	**0.0012 J**	<0.00050	**0.054**	**0.67**	**0.0022 J**	**0.13**	**9.5**	**0.057**
	7/13/10	<0.00050	<0.00050	<0.00050	**0.021**	**0.018 J**	**0.69**	<0.00060	**0.10**	**3.2**	**0.029**
	6/15/11	<0.010	<0.009	<0.011	<0.010	**0.054**	**0.670**	<0.017	**0.150**	**8.4**	**0.049**
	5/23/12	<0.010	<0.009	<0.011	<0.010	**0.038 J**	**0.53**	<0.017	**0.10**	**7.9**	**0.041**
MW-10	9/30/09	**0.013**	**0.021**	<0.00050	**4.9**	**0.00059 J**	**0.082**	**0.00087 J**	**0.029**	**0.17**	**0.0028**
	12/10/09	**0.016**	**0.023**	<0.00050	**5.8**	<0.00050	**0.083**	**0.0015 J**	**0.023**	**0.34**	**0.0030**
	3/25/10	**0.014**	**0.02**	<0.00050	**4.4**	**0.00090 J**	**0.08**	**0.0026 J**	**0.024**	**0.29**	**0.0036**
	7/13/10	**0.0099**	**0.017**	<0.00050	<0.00050	**0.00092 J**	**0.078**	**0.00093 J**	**0.025**	**0.22**	**0.0051**
	6/15/11	**0.0035 J**	<0.0009	<0.0011	**2.1**	<0.0013	**0.067**	<0.0017	**0.022**	**0.120**	**0.0021**
	5/23/12	**0.0072**	**0.013**	<0.0011	**3.2**	<0.0013	**0.11**	<0.0017	**0.038**	**0.17**	**0.0033**
MW-11	9/30/09	<0.00050	<0.00050	<0.00050	<0.00050	**0.012**	**0.16**	<0.00060	**0.046**	**3.2**	**0.015**
	12/9/09	**0.00063 J**	<0.00050	**0.00063 J**	<0.00050	**0.023**	**0.32**	**0.00068 J**	**0.12**	**5.8**	**0.043**
	3/24/10	**0.0016 J**	<0.00050	**0.00067 J**	<0.00050	**0.032**	**0.64**	**0.0022 J**	**0.18**	**13**	**0.054**
	7/13/10	<0.00050	<0.00050	<0.00050	<0.00050	**0.020 J**	**0.50**	<0.00060	**0.13**	**12**	**0.077**
	6/15/11	<0.010	<0.009	<0.011	<0.010	<0.013	**0.250**	<0.017	**0.065**	**6.0**	**0.022**
	5/23/12	<0.0010	<0.0011	<0.0011	<0.0011	<0.013	**0.099**	<0.0017	**0.027**	**1.2**	**0.0087**
MW-13	6/15/11	<0.0010	<0.0009	<0.0011	<0.001	<0.0013	<0.0025	<0.0017	<0.0010	**0.053**	<0.0010
	9/20/11	<0.0010	<0.00090	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	**0.051**	<0.0010
	5/22/12	<0.0010	<0.00090	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	**0.0030 J**	<0.0010
MW-14	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
	9/20/11	<0.0010	<0.00090	<0.0011	<0.0011	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
	5/23/12	<0.0010	<0.00090	<0.0011	**0.0017 J**	<0.0013	<0.0025	<0.0017	<0.0010	<0.0011	<0.0010
MW-15	6/15/11	<0.0010	<0.0009	<0.0011	<0.0010	**0.0033 J**	**0.0099**	<0.0017	**0.0024 J**	**0.110**	<0.0010
	9/20/11	<0.0010	<0.00090	<0.0011	<0.0010	**0.0021 J**	**0.012**	<0.0017	**0.0029 J**	**0.12**	<0.0010
	5/22/12	<0.0010	<0.00090	<0.0011	<0.0010	**0.0030 J**	**0.0065**	<0.0017	**0.0019 J**	**0.065**	<0.0010

Notes: Only those VOCs detected in at least one groundwater sample are included on the table.
BOLD results indicate concentrations above the laboratory sample detection limit.
BOLD and SHADED results exceed the indicated Critical PCL.

Critical PCL - Tier 1 protective concentration level (PCL) for a residential site
J - constituent was detected at a concentration bewteeen the SDL and the method quantitation limit (MQL) and the concentration is an estimated value.
< - not detected at concentrations above the sample detection limit (SDL)
----- - constituent not analyzed
TCEQ - Texas Commission on Environmental Quality
EPA - Environmental Protection Agency
VOCs - volatile organic compounds

TABLE F6

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - TPH and TOTAL METALS
Block 39
502 West 25th Street, Houston, Harris County, Texas
TCEQ Corrective Action Site ID T3006
Terracon Project 92097202

(all concentrations are in milligrams per liter (mg/l))

Sample Location	Sample Date	TPH (TX 1005)			Total Metals (EPA 6020/7470)		
		C_6 - C_{12} Carbon Range	C_{12} - C_{28} Carbon Range	C_{28} - C_{35} Carbon Range	Arsenic	Barium	Lead
Tier 1 $^{GW}GW_{Ing}$ Critical PCL without MSD		**0.98**	**0.98**	**0.98**	**0.01**	**2**	**0.015**
Tier 1 $^{Air}GW_{Inh-v}$ Critical PCL with MSD		**1,800**	**7,500**	**7,500**	**-----**	**-----**	**-----**
ONSITE GROUNDWATER PLUME							
MW-1	5/22/08	-----	-----	-----	**0.00161 J**	**0.109**	<0.00050
MW-2	5/22/08	<0.18	<0.18	<0.18	**0.00230 J**	**0.122**	<0.00050
MW-3	5/22/08	<0.19	<0.19	<0.19	<0.00050	**0.214**	<0.00050

Notes: Only those Total Metals detected in at least one groundwater sample are included.
BOLD results indicate concentrations above the laboratory sample detection limit.
BOLD and SHADED results exceed the indicated Critical PCL.

Critical PCL - Tier 1 protective concentration level (PCL) for a residential site with a 0.5-acre source.
J - constituent was detected at a concentration bewteeen the SDL and the method quantitation limit (MQL) and the concentration is an estimated value.
< - not detected at concentrations above the sample detection limit (SDL)
----- - constituent not analyzed OR PCL not applicable
TCEQ - Texas Commission on Environmental Quality
EPA - Environmental Protection Agency
TPH - total petroleum hydrocarbons

TABLE F7 - Arsenic

TRRP TIER 2 PCL
CALCULATION OF ^{GW}SOIL CONCENTRATION

Site:	Block 39		feet	cm
Sample:	SB-2	Depth to achieve PCL conc. (L1):	4	121.92
pH:	7.87	Depth to gw from surface (L2):	22	673.608

Equation:

$$^{GW}SOIL = \frac{(\text{Groundwater PCL})(LDF) * L2}{K_{sw} * L1}$$

$$K_{sw} = \frac{Roe_b}{K_d Roe_b + theta_{ws} + theta_{as} H'}$$

Where:

Site Specific		K_{sw}=	soil leachate partition factor [mg/L-water/mg/Kg-soil]	
350.73(e)(1)(C)	Add Below	K_d	soil water partition coefficient [cm^3-water / g-soil] -pH specific	$[K_d = K_{oc} * f_{oc}]$
Tier 1 default	1.67	Roe_b	dry bulk soil density [g-soil/cm^3-soil]	
Tier 1 default	0.160	$theta_{ws}$	water content [cm^3/cm^3]	
Tier 1 default	0.210	$theta_{as}$	air filled porosity [cm^3/cm^3]	
350.73(e)	Add Below	H'	dimensionless Henry's Law constant [-]	
Site Specific	Add Above	L2	Depth from top of affected soil to groundwater table (cm)	
Site Specific	Add Above	L1	Thickness of affected soil (cm)	

Chemical	Henry's Law constant	Kd	Residential Groundwater PCL	K_{sw}=	LDF= 20 (0.5acre) 10 (30-acre)	L1	L2	L2/L1	TIER2^{GW}SOIL=
Arsenic	0.00E+00	31	0.010	3.22E-02	20.000	121.920	673.608	5.525	34.4

TABLE F7 - Barium

TRRP TIER 2 PCL
CALCULATION OF ^{GW}SOIL CONCENTRATION

Site:	**Block 39**		feet	cm
Sample:	**TSP-1**	Depth to achieve PCL conc. (L1):	1	30.48
pH:	**7.87**	Depth to gw from surface (L2):	1	30.48

Equation:

$$^{GW}SOIL = \frac{(\text{Groundwater PCL})(LDF) * L2}{K_{sw} * L1}$$

$$K_{sw} = \frac{Roe_b}{K_d Roe_b + theta_{ws} + theta_{as} H'}$$

Where:

Site Specific		**K_{sw}=**	**soil leachate partition factor [mg/L-water/mg/Kg-soil]**
350.73(e)(1)(C)	**Add Below**	**K_d**	**soil water partition coefficient [cm^3-water / g-soil] -pH specific**
Tier 1 default	**1.67**	**Roe_b**	**dry bulk soil density [g-soil/cm^3-soil]**
Tier 1 default	**0.160**	**$theta_{ws}$**	**water content [cm^3/cm^3]**
Tier 1 default	**0.210**	**$theta_{as}$**	**air filled porosity [cm^3/cm^3]**
350.73(e)	**Add Below**	**H'**	**dimensionless Henry's Law constant [-]**
Site Specific	**Add Above**	**L2**	**Depth from top of affected soil to groundwater table (cm)**
Site Specific	**Add Above**	**L1**	**Thickness of affected soil (cm)**

[$K_d = K_{oc} * f_{oc}$]

Chemical	Henry's Law constant	Kd	Residential Groundwater PCL	K_{sw}=	LDF= 20 (0.5acre) 10 (30-acre)	L1	L2	L2/L1	TIER2^{GW}SOIL=
Barium	0.00E+00	52	2.000	1.92E-02	20.000	30.480	30.480	1.000	2083.83

TABLE F7 - Lead

TRRP TIER 2 PCL
CALCULATION OF ^{GW}SOIL CONCENTRATION

Sample:	**Block 39**		feet	cm
Sample:	**SB-2**	Depth to achieve PCL conc. (L1):	1	30.48
pH:	**7.87**	Depth to gw from surface (L2):	1	30.48

Equation:

$$^{GW}SOIL = \frac{(\text{Groundwater PCL})(LDF) * L2}{K_{sw} * L1}$$

$$K_{sw} = \frac{Roe_b}{K_d Roe_b + theta_{ws} + theta_{as} H'}$$

Where:

Site Specific		**K_{sw}=**	**soil leachate partition factor [mg/L-water/mg/Kg-soil]**	
350.73(e)(1)(A)	**Add Below**	**K_d**	**soil water partition coefficient [cm^3-water / g-soil] -pH specific**	*[$K_d = K_{oc} * f_{oc}$]*
Tier 1 default	**1.67**	**Roe_b**	**dry bulk soil density [g-soil/cm^3-soil]**	
Tier 1 default	**0.160**	**$theta_{ws}$**	**water content [cm^3/cm^3]**	
Tier 1 default	**0.210**	**$theta_{as}$**	**air filled porosity [cm^3/cm^3]**	
350.73(e)	**Add Below**	**H'**	**dimensionless Henry's Law constant [-]**	
Site Specific	**Add Above**	**L2**	**Depth from top of affected soil to groundwater table (cm)**	
Site Specific	**Add Above**	**L1**	**Thickness of affected soil (cm)**	

Chemical	**Henry's Law constant**	**Kd**	**Residential Groundwater PCL**	**K_{sw}=**	**LDF= 20 (0.5acre) 10 (30-acre)**	**L1**	**L2**	**L2/L1**	**TIER2^{GW}SOIL=**
Lead	0.00E+00	1830	0.015	5.46E-04	20.000	30.480	30.480	1.000	549.0

TABLE F7 - Mercury

TRRP TIER 2 PCL
CALCULATION OF ^{GW}SOIL CONCENTRATION

Site:	**Block 39**		feet	cm
Sample:	**SB-2**	Depth to achieve PCL conc. (L1):	1	30.48
pH:	**7.87**	Depth to gw from surface (L2):	1	30.48

Equation:

$$^{GW}SOIL = \frac{(Groundwater\ PCL)(LDF) * L2}{K_{sw} * L1}$$

$$K_{sw} = \frac{Roe_b}{K_d Roe_b + theta_{ws} + theta_{as} H'}$$

Where:

Site Specific		K_{sw}=	**soil leachate partition factor [mg/L-water/mg/Kg-soil]**	
350.73(e)(1)(C)	**Add Below**	K_d	**soil water partition coefficient [cm^3-water / g-soil] -pH specific**	*[$K_d = K_{oc} * f_{oc}$]*
Tier 1 default	**1.67**	Roe_b	**dry bulk soil density [g-soil/cm^3-soil]**	
Tier 1 default	**0.160**	$theta_{ws}$	**water content [cm^3/cm^3]**	
Tier 1 default	**0.210**	$theta_{as}$	**air filled porosity [cm^3/cm^3]**	
350.73(e)	**Add Below**	H'	**dimensionless Henry's Law constant [-]**	
Site Specific	**Add Above**	L2	**Depth from top of affected soil to groundwater table (cm)**	
Site Specific	**Add Above**	L1	**Thickness of affected soil (cm)**	

Chemical	**Henry's Law constant**	**Kd**	**Residential Groundwater PCL**	**K_{sw}=**	**LDF= 20 (0.5acre) 10 (30-acre)**	**L1**	**L2**	**L2/L1**	**TIER2^{GW}SOIL=**
Mercury	4.74E-01	190	0.002	5.26E-03	20.000	30.480	30.480	1.000	7.61

APPENDIX G – PLUME STABLILITY

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.

Separate onsite and offsite COC groundwater plumes and sources of impact are supported by the observed stratigraphy, COC concentrations, groundwater flow direction, a MIP Survey, and identified offsite sources. Discussions supporting separate onsite and offsite groundwater plumes are presented in Appendix J. *Since the offsite affected groundwater plume is not associated with an on-site source and not included in the designated MSD site, there is no further discussion of the offsite groundwater plume in this MSD Application. However, the concentrations of the COCs in the offsite groundwater plume are included in Tables F5 and F6 and on Figure 5B-1 for informational purposes. The offsite VOC concentrations in the groundwater also do not exceed Non-Ingestion PCLs..*

The onsite groundwater plume has been delineated horizontally and vertically to ingestion PCLs. The groundwater plume is considered stable or decreasing and the COCs are undergoing dechloronization. The onsite sources of contamination have not been present for between 30 and 40 years. The changes in COC concentrations observed in the groundwater are a result of seasonal fluctuations in groundwater levels (a severe drought between 2010 and 2011 resulted in an approximate four foot decrease in overall water levels) and dechloronization and bioremediation processes which affect groundwater chemistry. The attached concentration vs time graphs (Graphs G1, G2, and G3) show the trends for each COC in the onsite plume with exceedences

Consecutive groundwater monitoring events between 2008 and 2012 of MW-1 and MW-4 indicated the concentrations of the parent COC (TCE) are decreasing, which can result in corresponding temporary concentration increases in associated daughter products (e.g., 1,1-DCE and cis-1,2-DCE). The 1,1-DCE and cis-1,2-DCE concentrations in MW-1 and MW-4 are relatively stable; although, a slight increase in concentrations correlates to the corresponding decrease in TCE concentrations (Graphs G1 and G2). TCE, 1,1-DCE, and cis-1,2-DCE are currently not detected in the surrounding downgradient and crossgradient monitoring wells (MW-2, MW-3, MW-5, MW-6, MW-8, and MW-9).

The 1,2-DCA concentrations detected in MW-12 are decreasing over time and the current concentration of 0.0059 mg/l barely exceeds the Ingestion PCL of 0.005 mg/l (Graph G3).

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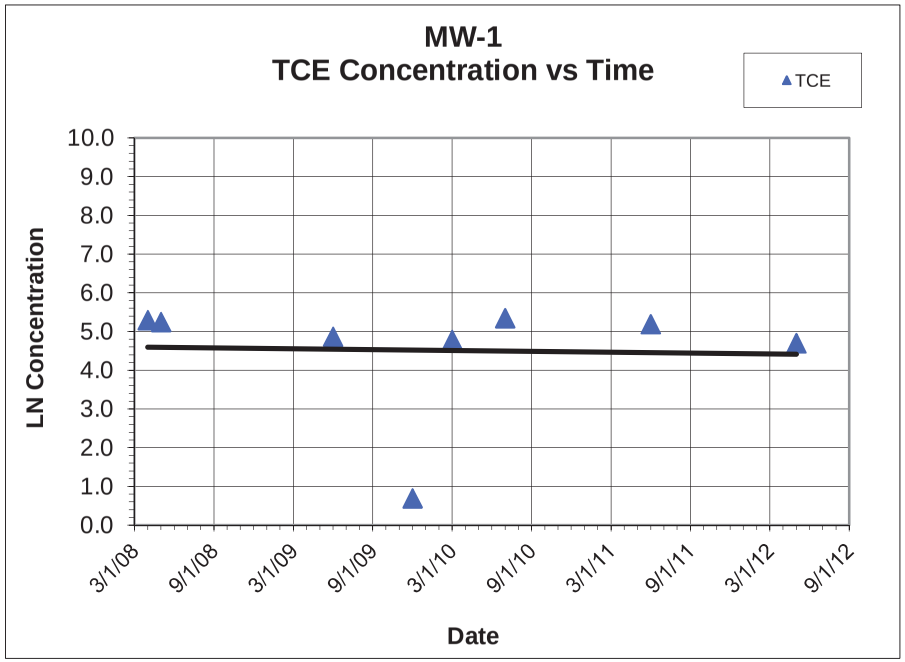
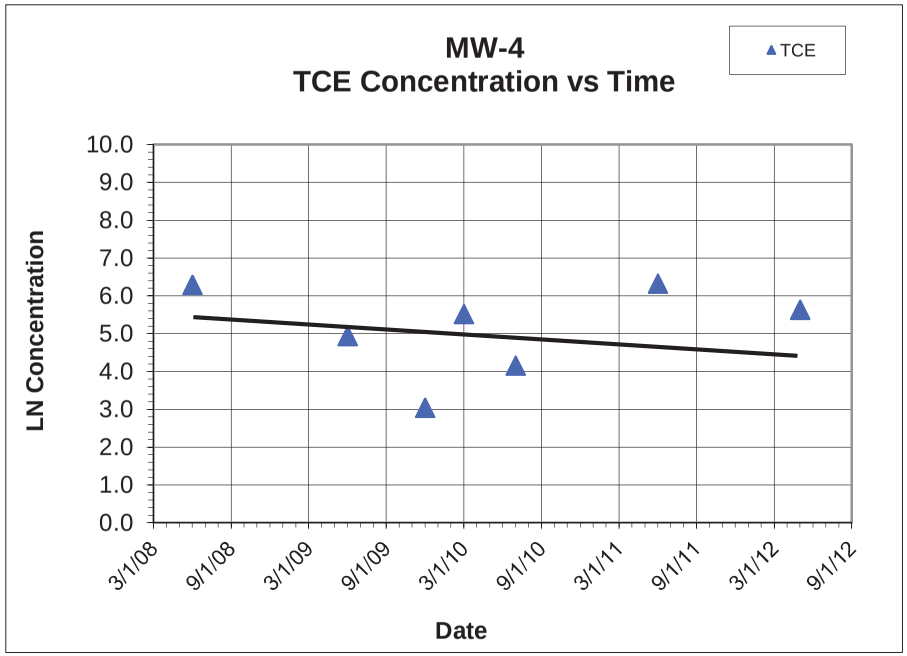
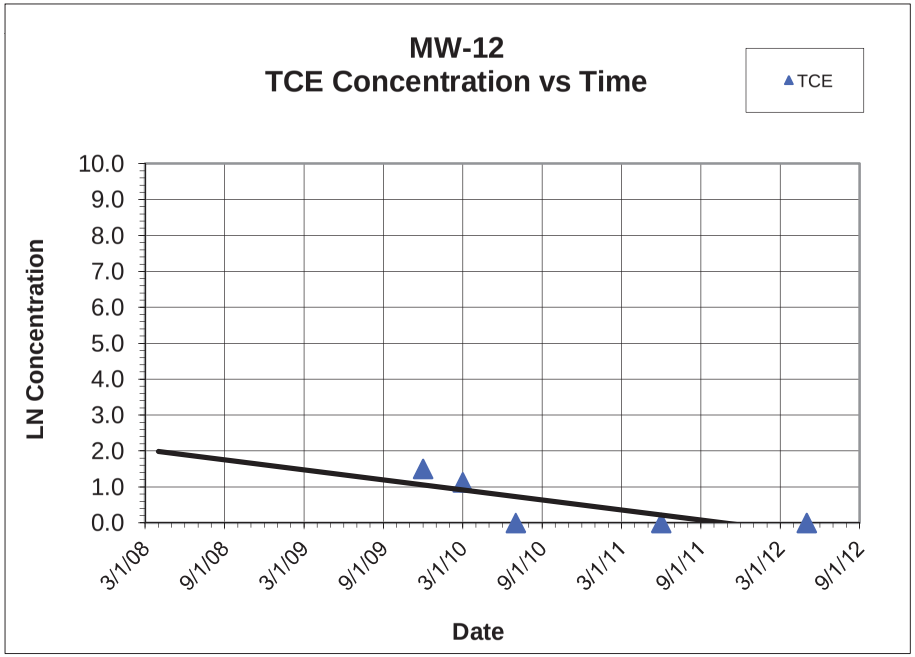
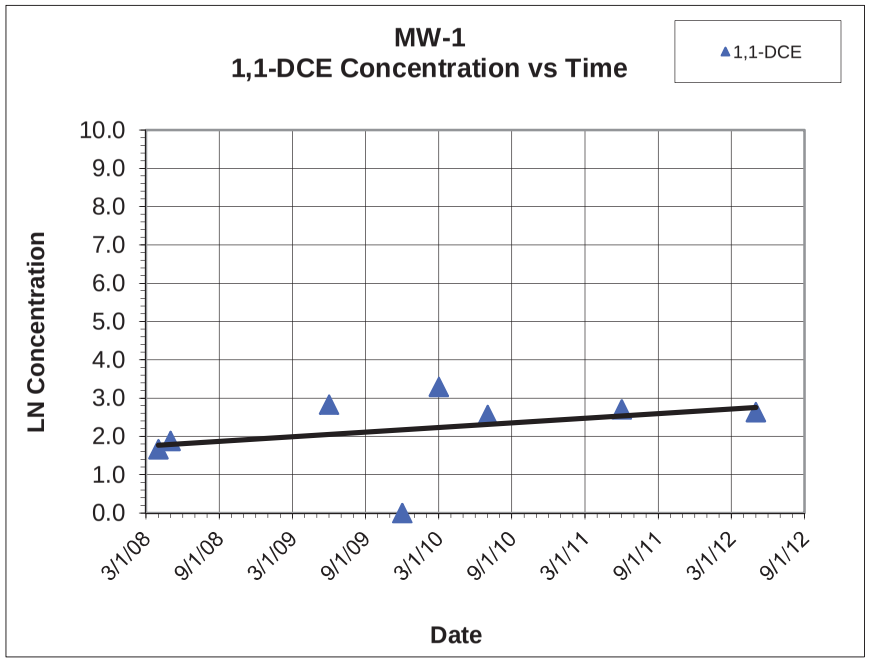
APPENDIX G - GRAPH G1
TCE Concentrations vs Time

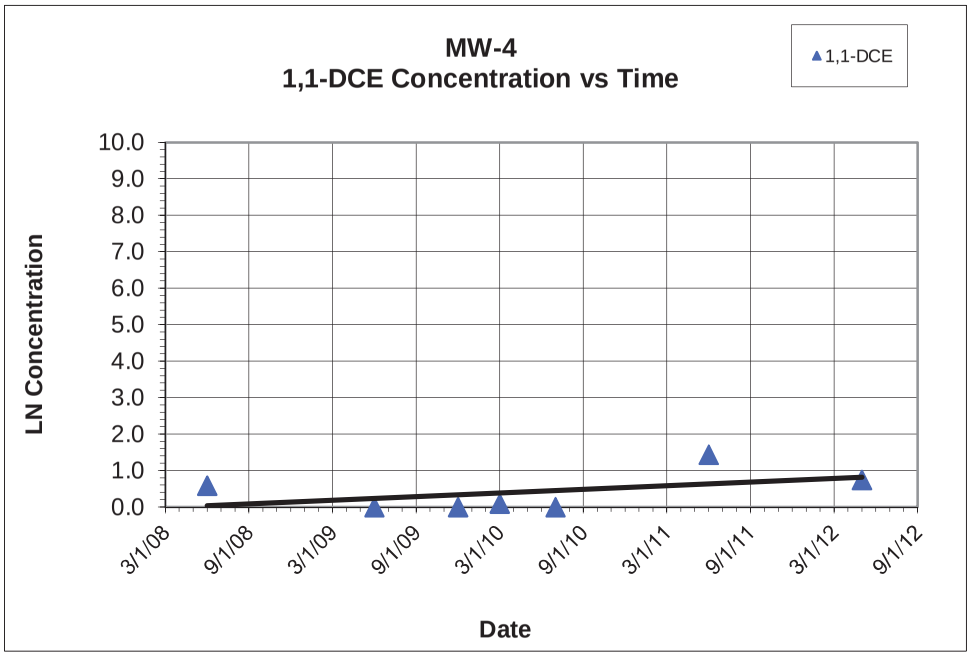


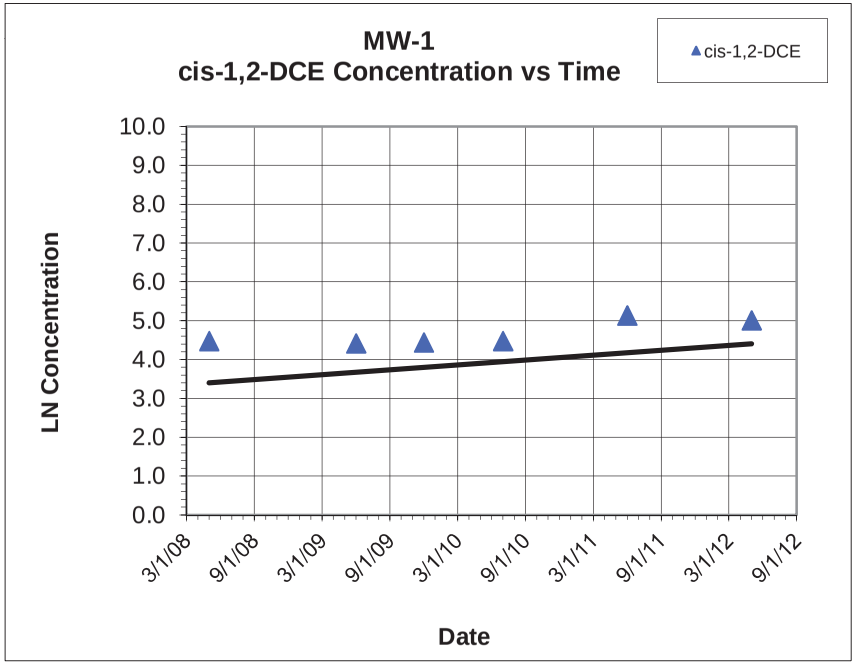


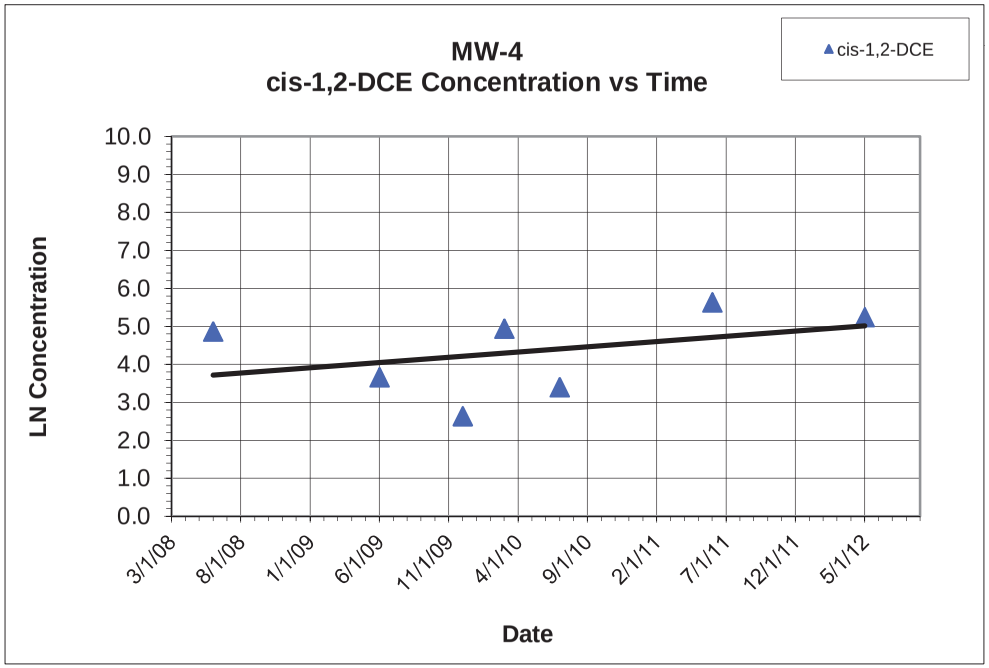
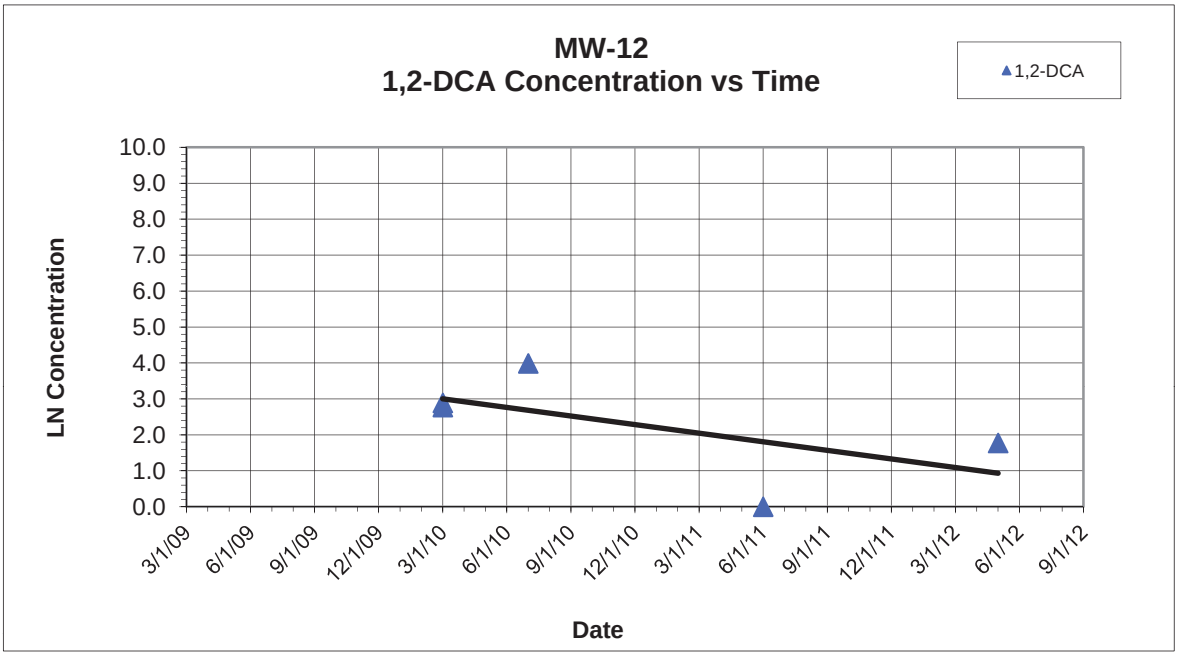


APPENDIX G - GRAPH G2
1,1-DCE and cis-1,2-DCE Concentrations vs Time









APPENDIX G - GRAPH G3
1,2-DCA Concentrations vs Time