

**CORRECTIVE ACTION PLAN**

**East Decatur Greenway  
890 Columbia Drive  
Decatur, DeKalb County, Georgia**

Prepared for:

**East Decatur Greenway  
890 Columbia Drive  
Decatur, Georgia**

And

**U.S. Environmental Protection Agency  
Region IV**

Prepared by:

**Environmental Technology Resources, Inc.  
4780 Ashford Dunwoody Road  
Suite A-456  
Atlanta, Georgia 30338**

August 2015

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**East Decatur Greenway**  
**890 Columbia Drive**  
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**Prepared by:**  
**Environmental Technology Resources, Inc.**  
**4780 Ashford Dunwoody Road**  
**Suite A-456**  
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August 2015

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**CORRECTIVE ACTION PLAN**  
**East Decatur Greenway**  
**890 Columbia Drive**  
**Decatur, DeKalb County, Georgia**

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## 1.0 INTRODUCTION

### 1.1 Background Information

The “Site” or “subject property” is located at 890 Columbia Drive in Decatur, DeKalb County, Georgia. The property is located in unincorporated Decatur. The central business center of the City of Decatur is located approximately 1.5 miles to the northwest. A Site Location Map is included as Figure 1.

The subject property includes approximately 1.1 acres of land. The property is bordered by The Friends School of Atlanta to the north, residential homes to the east and Columbia Drive to the west. West of Columbia Drive are residential properties. The East Fork of the Middle Branch of Shoal Creek is located along the eastern boundary of the property. Much of the property is considered to be located within the 100-year floodplain. The limits of the floodplain are identified in the survey. A copy of the property survey is included as Figure 2. It should be noted that the Site Survey only includes the property at 890 Columbia Drive. The subject property also includes two adjacent tracts of land totaling 0.0305 acres located to the north.

The subject property was originally developed as a gasoline station in the 1940’s and was operational until it was abandoned in 1999. The gasoline station utilized three 8,000-gallon underground storage tanks and two dispenser islands to store and dispense fuel. In February 1997, the Georgia Environmental Protection Division (EPD) – Underground Storage Tank Management Program (USTMP) received a release notification from the property owner. The Georgia EPD subsequently issued a letter to the owner of the property requesting the completion of a Corrective Action Plan (CAP) Part A. Although groundwater monitoring wells were installed, a CAP Part A was not submitted to the Georgia EPD.

Phase II Environmental Site Assessments were completed on the property in 2007 and 2012. In 2007, ETRI completed a Phase II Environmental Site Assessment which included the installation of four soil borings. Soil and groundwater sample analyses determined that Benzene, Toluene and Ethylbenzene were detected at concentrations exceeding applicable Georgia EPD USTMP soil thresholds. In addition, groundwater samples were found to contain Benzene above applicable Georgia EPD USTMP In-Stream groundwater quality standards.

In 2012, Tetra Tech was tasked by EPA to complete a Phase I and Phase II ESA on the property. The Phase II included the collection of subsurface soil, groundwater, sediment and surface water samples. Petroleum contamination above Georgia EPD USTMP threshold concentrations was detected in soil and groundwater.

Tetra Tech subsequently completed the closure of underground storage tanks in 2012. Three 8,000-gallon tanks, approximately 75 feet of piping and two dispenser islands were removed. In addition, Tetra Tech removed approximately 318 cubic yards of petroleum contaminated soil from the site.

Soil samples collected from the site during and after the UST and soil removal determined that Benzene was detected beneath the UST system at concentrations ranging from 0.076 mg/Kg to 28 mg/Kg. Ethylbenzene was detected beneath the UST system at concentrations ranging from 0.037 mg/Kg to 180 mg/Kg and Toluene was detected at concentrations ranging from 0.16 mg/Kg to 210 mg/Kg.



Source: Freshlogicstudios.com

**ETRI**

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Suite A-456  
Atlanta, Georgia 30338  
Scale: Noted

**FIGURE 1**  
**SITE LOCATION MAP**  
890 Columbia Drive  
Decatur, Georgia

Project No. 13-148

**CLOSURE STATEMENT**

THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS AN ANGULAR ERROR OF 3 SECONDS PER ANGLE POINT AND A PRECISION RATIO OF 1 IN 96,000. IT HAS BEEN ADJUSTED USING THE COMPASS RULE.

THE DATA SHOWN ON THIS PLAT HAS A CLOSURE PRECISION RATIO OF 1 IN 146,516.

**GENERAL NOTES**

EQUIPMENT USED TO OBTAIN THESE MEASUREMENTS WAS A SOKKIA SETS 30R3.

ALL I.P.'s ARE 3/8" REBARs UNLESS OTHERWISE NOTED.

ALL MATTERS OF TITLE EXCEPTED.

THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE SEARCH. THERE MAY BE EASEMENTS OR OTHER ENCUMBRANCES THAT ARE NOT SHOWN.

BEARINGS ARE BASED ON ANGLES TURNED FROM A SINGLE MAGNETIC OBSERVATION.

\*PER DEED AND PLAT RECORDS, NO MONUMENT FOUND.

BY GRAPHIC PLOTTING ONLY, A PORTION OF THIS SITE IS WITHIN THE LIMITS OF A 100 YR. FLOOD HAZARD AREA (ZONE "AE") AS PER F.U.R.M. DEKALB COUNTY, GEORGIA AND INCORPORATED AREAS, COMMUNITY PANEL NO. 13089C 0069 H (DATED MAY 7, 2001).

THE SURVEY AND PLAT SHOWN HEREON IS NOT INTENDED FOR USE OR RELIANCE BY ANY PARTIES OR ENTITIES NOT SPECIFICALLY LISTED IN THE TITLE. UNAUTHORIZED THIRD PARTIES SHALL INDEMNIFY AND HOLD GUNNIN LAND SURVEYING, LLC HARMLESS AGAINST ANY AND ALL LIABILITY FOR ANY LOSS ARISING OUT OF, OR RELATED TO, RELIANCE BY ANY THIRD PARTY ON ANY WORK PERFORMED THEREUNDER, OR THE CONTENTS OF THE SURVEY.

ABOVE GROUND UTILITY LOCATIONS WERE OBTAINED FROM FIELD OBSERVATIONS. UNDERGROUND UTILITIES CROSSING OR SERVING THE PREMISES MAY EXIST THAT ARE NOT SHOWN.

STREET ADDRESS: 890 COLUMBIA DRIVE

ADDITIONAL REFERENCES:

1. DB 11500, PG. 376;
2. DB 20389, PG. 681;
3. PLAT OF THE PROPERTY OF HOOD OIL COMPANY PREPARED BY W.L. MORROW DATED AUGUST 17, 1956;
4. DB 1530, PG. 160.



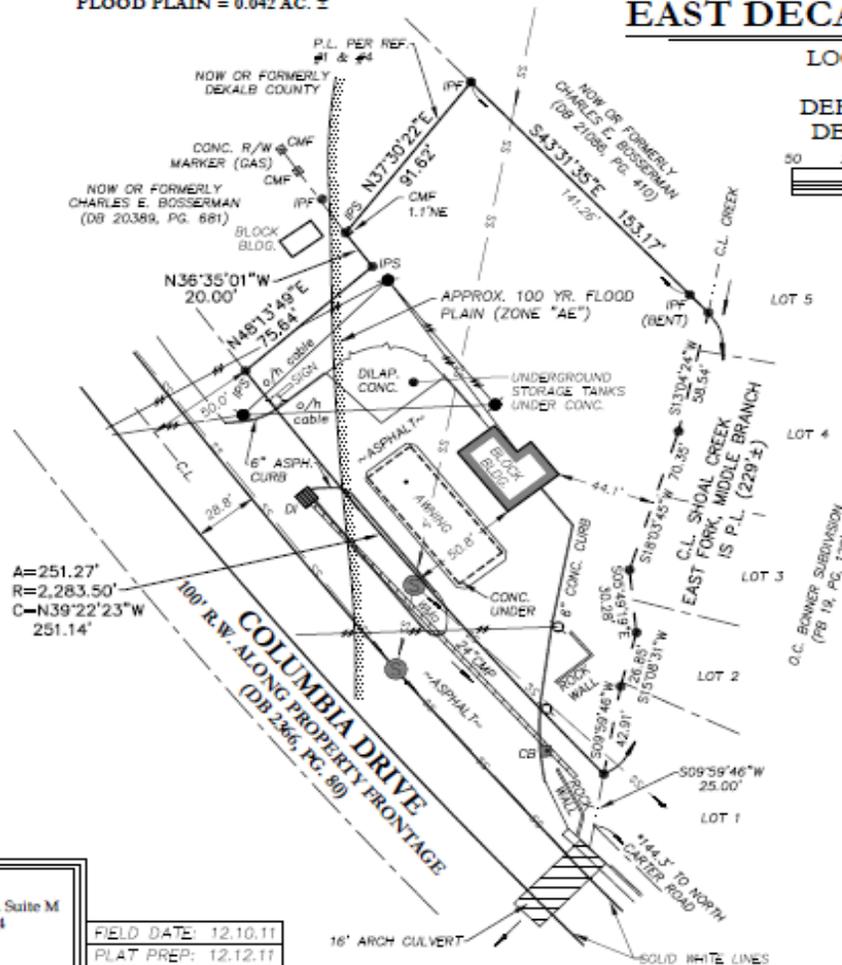
270 E Main Street, Suite M  
Canton, GA 30114  
Tel: 678.890.7502  
Fax: 678.609.4731

FIELD DATE: 12.10.11  
PLAT PREP: 12.12.11  
PROJ. NO.: 11041

**TOTAL AREA = 0.795 AC. ±**  
**AREA OUTSIDE APPROX. 100 YR. FLOOD PLAIN = 0.042 AC. ±**

**BOUNDARY SURVEY FOR EAST DECATUR GREENWAY INC.**

LOCATED IN LAND LOT 216  
15th DISTRICT  
DEKALB COUNTY, GEORGIA  
DECEMBER 10, 2011 1"=50'



**LEGEND**

IPF	1/2" REBAR FND.
IPS	1/2" REBAR SET
R.W.	RIGHT OF WAY
SSE	SANITARY SEWER EASEMENT
DE	DRAINAGE EASEMENT
L.L.	LAND LOT LINE
C.L.	CENTERLINE
CMF	CORRUGATED METAL PIPE
RCF	REINFORCED CONCRETE PIPE
DI	DROP INLET
WM	WATER METER
MH	SANITARY SEWER MANHOLE
CB	CATCH BASIN
PP	POWER POLE
LP	LIGHT POLE
EM	ELECTRIC METER
FH	FIRE HYDRANT
WV	WATER VALVE
B.C.	BACK OF CURB
E.P.	EDGE OF PAVEMENT
O.H.	OVERHEAD ELEC. SERVICE LINE
B.L.	BUILDING LINE
CMF	CONCRETE MONUMENT FOUND
SS	SANITARY SEWER LINE
GLM	GAS LINE MARKER

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Source Gunnin I

Project No.	Scale	Date
13-148	Not to Scale	8-9-2013

**FIGURE 2**  
**SITE SURVEY**  
890 Columbia Drive  
Decatur, Georgia

Total Xylenes have been detected at concentrations ranging from 0.03 mg/Kg to 900 mg/Kg and total petroleum hydrocarbons – gasoline range organics (TPH-GRO) at concentrations from 3.3 mg/Kg to 8,300 mg/Kg.

Additional soil, groundwater, sediment and surface water samples were collected on and around the EDG site in 2012. Three additional soil borings were installed on the property as part of these additional investigations. Soil samples collected from borings were found to contain Benzene at levels ranging from 0.084 mg/Kg to 0.93 mg/Kg. One soil sample that was collected from a boring located underneath the former convenience store was found to have a concentration of Benzene of greater than 0.5 mg/Kg.

Groundwater samples were collected from existing monitoring wells on the property. Benzene was detected in groundwater at concentrations of 0.051 mg/L to 23 mg/L. Ethylbenzene was detected at levels of 1.4 mg/L to 3.6 mg/L. One of the monitoring wells was found to contain Toluene at 1.0 mg/L and total Xylenes of 10.8 mg/L.

BTEX and TPH-GRO were not detected in sediment samples collected from the East Fork of the Middle Branch of Shoal Creek. Toluene was detected at 1.9 J ug/Kg in a downstream sediment sample and 4.1 J ug/Kg in a duplicate downstream sediment sample. Surface water samples were not detected at concentrations exceeding their reporting limits in the surface water samples collected from the East Fork of the Middle Branch of Shoal Creek.

East Decatur Greenway (EDG) acquired the subject property on November 6, 2012. Prior to acquiring the property, EDG filed for a limit of liability protection under the Georgia Brownfield Act. A provisional limit of liability was issued to East Decatur Greenway by the Georgia EPD prior to the acquisition of the property.

## **1.2 Constituents of Concern and Cleanup Levels**

Based on the prior use of the property and previous soil and groundwater investigations, the constituents of concern have been identified as Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), Polyaromatic Hydrocarbons and Lead. Testing that was completed in July 2015 determined that the primary contaminants of concern that exceed Type 1 and 3 RRS include Benzene, Toluene and Xylenes. One sample was found to have various PAHs that exceed Type 1 and 3 RRS.

The EDG property is a non-residential property, thus Type 3 and 4 criteria would be applicable to the site. If practical, EDG will pursue Type 1 RRS for soils. Table 1 is a summary of the soil cleanup standards that will apply to the EDG site.

**Table 1**  
**Soil Cleanup Levels**  
 EDG Site, Decatur, Georgia

<b>Parameter</b>	<b>Type 1 / 3 Risk Reduction Standard, Soil</b>
Benzene	0.5 / 0.5
Toluene	100 / 100
Ethylbenzene	70 / 70
m, p-Xylenes	1,000 / 1,000
o-Xylenes	20 / 20
<i>PAHs</i>	
Acenaphthene	300 / 1,257
Anthracene	400 / 20,186
Benzo (a) anthracene	5 / 27.75
Benzo (b) fluoranthene	5 / 78.4
Benzo (a ) pyrene	1.64 / 7.84
Benzo (g,h,i) perylene	500 / 500
Benzo (k) fluoranthene	5 / 783
Chrysene	5 / 2,831
Dibenzo (a,h) anthracene	2.04 / 7,840
Fluoranthene	500 / 9,083
Fluorene	360 / 1,514
Ideno (1,2,3-c) pyrene	5 / 78.4
Naphthalene	100 / 100
Phenanthrene	110 / 110
Pyrene	500 / 6,676
<i>Metals</i>	
Lead	75 / 400

Note: Values in mg/Kg

Type 3 RRS Source: Project Jasper Property, Oasis Consulting, May 2014

## 2.0 SOIL CHARACTERIZATION

### 2.1 Results of Additional Soil Characterization

On July 10, 2015, additional investigations were completed in order to obtain a volumetric estimate of soils that require corrective actions. The sampling was conducted in accordance with an approved QAPP and a project specific Sampling and Analysis Plan (SAP).

Nineteen soil borings were installed to a depth where groundwater is encountered (15 feet). In areas where soil has been removed, samples were collected below the clean backfill areas.

The soil samples were initially screened for total volatile organic compounds using a Photoionization Detector (PID). Samples from each boring were selected for analyses based on PID readings, odors and discoloration. The soil samples were analyzed for the presence of Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), polyaromatic hydrocarbons (PAHs) and total lead. Analytical Environmental Services, Inc. of Atlanta, Georgia performed the sample analyses.

The results of the sample analyses are summarized in Table 2. Samples that exceed risk reduction standards are highlighted in bold. The soil boring locations and results of the sample analyses are shown in Figure 3. Detailed soil boring location maps for the former tank pit and dispenser island areas are included in Figures 4 and 5. The Benzene concentrations and other parameters that exceed risk reduction standards are included in these figures.

The results of the additional investigations determined the following:

- None of the soil samples had concentrations of total Lead that exceed Type 3 Risk Reduction Standards. Two of the soil samples were found to have concentrations of Lead that were above Type 1 RRS but below Type 3 RRS. Due to the Benzene concentrations in these soils, they will be excavated and removed during corrective actions.
- With the exception of one sample (GPB18-3-5 ft.), the concentrations of PAHs do not exceed Type 1 or Type 3 RRS.
- The highest concentrations of Benzene, Toluene and Ethylbenzene are found in soils approximately 11 to 13 feet below ground surface. The depth to groundwater at the EDG site is 14.5 to 15 feet below ground surface.

**Table 2**  
**Summary of Soil Sample Analyses – July 10, 2015**  
 EDG  
 890 Columbia Drive, Decatur, Georgia

Parameter	GPB1-6-7 ft.	GPB1-11-13 ft.	GPB2-12-14 ft.	GPB3-12-14 ft.	GPB4-8-10 ft.	GPB4-12-14 ft.	GPB5-8-10 ft.	Type 1 / 3 RRS
<i>VOC's</i>								
Benzene	0.04	0.11	<b>0.81</b>	BRL	BRL	BRL	BRL	0.5 / 0.5
Toluene	0.0021	0.4	3.6	BRL	0.64	74	BRL	100 / 100
Ethylbenzene	0.0057	2.3	38	38	62	<b>91</b>	BRL	70 / 70
m&p Xylene	0.036	8.5	110	110	210	360	0.0012	1,000 / 1,000
o-Xylene	0.0016	2.8	<b>27</b>	5.0	9.2	<b>140</b>	BRL	20 / 20
<i>PAH's</i>	BRL							
1-Methylnaphthalene	BRL	BRL	15	7.9	7.9	16	7.9	NR
2-Methylnaphthalene	BRL	0.45	31	16	16	34	16	NR
Naphthalene	BRL	BRL	29	12	12	33	12	100 / 100
<i>Metals</i>								
Lead	21.7	20.7	23.9	39.5	21.9	22.7	22.4	75 / 400

Parameter	GPB5-11-13 ft.	GPB6-3-5 ft.	GPB6-11-13 ft.	GPB7-8-10 ft.	GPB7-11-13 ft.	GPB8-8-10 ft.	GPB8-11-13 ft.	Type 1 / 3 RRS
<i>VOC's</i>								
Benzene	0.0028	0.063	<b>11.0</b>	<b>3.8</b>	<b>12.0</b>	<b>1.3</b>	<b>27</b>	0.5 / 0.5
Toluene	0.0064	0.0025	<b>210</b>	1.3	48	0.083	<b>210</b>	100 / 100
Ethylbenzene	0.26	0.0081	<b>140</b>	<b>110</b>	<b>120</b>	0.73	<b>110</b>	70 / 70
m&p Xylene	1.3	0.55	520	110	410	0.89	440	1,000 / 1,000
o-Xylene	0.38	0.1	<b>180</b>	1.4	<b>140</b>	0.073	160	20 / 20
<i>PAH's</i>		BRL				BRL		
1-Methylnaphthalene	1.5	BRL	14	16	14	BRL	15	NR
2-Methylnaphthalene	2.8	BRL	31	30	29	BRL	33	NR
Naphthalene	BRL	BRL	32	25	28	BRL	36	100 / 100
<i>Metals</i>								
Lead	25.0	18.2	28.6	22.5	26.8	27.6	20.6	75 / 400

**Table 2**  
**Summary of Soil Sample Analyses – July 10, 2015**  
 EDG  
 890 Columbia Drive, Decatur, Georgia

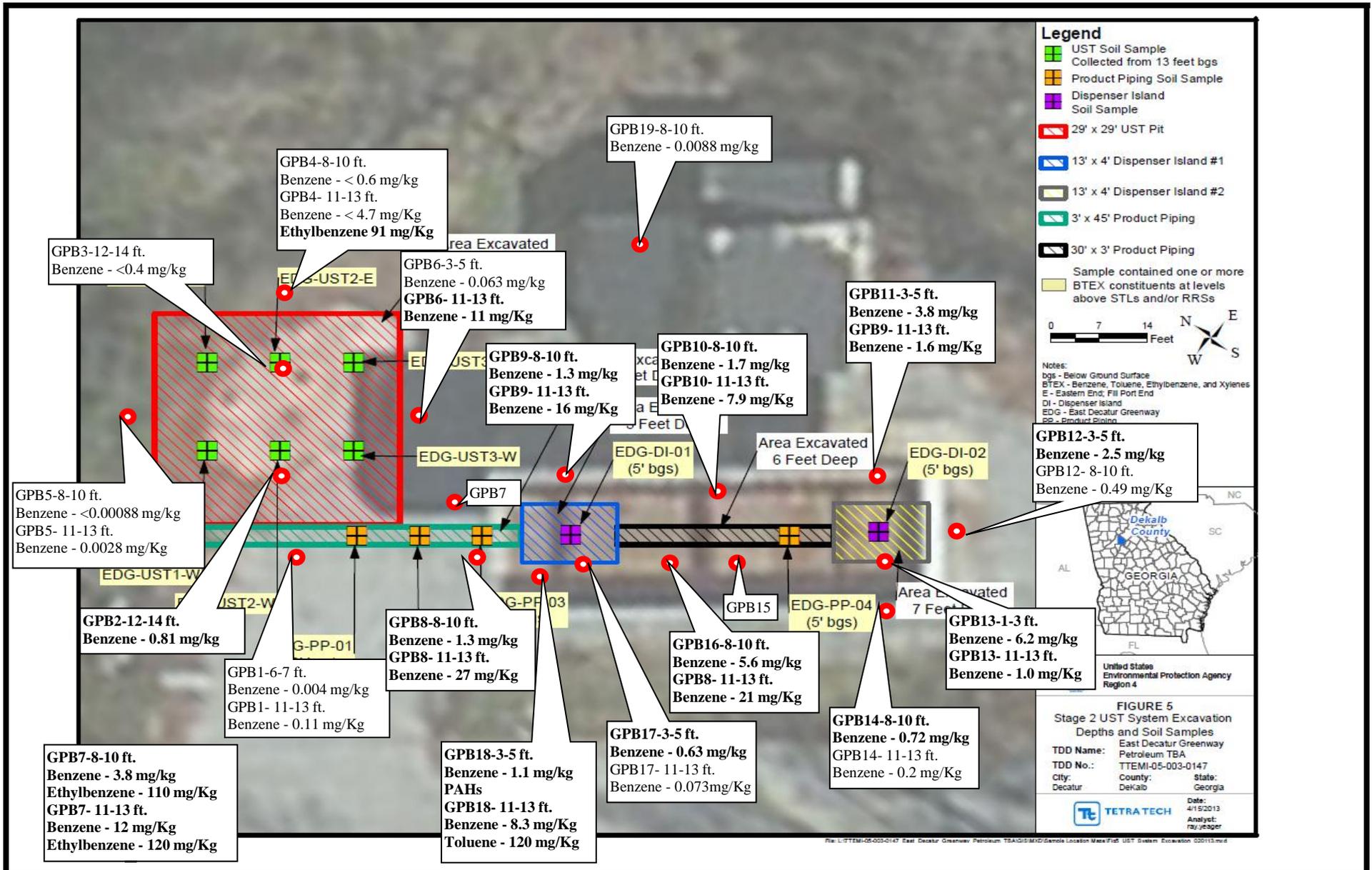
Parameter	GPB9-8-10 ft.	GPB9-11-13 ft.	GPB10-8-10 ft.	GPB10-11-13 ft.	GPB11-3-5 ft.	GPB11-10-11 ft.	GPB12-3-5 ft.	Type 1 / 3 RRS
<i>VOC's</i>								
Benzene	<b>1.3</b>	<b>16.0</b>	<b>1.7</b>	<b>7.9</b>	<b>3.8</b>	<b>1.6</b>	<b>2.5</b>	0.5 / 0.5
Toluene	0.024	2.7	0.0025	BRL	1.2	0.018	BRL	100 / 100
Ethylbenzene	0.1	<b>120</b>	0.1	9.4	0.65	1.8	20	70 / 70
m&p Xylene	0.14	280	0.042	11	1.1	0.14	1.6	1,000 / 1,000
o-Xylene	0.0079	<b>21</b>	0.0039	BRL	0.4	0.014	BRL	20 / 20
<i>PAH's</i>	BRL		BRL		BRL	BRL	BRL	
1-Methylnaphthalene	BRL	27	BRL	16	BRL	BRL	BRL	NR
2-Methylnaphthalene	BRL	59	BRL	30	BRL	BRL	BRL	NR
Naphthalene	BRL	65	BRL	0.5	BRL	BRL	BRL	100 / 100
<i>Metals</i>								
Lead	157	20.1	15.5	20.5	22.4	22.4	13.6	75 / 400

Parameter	GPB12-8-10 ft.	GPB13-1-3 ft.	GPB13-11-13 ft.	GPB14-8-10 ft.	GPB14-11-13 ft.	GPB16-8-10 ft.	GPB16-11-13 ft.	Type 1 / 3 RRS
<i>VOC's</i>								
Benzene	0.49	<b>6.2</b>	<b>1.0</b>	<b>0.72</b>	0.2	<b>5.6</b>	<b>21.0</b>	0.5 / 0.5
Toluene	0.012	50	0.0089	0.0058	0.0026	0.0049	BRL	100 / 100
Ethylbenzene	0.0026	63	2.1	0.049	0.47	9.0	<b>86.0</b>	70 / 70
m&p Xylene	0.096	310	3.8	0.048	0.022	0.54	63.0	1,000 / 1,000
o-Xylene	0.013	<b>85</b>	0.0065	0.0061	0.0018	0.05	BRL	20 / 20
<i>PAH's</i>	BRL		BRL	BRL	BRL	BRL		
1-Methylnaphthalene	BRL	1.7	BRL	BRL	BRL	BRL	15.0	NR
2-Methylnaphthalene	BRL	3.1	BRL	BRL	BRL	BRL	28.0	NR
Naphthalene	BRL	2.7	BRL	BRL	BRL	BRL	28.0	100 / 100
<i>Metals</i>								
Lead	12.3	30.0	14.5	19.4	12.7	15.1	21.5	75 / 400

**Table 2**  
**Summary of Soil Sample Analyses – July 10, 2015**  
 EDG  
 890 Columbia Drive, Decatur, Georgia

Parameter	GPB17- 3-5 ft.	GPB17- 11-13 ft.	GPB18- 3-5 ft.	GPB18- 11-13 ft.	GPB19- 8-10 ft.	Type 1 / 3 RRS
<i>VOC's</i>						
Benzene	<b>0.63</b>	0.073	<b>1.1</b>	<b>8.3</b>	0.0088	0.5 / 0.5
Toluene	0.047	0.086	0.046	<b>120.0</b>	0.00098	100 / 100
Ethylbenzene	0.42	0.26	1.1	60.0	BRL	70 / 70
m&p Xylene	0.35	0.85	3.1	250	0.0028	1,000 / 1,000
o-Xylene	0.039	0.36	0.24	<b>95</b>	BRL	20 / 20
<i>PAH's</i>		BRL		BRL	BRL	
Anthracene			0.4			500 / 20,186
Benzo(a)anthracene			4.8			5.0 / 27.75
Benzo(a)pyrene			<b>4.1</b>			1.64 / 78.4
Benzo(b)fluoranthene			<b>6.2</b>			5.0 / 78.4
Benzo(k)fluoranthene			1.7			5.0 / 7.84
Benzo(g,h,i) perylene			2.6			500 / 500
Chrysene			4.3			5.0 / 2,831
Dibenz(a,h)anthracene			0.9			5.0 / 7,840
Fluoranthene			6.5			500 / 9,083
Fluorene			0.048			360 / 1,514
Indeno(1,2,3-cd)pyrene			2.5			5.0 / 78.4
1-Methylnaphthalene	5.3		BRL	3.6		NR
2-Methylnaphthalene	3.5		BRL	7.7		NR
Naphthalene	6.5		BRL	7.1		100 / 100
Phenanthrene			0.55			110 / 110
Pyrene			5.4			500 / 6,676
<i>Metals</i>						
Lead	180	11.2	21.0	19.1	19.1	75 / 400

Notes: Results Reported in mg/Kg, ppm  
 BRL – Not Detected  
 NA – Not Analyzed  
 N/A – Not Applicable  
 NR – Not Regulated under HSRA



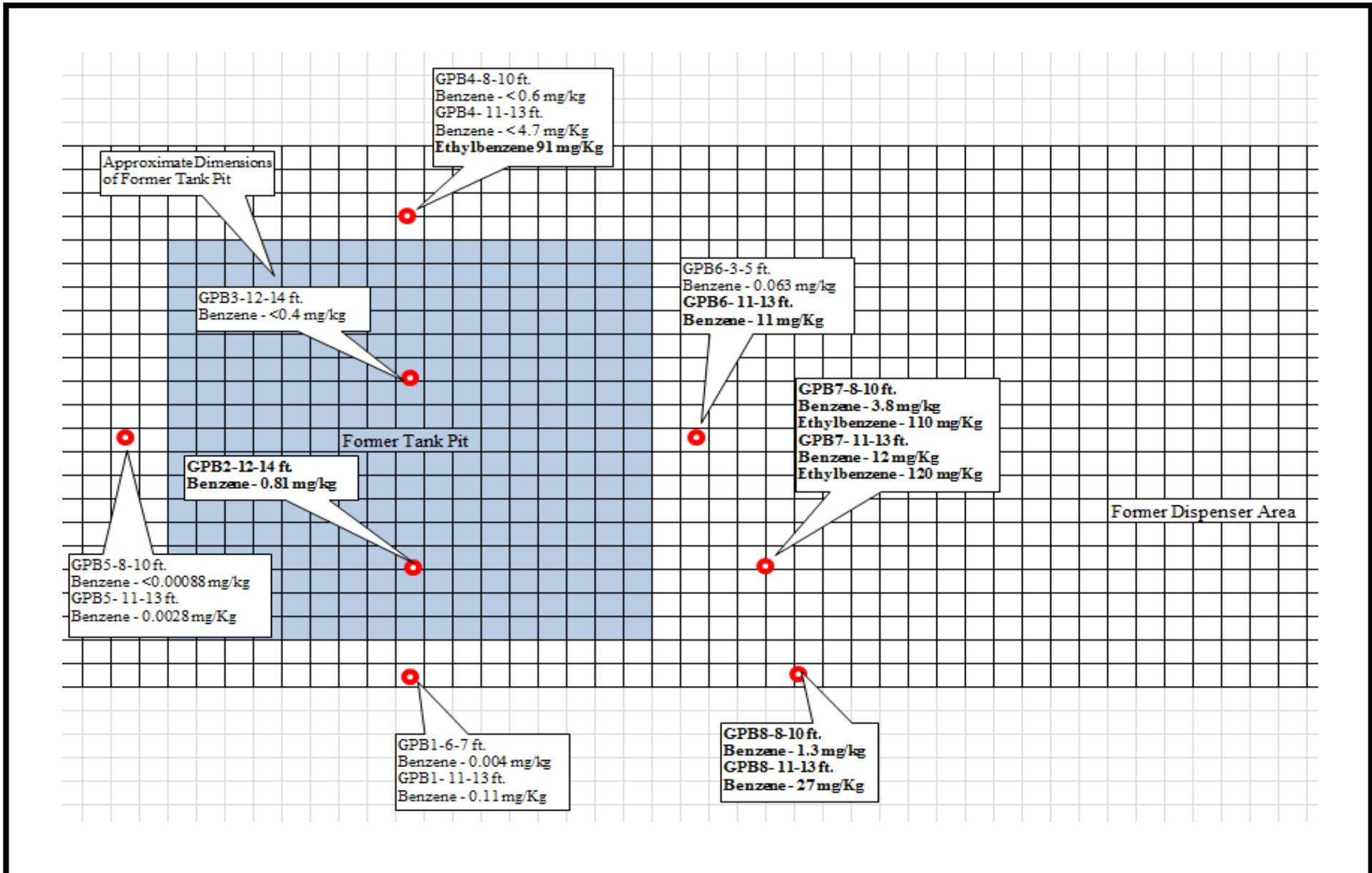
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● Soil Boring Location

Project No.	Scale	Date
13-148	Not to Scale	7/10/2015

**FIGURE 3**  
**SOIL BORING LOCATIONS AND RESULTS - July 10, 2015**  
 890 Columbia Drive  
 Decatur, Georgia



**ETRI**

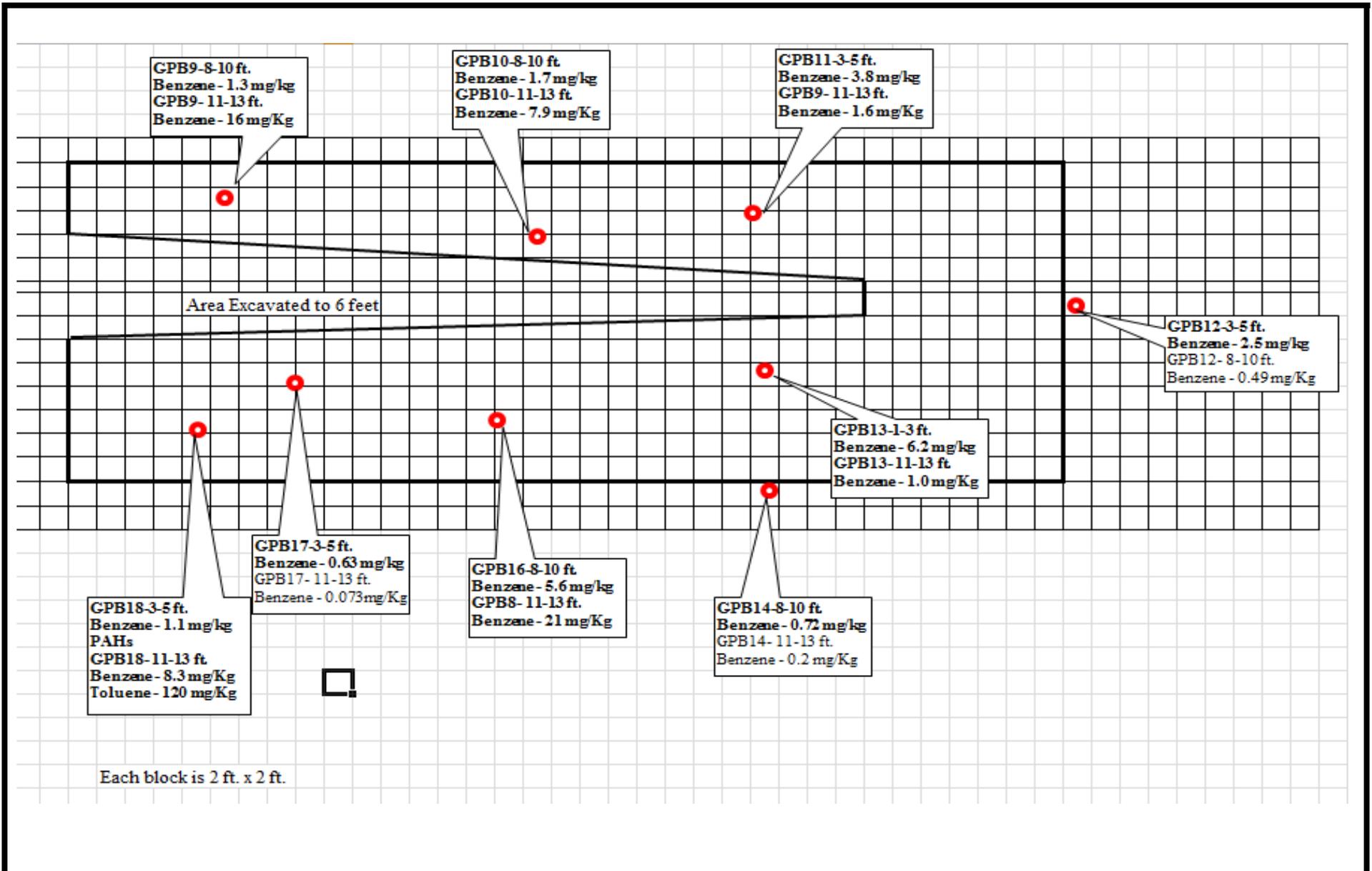
Environmental Technology Resources, Inc.  
 4780 Ashford Dunwoody Rd.  
 Suite A-456  
 Atlanta, Georgia 30338

● Soil Boring Location

Project No.	Scale	Date
13-148	Not to Scale	7/10/2015

**FIGURE 4**

**SOIL SAMPLE RESULTS - Former Tank Pit**  
 890 Columbia Drive  
 Decatur, Georgia



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 Atlanta, Georgia 30338

● Soil Boring Location

Project No. 13-148	Scale Not to Scale	Date 7/10/2015
-----------------------	-----------------------	-------------------

**FIGURE 5**

**SOIL SAMPLE RESULTS - Former Dispenser Area**  
 890 Columbia Drive  
 Decatur, Georgia

## 2.2 Volumetric Estimate of Contaminated Soils Requiring Corrective Actions

Utilizing the data developed during the July 2015 soil sampling, the approximate volume of soil that will require corrective actions was estimated. As noted, during the tank closure, Tetra Tech had removed soil in the tank pit area, along transfer lines and in the area of the dispensers. Figure 6 shows the areas and depths where contaminated soils were previously removed and replaced with clean backfill and gravel.

The following is a discussion of the volumetric estimate of contaminated soils that will require corrective actions at the EDG site. Figures showing details on the areas to be excavated are included in Figures 7 and 8.

### *Former Tank Pit*

The soil sample collected from boring GPB2 at 12-14 feet was found to contain Benzene at a concentration of 0.81/mg/Kg. The sample collected from borings GPB1 at 6-7 feet and 11-13 feet, GPB3 at 12-14 feet and GPB5 at 8-10 feet and 11-13 feet were found to have concentrations of BTEX and PAHs below RRS. The soil sample collected from boring GPB4 at 8 to 10 feet was also found to contain BTEX and PAHs below RRS but the sample collected at 11 to 13 feet exceeded RRS for Ethylbenzene

Excavation Plan – Former Tank Pit (see Figure 7)

- Remove backfill soils in former tank pit to a depth of 12 feet and stockpile these soils on-site.
- Excavate soils in the area of soil boring GPB2 - 26 feet by 12 feet soils from a depth of 12 to 15 feet.
- Excavate soils in the area of soil boring GPB4 - 16 feet by 10 feet soils from a depth of 10 to 15 feet.
- Estimated volume of soil – 65 yd<sup>3</sup>

### *Between Former Tank Pit/Transfer Lines and Former Fuel Dispenser Island*

Two soil borings GPB7 and GPB8 were installed between the tank pit and former transfer lines and dispenser island. The soil samples collected from borings GPB7 at 8-10 feet and 11-13 feet and GPB8 at 8-10 feet and 11-13 feet were found to contain Benzene and Ethylbenzene above risk reduction standards.

Excavation Plan - Area Between Former Tank Pit/Transfer Line and Dispenser Island (see Figure 7)

- Excavate soils in an area measuring 14 feet by 20 feet to a depth of 15 feet.
- Estimated volume of soil – 155 yd<sup>3</sup>

### *Former Fuel Dispenser Island and Transfer Lines*

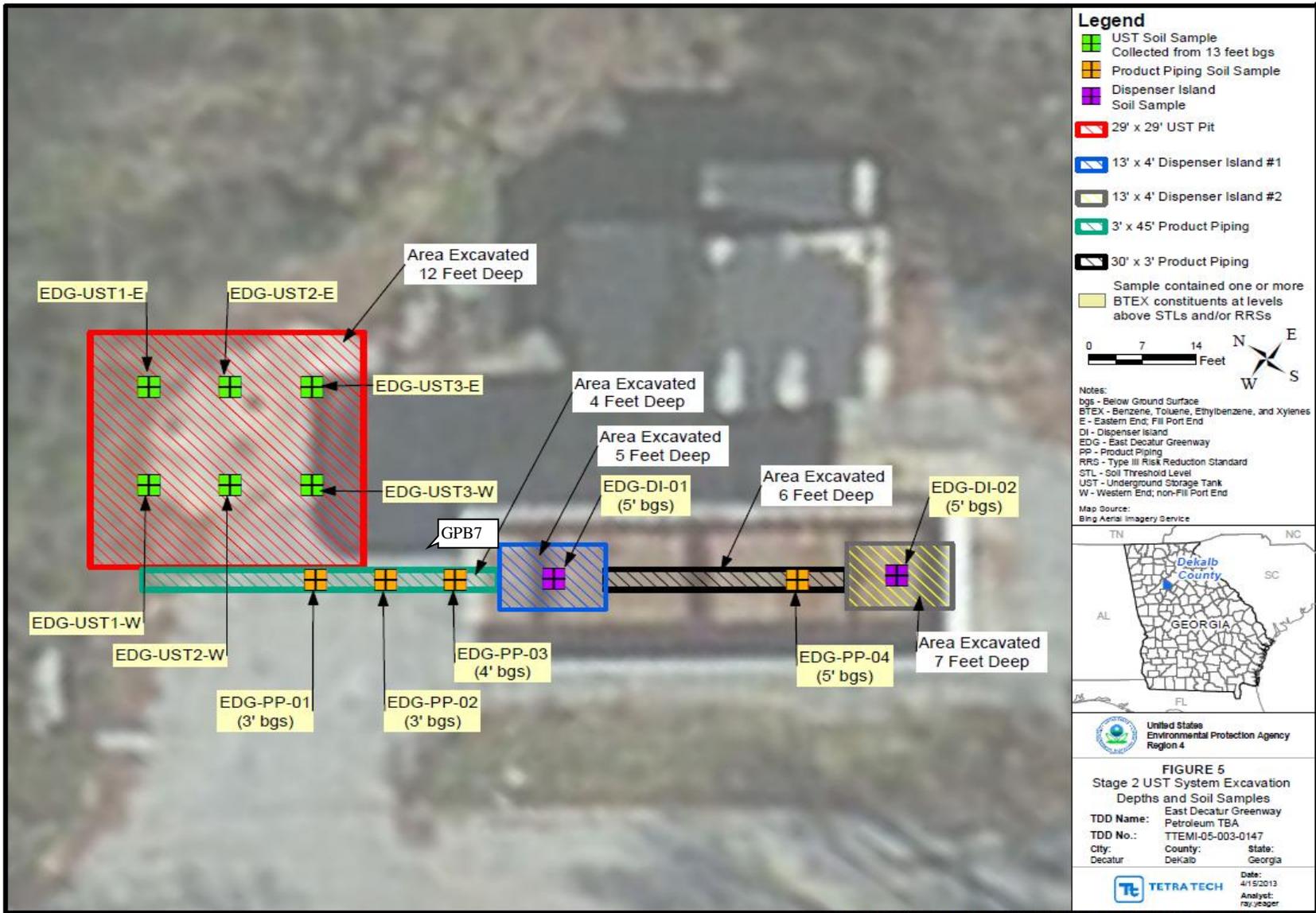
Soil borings GPB8 through GPB18 were installed in the area where former fuel dispensers and transfer lines were located. Soil samples were collected for analyses at depths of 1 to 3 feet, 3 to 5 feet, 8 to 10 feet or 11 to 13 feet. The Benzene concentrations were highest at a depth of 11 to 13 feet.

Excavation Plan - Former Fuel Dispenser Island and Transfer Line (see Figure 8)

- Remove Clean Soil in Area Previously Excavated to a Depth of Six Feet – Stockpile Clean Soils
- Remove Existing Concrete
- Excavate soils shown in Figure 8 in Blue to a depth of 15 feet
- Excavate Area 8 feet by 26 feet (Light Blue) to a Depth of 11 feet
- Excavate Area 6 feet by 13 feet to a depth of 8 feet (Light Green)
- Estimated volume of soil – 1,051 yd<sup>3</sup>

*Other*

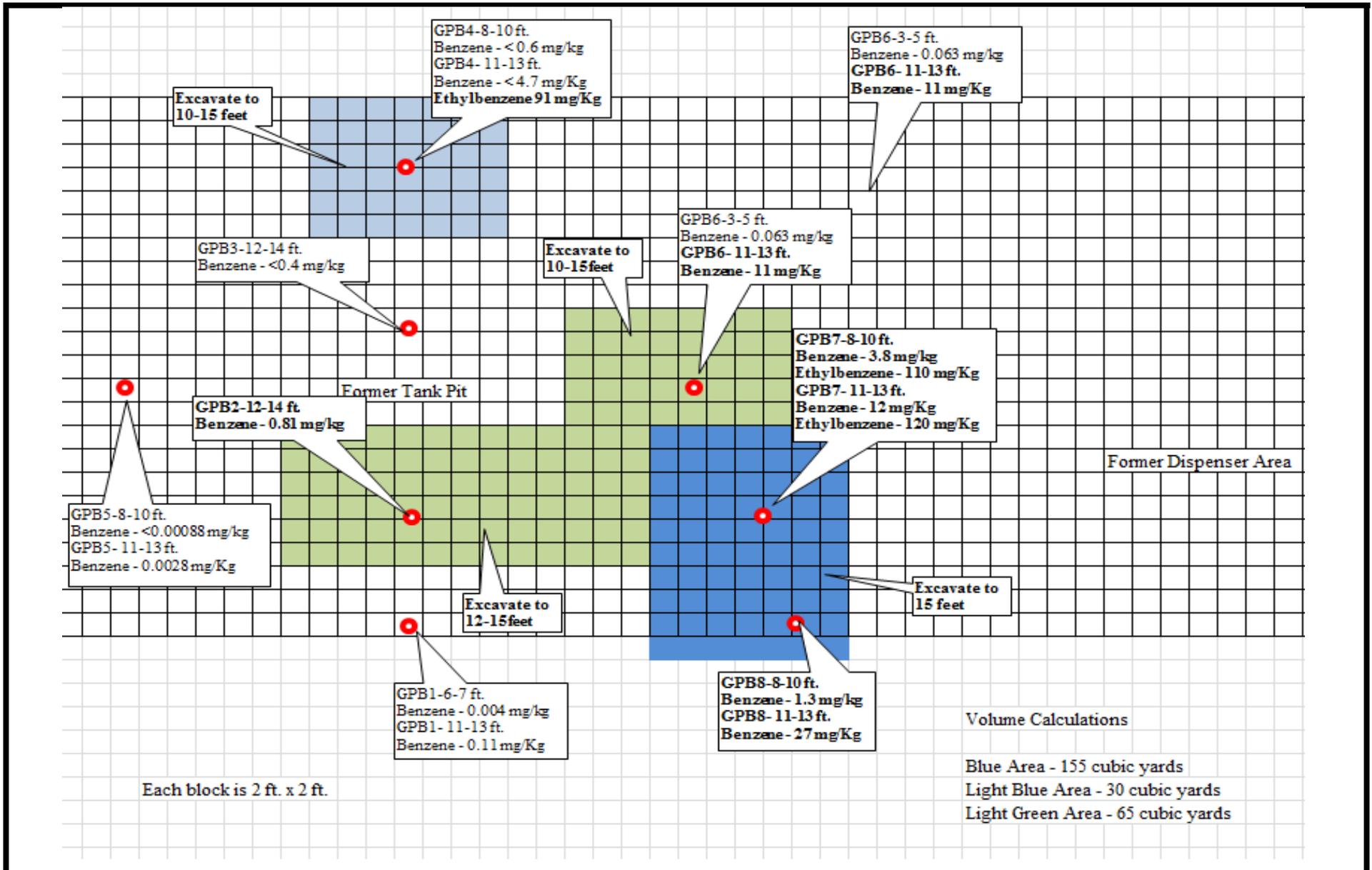
- Existing Asphalt Pavement and Concrete above former *Fuel Dispenser Island and Transfer Line* will be excavated and disposed in a construction and demolition debris landfill



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**FIGURE 6**  
**AREAS OF PREVIOUS EXCAVATION**  
 890 Columbia Drive  
 Decatur, Georgia



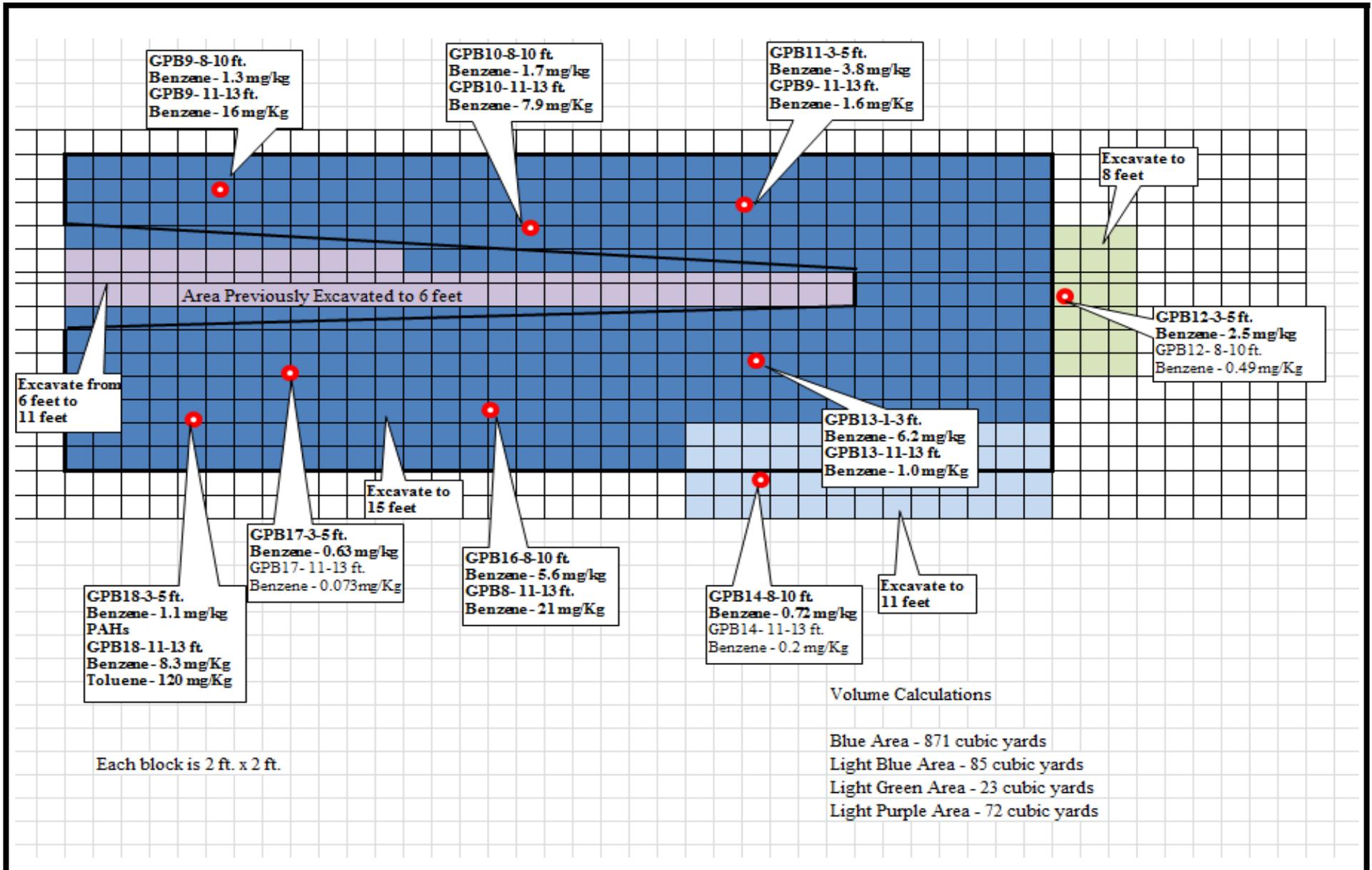
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Project No.	Scale	Date
13-148	Not to Scale	7/10/2015

**FIGURE 7**

**EXCAVATION PLAN - Former Tank Pit Area and Area Between Tank Pit and Dispensers**  
 890 Columbia Drive  
 Decatur, Georgia



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Project No. 13-148	Scale Not to Scale	Date 7/10/2015
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**FIGURE 8**  
**EXCAVATION PLAN - Former Dispenser Island**  
 890 Columbia Drive  
 Decatur, Georgia

### **3.0 SOIL AND FREE PRODUCT REMEDIATION**

#### **3.1 Remedial Action Approach**

The objective of the corrective action measures will be to achieve compliance with Type 3 risk reduction standards applicable to soils on the subject property.

##### **3.1.1 Soil Corrective Actions**

The planned corrective actions for the East Decatur Greenway site will involve the excavation and off-site disposal of petroleum contaminated soils. Soils that exceed risk reduction standards will be excavated using heavy equipment (track hoe or equivalent). The excavated soils will be placed into trucks and will be transported to a Subtitle D landfill.

Approximately 1,300 tons of petroleum contaminated soils will be excavated and disposed in a Subtitle D Landfill. Up to 400 tons of mildly petroleum contaminated soil will be excavated and will be treated on-site or will be transported and disposed at the designated Subtitle D Landfill.

The soil excavation plan will be conducted in accordance with the estimated volume of soil requiring corrective actions as presented in Section 2.2.

##### **3.1.2 Erosion and Sediment Control Measures**

Prior to implementing corrective actions on soils, an Erosion and Sediment Control Plan will be prepared for the project. The Erosion and Sediment Control Plan will be part of a Stream Buffer Variance that will be submitted to DeKalb County for approval.

Measures will be taken to minimize erosion and control the loss of sediment during the implementation of corrective actions. The goal will be to prevent the spread of soil from the work area by spillage, dust, vehicle traffic and storm water. This will include the use of siltation fencing, hay bales and removal of soil on tires and trucks prior to exiting the property. Excavation will only take place during dry conditions.

Spillage could occur during transport of the soil into dump trucks. This type of spillage will be monitored and controlled by not overfilling the bucket of the loader. All contact equipment including excavators, loaders and other heavy machinery will be decontaminated prior to leaving the work area. All heavy equipment will be manually brushed and scraped followed by a pressure wash as necessary prior to leaving the site.

##### **3.1.3 Free Product Corrective Actions**

During the implementation of soil excavation, a pit will be excavated to below the water table in the area where free product has been discovered (Former Temporary Well TMW-02). The location of the former temporary well is shown in Figure 7.

The purpose of the excavation will be to access the area where free product was present and allow for the

removal of the free product. Once the pit has been stabilized and open and groundwater/free product is accessible, a vacuum truck will be mobilized to remove the groundwater and free product.

Removal of the soil above the saturated zone and soil below the water table in the area where free product is present, followed by the removal of groundwater/free product mixture, is anticipated to minimize the chance for reoccurrence of the free product.

In order to demonstrate that free product does not rebound or reappear, a two-inch or four-inch recovery/monitoring well will be installed in the area for former TMW-02. An attempt will be to install the well prior to backfilling the area. If it is not possible to install the well prior to backfilling, it will be necessary to use a drill rig to install the well. Should the free product return to the site, the recovery/monitoring well could be used to perform additional free product removal without the need to re-excavate the area.

### **3.2 Management, Profiling and Disposal**

Prior to implementing corrective actions, the selected contractor will submit a waste profile to the land disposal facility. The purpose of the waste profile is to document the contaminants and contaminant concentrations and ensure acceptability by the landfill.

The soils that exceed risk reduction standards will be placed directly into dump trucks and will be hauled to the designated facility for disposal. Waste manifests will accompany each load that is hauled and disposed. No treatment of the soil is planned prior to its disposal.

### **3.3 Confirmation Sampling and Analyses**

After completing the soil excavation, soil samples will be collected from the side walls of the excavation to confirm that remaining soils have concentrations of contaminants are below applicable risk reduction standards. The confirmation samples will be collected in accordance with the approved Sampling and Analyses Plan and Quality Assurance Project Plan. Since the excavation will likely be taken to the depth where groundwater is present, it will not be necessary to collect and analyze samples from the bottom of the excavation. Based on the results of the investigations conducted in July 2014, the confirmation sample analyses will be limited to BTEX. Confirmation samples collected in the area of GPB18 will also be analyzed for PAHs.

The analytical results for BTEX and PAHs will be compared to the remediation level goals that have been established. Sidewall samples will be collected using a stainless steel hand auger. All samples will be grab samples and no composite samples will be collected for analyses. Sidewall samples will be collected from each designated excavation area. Samples will be collected at a frequency of approximately every 50 linear feet.

### **3.4 Permitting**

As noted, an Erosion and Sediment Control Plan will be prepared for this project. Since the excavation will be conducted within the 75 feet stream buffer, DeKalb County will also require a Stream Buffer

Variance. These plans will be prepared and submitted to local authorities for approval.

### 3.5 Health and Safety

All corrective action work will be performed in compliance with all applicable OSHA regulations and in accordance with a Site Specific Health and Safety Plan (SSHASP).

The SSHASP provides measures for measuring, monitoring and controlling exposure of workers for hazardous compounds during site cleanup and provides for monitoring and controlling work conditions to ensure a safe working environment. The selected contractor will be required to provide their own SSHASP in accordance with OSHA requirements and in accordance with the specific requirements of the contractor.

A SSHASP was prepared by ETRI for the additional sampling, oversight during the corrective actions and confirmation sampling. A copy of the Site Specific Health and Safety Plan is included in Appendix A.

### 3.5 Schedule

A schedule for corrective actions has been developed which includes beginning and ending dates for corrective actions as well as specific activities within the project. Table 3 identifies the activities and the activity start and end date.

**Table 3**  
**Corrective Action - Project Schedule**  
 East Decatur Greenway, Decatur, Georgia

Activities	Activity Start Date	Activity End Date
Receive Proposals from Contractors	August 22, 2015	September 7, 2015
Select Contractor	September 14, 2015	
Begin Soil Excavation	October 1, 2015	October 21, 2015
Obtain Results of Confirmation Soil Samples	October 2, 2015	October 21, 2015
Obtain Results of Confirmation Soil Samples	October 2, 2015	October 20, 2015
Transport and Dispose of Contaminated Soils	October 1, 2015	October 21, 2015
Backfill Site	October 21, 2015	October 23, 2015



# SITE-SPECIFIC HEALTH AND SAFETY PLAN

Prepared for:

**East Decatur Greenway**  
890 Columbia Drive  
Decatur, Georgia

June 2015

Prepared by:

**Environmental Technology Resources, Inc.**  
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Prepared by:

Name

Date

ETRI Health & Safety Officer:

Thomas Ruffalo

6-29-15

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**HEALTH AND SAFETY PLAN**

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## FIGURES

Figure 1 – Hospital Route

## APPENDICES

Appendix A – Chemical Characteristics and Health and Safety Information for Contaminants of Concern

## **1.0 INTRODUCTION**

Environmental Technology Resources, Inc. (ETRI) has developed this Site Specific Health and Safety Plan (SSHSP) in order to establish guidelines for safe operating procedures while performing all activities on site. The guidelines will establish procedures for hazard assessment, communications, safety equipment usage, training requirements and medical surveillance programs. All guidelines set forth in this document will be utilized at all times and were developed especially for all activities completed at 890 Columbia Drive in Decatur, Georgia (“Site” or “subject property”).

This SSHSP establishes the policies and procedures which protect workers and the public from potential hazards posed by work at this site. The SSHSP fully complies with the requirements of the occupational safety and health administrations (OSHA's) 29 CFR 1910.120 - "Hazardous Waste Operations and Emergency Response" standard and specifically addresses the requirements contained in 1910.120 (b)(4).

All individuals conducting work at the site under the direction of ETRI personnel, subcontractors, and supervisors must read, comprehend and abide by all guidelines established for site work. Acknowledgment of the hazards present on the site and the control measures necessary to prevent accidents is indicated by each person's signature on the SSHSP acknowledgment form.

ETRI considers safety the highest priority during work at a site containing potentially hazardous materials and has established a standard policy of zero exposure which must be upheld on all projects. All project activities will be conducted in a manner that minimizes the probability of injury, accident or incident occurrence. Although the plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by ETRI supervisors and health and safety officials.

### **1.1 SITE HISTORY**

This safety plan has been developed by ETRI to describe the safety related activities associated with the Hazardous Waste activities to be performed at 890 Columbia Drive in Decatur, Georgia.

The subject property includes approximately 1.1 acres of land that is bordered to the southwest by Columbia Drive and to the east by the East Branch of the Middle Fork of Shoal Creek. The Friends School of Atlanta is located to the northwest.

The property was originally developed as a gasoline station in the 1940's. The gas station was operational until it was abandoned in 1999. The gasoline station utilized three 8,000-gallon underground storage tanks and two dispenser islands to dispense fuel. In February 1997, the Georgia Environmental Protection Division (EPD) – Underground Storage Tank Management Program (USTMP) received a release notification. The Georgia EPD subsequently issued a letter to the owner of the property requesting the completing of a Corrective Action Plan (CAP) Part A. Although groundwater monitoring wells were installed, a CAP Part A was never submitted to the Georgia EPD. The EPD subsequently issued a notice of violation in 2005. The owner did not respond to the NOV.

In 2007, ETRI completed a Phase II Environmental Site Assessment on behalf of a prospective purchaser of the property. Four soil borings were installed and soil and groundwater samples were collected and analyzed. Soil samples determined that concentrations of Benzene, Toluene and Ethylbenzene were detected at concentrations exceeding applicable Georgia EPD USTMP soil thresholds. In addition, groundwater samples were found to contain Benzene above applicable Georgia EPD USTMP In-Stream groundwater quality standards.

In 2012, Tetra Tech was tasked by EPA to complete a Phase I and Phase II ESA on the property. The Phase II included the collection of subsurface soil, groundwater, sediment and surface water samples. Petroleum contamination above Georgia EPD USTMP threshold concentrations was detected in soil and groundwater.

Tetra Tech subsequently completed the closure of underground storage tanks in 2012. Three 8,000-gallon tanks, approximately 75 feet of piping and two dispenser islands were removed. In addition, Tetra Tech removed approximately 318 cubic yards of petroleum contaminated soil from the site. They have estimated that an additional 1,800 cubic yards of soil would need to be excavated in order for the property to meet the applicable risk reduction standards.

The work that will be performed at the Site will include soil boring installation to determine the quantities of soil that exceed appropriate risk reduction standards, excavation and loading of soils that exceed risk reduction standards, extraction of groundwater from a pit excavated during the soil removal, backfilling the excavation areas and installation of a groundwater monitoring well.

Unless air levels of ambient concentrations of volatile organics exceed a sustained reading of 5 ppm during sampling activities, the required level of protection will be Level D. The PPE required for the level of protection will include safety boots, hard hat, safety glasses and gloves. If the level of protection required increases (sustained ambient air reading exceeds 5 ppm on the PID) to Level C, ETRI will stop drilling, soil excavation, vacuum extraction of groundwater, backfilling and monitoring well installation activities and determine the best course of action at that time.

## **2.0 KEY PERSONNEL AND MANAGEMENT**

ETRI maintains a policy of providing its employees, subcontractors, and authorized visitors with information and procedures in order to protect them and the adjacent community from any adverse effects that could result from work at a job site involving potentially hazardous substances. All personnel involved with this project will follow the health and safety procedures set forth in this plan. Visitors will not be given entry unless they read and agree to comply with this plan. The site safety plan acknowledgment will be signed by all personnel required to enter contaminated work areas.

### **2.1 PROJECT MANAGER**

The Project Manager (PM) maintains overall control of the entire project. The PM is responsible for compliance with contract specifications, the SSHSP and all applicable regulations. Project specific responsibilities include the following:

- Ensure that all project activities are defined and as a result, hazards are identified along with control measures.
- Assembly of qualified ETRI personnel and subcontractors when applicable for site activities.
- Secures all resources necessary for safe completion of the project.
- Functions as the Site Supervisor, assuming all of his responsibilities, if the project requires.

### **2.2 SITE SUPERVISOR**

The Site Supervisor (SS) has responsibility for all field activities and enforces safe work practices by all crew members. He watches for any ill effects on any of the crew members, especially those symptoms caused by heat stress or chemical exposure. The SS oversees the safety of any visitors who enter the site. The SS maintains communication with the ETRI project manager and client representative(s). Typically, the Project Manager of ETRI projects will also function as the Site Supervisor; however, if this is not the case the following responsibilities are required:

- Ensures that all personnel conduct project activities in accordance with the SSHSP.
- Ensures that all ETRI personnel and their subcontractors are well informed of the policies outlined in this SSHSP and their application to any potential hazards which may be present.
- Coordinates all emergency response procedures.

### 2.3 SITE SAFETY OFFICER

ETRI designates a site safety officer (SSO) who defines, implements and enforces the project safety program and procedures. The SSO will conduct the daily safety meetings and will interface as required with other site representatives. The SSO takes the following action(s) when appropriate:

- Monitors all personnel performance for compliance with safe work practices and of methods to correct the problems.
- Continually monitors and evaluates environmental conditions such as weather, chemical and physical conditions and recommend to the Site Supervisor modifications necessary to ensure personnel safety.
- Conduct daily safety meetings.
- Assist in the coordination of emergency response activities.
- Orders the immediate shut-down of site activities in the case of a medical emergency or unsafe practice.
- Ensures protective clothing and equipment are properly stored and maintained.
- Ensures that the environmental and personnel monitoring operations are on-going and in accordance with technical specifications and required procedures.
- Restricts visitors from areas of potential exposure to harmful substances.

A safety log will be kept for this project. This log will be included in the daily project log or may be a separate logbook. The logbook will include daily safety meeting topics, training sessions, air monitoring information, first aid administered, visits of all outside personnel and any incidents of a health and safety nature.

The SSO is responsible for implementing and enforcing the site safety program and procedures. He or she establishes and enforces the protective equipment to be used for various site activities; and decides when action levels have been reached which require more stringent personnel protection.

#### 2.4 EQUIPMENT OPERATORS, FOREMAN and TECHNICIANS

Each employee is responsible for his/her own safety as well as the safety of those around him/her. The employee shall use all equipment provided in a safe and responsible manner as directed by his/her supervisor. Equipment operators will be responsible for the maintenance, inspection, and safe operation of their equipment. All field personnel are responsible for abiding by the SSHSP. This includes the following:

- Compliance with all safe work practices and the SSHSP.
- Notify the SS or the SSO of unsafe practices or conditions.
- Report all accidents or injuries to the SS or the SSO, no matter how slight.

#### 2.5 SUBCONTRACTORS

All subcontractors must abide by the policies outlined in this SSHSP. ETRI will utilize the services of the following subcontractors during this project:

<u>Subcontractor</u>	<u>Service</u>
GeoLab	Drilling
Remediation Contractor (Too be Determined)	Excavation and Loading of Soil
	Vacuum Extraction of Groundwater
Trucking Company (Too be Determined)	Transport of Soil from Site to Landfill

These subcontractors are required to maintain at a minimum a Corporate Health and Safety Program, read and acknowledge ETRI' s SSHSP by signing the acknowledgment form located in Appendix A of this document. More specifically:

- Subcontractors are responsible for ensuring all personnel meet and abide by this SSHSP.
- Subcontractors who do not abide by the guidelines in this SSHSP, will be removed from the site until corrective action takes place.
- Subcontractors are responsible for supplying to their personnel all necessary personal protective devices required for site work.
- Subcontractor personnel whom are not qualified to work on site will be excluded from site activities.

## 2.6 RESPONSIBLE ETRI HEALTH AND SAFETY PERSONNEL

The following personnel are responsible for health and safety on the EDG - 890 Columbia Drive Site:

Project Manager: Thomas R. Harper

Site Supervisor: Thomas R. Harper

Site Safety Officer: Thomas R. Harper

### **3.0 MEDICAL SURVEILLANCE**

An essential requirement of health and safety planning for site operations is to ensure that project personnel who might be exposed to materials having potentially adverse health effects have been medically examined according to their potential exposures and are medically certified to work on the site and wear respiratory protection. A medical surveillance program is implemented to establish a baseline and to monitor for any symptoms of over-exposure for individuals who participate in remedial investigations.

All ETRI personnel participate in a medical and health monitoring program that meets the requirements of 29CFR1910. 120. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a yearly basis. Standard examination features include height, weight, vision, temperature and blood pressure. Other tests which may be conducted include chest x-rays, electrocardiograms pulmonary function tests, urine tests and blood tests. The attending physician's written medical opinion will be made available upon request.

ETRI's Medical Surveillance Testing Parameters include the following:

- Complete Medical and work histories
- Physical Examination
- Eye Examination
- EKG ( for individuals over 40 years of age)
- Complete Blood Count (CBC) with differential
- Chest X-ray (as needed)
- Pulmonary Functions Test
- Audiogram
- Urinalysis
- Specific Blood Tests if needed

#### **4.0 TRAINING**

As a prerequisite to employment at ETRI, all field employees are required to take a 40-hour training class and pass a written examination. This training is comprehensive and covers all forms of personal protective equipment. In addition, this course covers the toxicological effects of various chemicals including nerve agents, handling of unknown tanks, drums and confined space entering procedures and electrical safety. This course is in full compliance with OSHA requirements in 29 CFR 1910.120(e).

In addition to the initial forty hour training, all site personnel must attend an 8 hour annual refresher course. The purpose of this course is to ensure that personnel retain the basic knowledge necessary for safe hazardous waste operations and to demonstrate proper health and safety procedures.

Site-specific and task specific training will be conducted at each site in the form of daily "tailgate" meetings before any work is initiated each day. All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Site Safety Plan Acknowledgment.

## 5.0 JOB HAZARD ANALYSIS

Potential health and safety hazards are summarized in this section. The objective of ETRI's health and safety planning is to prevent injury or illness. The SSO is tasked with continuously observing the site conditions and activities and to identify potential health and safety concerns not addressed in this SSHSP. The following sections address site specific hazards including: chemical, physical and environmental hazards.

### 5.1 CHEMICAL HAZARDS

The following chemical hazards are present on the EDG site. Standard limits of exposure will be used during site activities. The chemical hazards and the limits of exposure are listed below:

<i>Chemical Name</i>	<i>OSHA PEL</i>
Benzene	1 ppm TWA
Toluene	100 ppm TWA
Ethylbenzene	100 ppm TWA
Xylenes	100 ppm TWA
Lead	0.05 mg/m <sup>3</sup>

Additional information about the chemicals that are expected to be encountered during site activities obtained from the NIOSH Pocket Guide to Chemical Hazards is included in Appendix A.

### 5.2 PHYSICAL HAZARDS

There are numerous physical hazards associated with this project which, if not identified and addressed, could present operational problems as well as cause accidents and personal injury to the work force. Hazard identification and mitigation, training, adherence to work rules, and careful housekeeping can prevent many problems or accidents arising from physical hazards. The following will outline the major physical hazards and the suggested preventative measures to be followed during this project:

- Elevated Work Platforms: Personnel will not be expected to be working off of elevated work platforms, scaffolding, and/or from aerial baskets over the duration of this project. If over the course of the project, elevated work platforms are necessary, hazard risks and

appropriate measures to ensure personnel safety will be added as an amendment to this SSHASP.

- Confined Space Entries: Personnel required to enter confined spaces, including; tanks, pits, sumps will follow ETRI's confined space entry procedures requiring air monitoring, proper personal protective equipment, standby personnel and provisions for emergency rescue.
- Hoisting Accidents. Employees may have suspended loads dropped on them; be caught behind a load and a stationary object; or be crushed or struck by the counterweight. All hoisting will be done by qualified personnel only after safety checks of chokes and cables. In addition, no hoisting will take place without a designated signal man present.
- Flame, Heat, or Spark Producing Operations. Because of the possibility of flammable materials being present at this site, flame, heat or spark producing operations will be limited. If a case arises where that is necessary. ETRI will follow their Hot Work Permit requirements.
- High Pressure Washing. Washing or cleaning certain pieces of equipment may require the use of high pressure washers referred to as lasers. These devices can be hazardous if not used properly. ETRI's specific safety procedures will be followed.
- Electrical Hazards. Electrical devices and equipment must be de-energized prior to working near them. All extension cords must be kept out of water, protected from crushing and inspected regularly to ensure structural integrity. Temporary electrical circuits must be protected with ground fault interrupters. Only qualified electricians are authorized to work on electrical circuits.
- Danger tag and Lockout procedures will be used to prevent operation of a switch, valve or piece of equipment to prevent injury or damage. Electrical switches and other electrical devices must have fuses removed and be locked, tagged and tried to make sure the correct device is locked out or that an interlock is not backfeeding. The SSO will install his lock and tag. Following this, tags and locks shall be attached to the same device by other persons or groups involved. The SSO shall not remove his lock or tag or operate the device until all other locks and / or tags have been removed. Only one person may sign a Danger Tag. Any number of locks and Danger Tags may be attached to a valve, switch or device to properly protect persons or groups involved. Operation is prohibited under all circumstances until all locks and tags have been removed. In all cases the ETRI SSO's lock is the last lock and tag removed.
- Slip/Trip/Fall Hazards. Some areas may have wet surfaces which will greatly increase the possibility of inadvertent slips. Caution must be exercised when using steps and stairs due to slippery surfaces in conjunction with the fall hazard. Good housekeeping practices are essential for minimizing trip hazards.
- Heavy Equipment. All heavy equipment brought to ETRI's project sites will be subcontracted. The subcontractor is responsible for maintaining the equipment in good working order. The equipment must possess the necessary back-up alarms, horn and related safety devices required and installed by the manufacturer. Caution must be

exercised when operating heavy equipment and/or working around it. Personnel at the ground levels should maintain eye contact with heavy equipment operators prior to walking behind or in front of the equipment.

- Open Excavations. Open excavations are susceptible to cave in and the possibility of entrapment of personnel. Care should always be taken when standing around or placing equipment around open excavations. Undercutting the side of excavations should never be conducted unless shoring measures are put in place. At no time should personnel enter an excavation which is deeper than four foot without rescue and support equipment. Open excavations should be inspected frequently for signs of stressed walls.

All ETRI personnel are familiar with the field activities which will be conducted at the site. They are trained to work safely under various field conditions. In addition, the SS will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Hard hats, safety glasses and safety boots will be required in all areas of the site. Specific health and safety standard operating procedures that apply to site remedial operations will be available onsite.

### 5.3 ENVIRONMENTAL HAZARDS

Environmental hazards are typically associated with nature and vary with site location. There is little which can be done to eliminate these hazards, however, preventative measures can be taken to minimize their occurrence.

#### 5.3.1 Hazardous Noise

The operation of heavy equipment and other power equipment can produce hazardous noise levels for workers in the vicinity of the equipment use. Hearing protection should be worn by all site personnel when the noise levels exceed 85 dBA.

#### 5.3.2 Heat Related Illnesses

With the possible combination of warm ambient temperature and protective clothing, the potential for heat stress is a concern. Potential exists for heat-related rash, cramps, exhaustion, and stroke. An action level for heat stress has been established. At 75°F ambient temperature, the SM will recognize the effects of heat stress on the field crew, and will alert the crew to watch for any symptoms. The SS will also advise the crew to increase the amount of dietary salt. Workers are encouraged to increase consumption of water and electrolyte-containing beverages such as Gatorade during warm weather.

Water and electrolyte-containing beverages will be provided on site and will be available for consumption during work breaks.

At a minimum, workers will break every 2 hours for 10- to 15-minute rest periods. In addition, workers are encouraged to take rests whenever they feel any adverse effects, especially those effects that may be heat-related. The frequency of breaks may be increased upon worker recommendation to the SSO and SS.

ETRI personnel are hazardous materials professionals and, through their extensive field experience, have been educated in heat and protective equipment requirements. In addition, they have been trained to recognize the symptoms of heat stress. Even with this experience, ETRI continually emphasizes heat stress awareness. During the safety "tailgate" meetings, the SSO will discuss heat stress, its symptoms and the factors which affect a person's ability to handle heat stress. For the purposes of "buddy monitoring", the following signs and symptoms are presented:

### **Heat Related Illnesses - Signs and Symptoms**

Heat Rash -	Marked by red splotches on skin. This can occur from continuous exposure to heat or humid air.
Heat Cramps -	Muscle spasms and pain in the hands, feet, and abdomen. They are caused by inadequate fluid intake and heavy sweating.
Heat Exhaustion -	When body organs attempt to keep the body cool. Symptoms include pale, cool, moist skin; heavy sweating and dizziness.
Heat Stroke -	Most serious form of heat related illness. This is a medical emergency!! Symptoms are red, hot, dry skin; lack of perspiration; nausea; dizziness and confusion.

### 5.3.3 Cold Related Illnesses

Working in an environment where air temperatures are below freezing or where wind-chill factors lower air temperatures to below freezing or where wind-chill factors lower air temperatures to below freezing, there is a potential for either frostbite or hypothermia to occur. Brief descriptions of these conditions are listed below:

## Cold Related Illnesses - Sign and Symptoms

Hypothermia - This is a condition when the body loses heat faster than it is produced. Symptoms of hypothermia include: shivering, apathy, and unconsciousness. This is a medical emergency!

Frostbite - This is a condition where there is freezing or partial freezing of parts of the body. Initially the skin turns white, then begins to turn numb. Finally, the area turns cold, numb and hard.

To prevent cold related injuries and illness, personnel should dress warmly, keep active and use shelter whenever available.

### 5.3.4 Snakes, Spiders and Stinging Insects

Prior to initiating any work on a project site, the site should be inspected for insects and snakes which could sting or bite. Areas which have high grasses should be probed with a snake stick prior to walking in these areas. High-top rubber boots should also be worn in high grass areas. Snake kits should be carried on sites which are prone to snakes. Any persons that are allergic to insect stings should make it known to the SS or SSO.

## 5.4 HAZARD COMMUNICATION

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.59 to all ETRI personnel and ETRI sub-contractors. Hazard communication will include the following:

- Container Labeling. ETRI personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.
- MSDSs. There will be an MSDS located on site for each hazardous chemical known to be or used on site. All MSDSs will be located in Appendix A of the site safety plan.

- Employee Information and Training. Training employees on chemical hazards is accomplished through an ongoing corporate training program. Additionally, chemical hazards are communicated to employees through daily safety meetings held at ETRI field projects and by an initial site orientation program.

At a minimum, ETRI employees will be instructed on the following:

- Hazards associated with all equipment on-site;
- Chemicals and their hazards in the work area;
- Preventing exposure to these hazardous chemicals;
- Company precautions concerning exposure to these chemicals;
- Appropriate procedures if exposed to these chemicals;
- Reading and interpreting labels and MSDSs for hazardous substances found on ETRI sites;
- Emergency spill procedures; and
- Proper storage and labeling of chemicals.

Before any new hazardous chemical is introduced on site, each employee will be given information in the same manner as presented during the safety class. The site supervisor will be responsible for assuring that the MSDS on the new chemical is available for review by on-site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed. Attendance is mandatory for all on-site employees.

## **6.0 SITE CONTROL**

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment are clearly identified prior to beginning operations. ETRI has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document titled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities." Each work area, if necessary, will be divided into three zones: an exclusion or "hot" zone, a Contamination Reduction Zone (CRZ), and a support zone.

### **6.1 EXCLUSION ZONE**

The exclusion zone will consist of areas where inhalation, oral contact, or dermal contact with contaminants will be possible. This is frequently referred to as the "hot" zone.

### **6.2 CONTAMINATION-REDUCTION ZONE**

The CRZ or transition zone will be established between the exclusion zone and support zone. In this area, personnel will begin the sequential decontamination process required to exit the exclusion zone. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the exclusion zone through the CRZ.

### **6.3 SUPPORT ZONE**

The support zone will consist of a clearly marked area where the office and decontamination trailer are located. Smoking and drinking will be allowed in designated areas only. Eating will be allowed in the breakroom only.

### **6.4 SITE CONTROLS and SECURITY**

The SSO and the SS shall establish the physical boundaries of each zone and shall instruct all workers and visitors regarding the limits of the restricted areas. No one shall be allowed to enter the restricted area without the required protective equipment for that area. The SS shall ensure compliance with all restricted area entry and exit procedures. The SS shall designate a decontamination point for personnel to exit the contaminated area and enter into the clean area where personnel may rest and drink.

Visitors should check in immediately upon arrival. Only authorized visitors will be allowed access to the contaminated areas. Each visitor will be required to wear the necessary protective equipment for use during the visits and shall be escorted by the SM while on site. All visitors, subcontractors and personnel will be required to sign a safety plan acknowledgment sheet to certify that they have read and will comply with the site health and safety plan. Failure to comply with this site entry procedure will result in expulsion from the site.

## 7.0 PERSONNEL PROTECTIVE EQUIPMENT

This section details the personal protective equipment (PPE) that will be provided and worn by site personnel to protect them against dermal contact and inhalation exposure to hazardous chemicals present on site.

### 7.1 LEVELS OF PROTECTION

The following levels of protection and accompanying PPE will be used during site remedial operations.

#### *Level B Protection*

- Air-line respirators with 5 minute egress unit
- Saran-coated tyvek over regular tyvek
- 2-pair inner gloves and 1-pair nitrile outer gloves
- Tingley overboots and steel toe/shank boots
- Tape overboots and gloves to sarans
- Hard hats
- Splash protection - as required by task
- Hearing protection - as required by task

#### *Level C Protection*

- Full facepiece air-purifying respirator with combination organic vapor/HEPA cartridges
- Saran-coated tyvek over regular tyvek
- Inner latex and outer nitrile gloves
- Steel toe/shank boots with latex overboots
- Tape overboots and outer gloves to sarans
- Hard hat
- Splash protection - as required by task
- Hearing protection - as required by task

#### *Level D Protection*

- Steel toe/shank boots
- Safety glasses with side shield
- Work gloves - as required by task
- Splash protection - as required by task
- Hearing protection - as required by task

### *Modified Level D Protection*

- Tyvek or saran-coated tyvek
- Inner latex and outer nitrile gloves
- Steel toe/shank boots with latex overboots
- Tape overboots outer gloves to Tyvek
- Hard hat
- Safety glasses with side shields
- Splash protection - as required by task
- Hearing protection - as required by task

## 7.2 TASK-SPECIFIC LEVELS OF PROTECTION

The following minimum levels of protection are specified for tasks performed during site remedial operations. Upgrades/ downgrades will be based on air monitoring results when compared to the appropriate action level, as detailed in Section 7.0 Air Monitoring.

### TASK / Level of Protection

Soil Sampling	/	Level D
Soil Excavation	/	Level D
Soil Loading	/	Level D
Well Installation	/	Level D
Groundwater Monitoring	/	Level D

## 7.3 RESPIRATOR CARTRIDGES

Personnel working in Level C will wear respirators equipped with Mine Safety Appliance (MSA) GMC-H air purifying cartridges. The GMC-H cartridge holds approval for:

- Organic vapors < 1,000 ppm
- Chlorine gas < 10 ppm
- Hydrogen chloride < 50 ppm
- Sulfur dioxide < 50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m<sup>3</sup>
- Asbestos containing dusts and mists
- Radon daughters
- Radionuclides
- Pesticides

#### 7.4 SUPPLIED-AIR RESPIRATORS

ETRI personnel will wear airline respirators with 5-minute egress bottles, if necessary. Standby personnel during confined space entries will be equipped with self-contained breathing apparatus (SCBA). Breathing air will meet the requirements for Grade "D" breathing air as described in the Compressed Gas Association Specification G 7.-1966. ETRI requires a certificate of analysis from breathing air vendors to demonstrate that this requirement is met.

#### 7.5 AIR-PURIFYING RESPIRATORS

ETRI's air-purifying respirators for this project will be MSA's ultratwin full facepiece respirator with nose cups, if necessary. ETRI's Respirator Protection Program for air purifying respirators is adhered to on site.

#### 7.6 CARTRIDGE CHANGES

All cartridges will be changed as necessary or at the most every other day. However, water saturation of the HEPA filter or dusty conditions may necessitate more frequent changes. Changes will occur when personnel begin to experience increased inhalation resistance, or breakthrough of a chemical warning property.

#### 7.7 INSPECTION AND CLEANING

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use.

#### 7.8 FIT TESTING

Annual respirator fit tests are required of all personnel wearing negative pressure respirators. The test will utilize isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

## 7.9 FACIAL HAIR

No personnel who have facial hair which interferes with the respirator's sealing surface will be permitted to wear a respirator.

## 7.10 CORRECTIVE LENSES AND CONTACT LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided. Contact lenses shall not be worn with any type of respirator.

## 7.11 MEDICAL CERTIFICATION

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator.

## 8.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

### 8.1 PERSONNEL DECONTAMINATION

Decontamination of personnel shall be accomplished to ensure that any material, which personnel may have contacted in the hot zone, is removed in the contamination-reduction zone. Personnel exiting the exclusion zone will utilize the following steps for Level B, C, D, Modified Level D personnel decontamination:

<i>Level B</i>	<i>Level C</i>
1. Equipment Drop	1. Equipment Drop
2. Outer boot/glove wash	2. Outer boot/glove wash
3. Outer boot/glove rinse	3. Outer boot/glove rinse
4. Outer boot/glove removal	4. Outer boot/glove removal
5. Air Supply removal (keep facepiece on)	5. Tyvek removal
6. Saranex/Tyvek removal	6. Respirator removal
7. Facepiece removal	7. Inner glove removal/disposal
8. Inner glove removal/ disposal	8. Hand/face wash
9. Hand/face wash	9. Respirator cleaning/sanitizing
	10. Respirator cleaning/sanitizing
<i>Level D</i>	<i>Level D Modified</i>
1. Equipment Drop	1. Equipment Drop
2. Outer boot/glove wash	2. Tyvek/Saranex removal
3. Outer boot/glove rinse	3. Outer boot/glove wash
4. Outer boot/glove removal	4. Outer boot/glove rinse
5. Hand/face wash	5. Outer boot/glove removal
	6. Hand/face wash

## 8.2 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility, remove clothing, shower, don clean clothing, and immediately be taken to the First Aid Station.

## 8.3 PERSONAL HYGIENE

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

## 8.4 OTHER DECONTAMINATION PROCEDURES

All liquids and disposable clothing will be treated as contaminated waste and disposed of properly. All non-expendable tools and equipment must be decontaminated prior to removal from the CRZ or the site. The following items will be on-hand to decontaminate tools and other equipment at the decontamination station:

- Brushes
- Boot Wash Tubs
- Plastic Wash Tubs
- Detergent Solution
- Potable Water
- Garbage Cans
- Garbage Can Liners

## 9.0 AIR MONITORING

Air monitoring will be conducted in order to determine airborne contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered. The following air monitoring efforts will be used at this site. Additional air monitoring may be conducted at the discretion of the SSO.

### 9.1 LOWER EXPLOSIVE LIMIT/OXYGEN METER

Prior to entering a confined space area performing line breaking, or hot work involving welding, cutting, or other high heat-producing operations where flammable or combustible vapors may be present, LEL/OVA measurements must be obtained in accordance with ETRI Safety Operating Procedures.

### 9.2 PHOTOIONIZATION DETECTOR (PID)

A PID meter will be used to monitor total ionizable organic vapor concentrations in ambient air, as necessary. A PID will prove useful as a direct reading instrument to aid in determining if respiratory protection needs to be worn (Level B/C) and to indicate if the exclusion zone encompasses the required areas.

The SSO will take measurements before operations begin in an area to determine the amount of volatile organic compounds (VOC's) naturally occurring in the air. This is referred to as a background level. The PID breathing zone action level applies to PID readings above background (i.e., 1 ppm for 10 minutes above background) only.

The following chart describes the air monitoring required and appropriate action levels.

#### ATR MONITORING ACTION LEVELS

<i>Monitoring Device</i>	<i>Action Level</i>	<i>Action</i>
LEL/02	> 10% LEL < 8%	Purge vapors to less than: 10% LEL or 8%
PID	> 50 ppm above background	Upgrade to Level C
PID	> 200 ppm above background	Upgrade to Level B

The above LEL action level applies to LEL readings obtained in an area where flammable / explosive vapors may be present (i.e. hot work/line-breaking) only, but personnel entry into the area will not occur. The confined space entry LEL and oxygen action levels for personnel entry into a confined space are 0% LEL and 20.9% oxygen, with LEL/oxygen readings taken at representative locations inside the space. The hot work LEL and oxygen levels for hot work tasks are less than 10% LEL and less than 8% oxygen. LEL/oxygen readings must be taken at representative locations when performing hot work, line-breaking, and confined space entries.

### 9.3 AIR MONITORING LOG

The SSO will ensure that all air-monitoring data is logged into a monitoring notebook, as necessary. Data will include instrument used, wind direction, work process, etc.

### 9.4 CALIBRATION REQUIREMENTS

The PID and LEL/O<sub>2</sub> meter will be calibrated daily prior to use. A separate log will be kept detailing date, time span, gas, or other standard, and name of person performing the calibration.

### 9.5 AIR MONITORING RESULTS

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings.

## **10.0 EMERGENCY RESPONSE**

Prior to field activities, the SS shall plan emergency egress routes and discuss them with all personnel who will be conducting the field work. Initial planning includes establishing emergency warning signals and evacuation routes in case of an emergency.

### **10.1 EMERGENCY SERVICES**

A tested system shall exist for rapid and clear distress communication. All personnel shall be provided for concise and clear directions and accessible transportation to local emergency services. A map outlining directions to the nearest hospital will be posted on site.

The following emergency equipment shall be present on the site:

- Fire extinguisher
- Industrial first aid kit

### **10.2 EMERGENCY EVACUATION FROM EXCLUSION AND CONTAMINATION REDUCTION ZONES**

Any personnel requiring emergency medical attention shall be evacuated immediately from exclusion and reduction zones. Personnel shall not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based upon the type and severity of the illness or injury, and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life saving first aid. For others, decontamination may aggravate the injury or delay life saving treatment. If decontamination ETRI not interfere with essential treatment, it should be performed.

If decontamination can be performed, wash external clothing and cut it away. If decontamination cannot be performed, follow these procedures:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel:
- Alert emergency and off-site medical personnel to potential contamination and instruct them about specific decontamination procedures; and
- Send along site personnel familiar with the incident.

### 10.3 FIRST AID

Qualified personnel only shall give first aid and stabilize an individual needing assistance. Life support techniques, such as cardio-pulmonary resuscitation (CPR) and treatment of life threatening problems, such as airway obstruction and shock, will be given top priority. Professional medical assistance shall be obtained at the earliest possible opportunity.

### 10.4 EMERGENCY ACTIONS

If actual or suspected serious injury occurs, these steps shall be followed:

- Remove the exposed or injured person(s) from immediate danger.
- Render first aid if necessary. Decontaminate affected personnel after critical first aid is given.
- Obtain paramedic services or ambulance transport to local hospital. This procedure shall be followed even if there is no visible injury.
- Other personnel in the work area shall be evacuated to a safe distance until the site supervisor determines that it is safe for work to resume.. If there is any doubt regarding the condition of the area, work shall not commence until all hazard control issues are resolved.

The following table lists all important emergency telephone numbers:

Assistance Center	Phone Number
ETRI	(770) 888-8181 or (770) 314-0676
Georgia EPD-Emergency Response	(770) 387-4900
Georgia EPD	(404) 657-5947
U.S. EPA – Spill Reporting	(404) 562-8700
Chemtrec (24 hours)	1-800-424-9300
National Response Center	1-800-424-3802
Local Fire Department	911
Local Police	911
EMERGENCY SERVICES	911

If it becomes necessary to summon emergency services, the following information should be provided:

- Name of caller and company
- Location of emergency and nearest street intersection to the site entrance.
- Type of emergency and present status of personnel and site.
- If injury is involved, state type of injury and if emergency treatment is being administered.
- Inform the person receiving the call that the site ETRI have hazardous materials on-site.

## 10.5 GENERAL EVACUATION PLAN

In the general case of a large fire, explosion, or toxic vapor release, a site evacuation shall be ordered and shall follow these steps:

- Sound the applicable alarm and advise client representative.
- Evaluate the immediate situation and downwind direction. All personnel will evacuate in the upwind direction.
- All personnel will assemble in an upwind area when the situation permits, a head count will be taken.
- Determine the extent of the problem. Dispatch a response team in protective clothing and self-contained breathing apparatus on site to evacuate any missing personnel or to correct the problem.

### **Route to Hospital:**

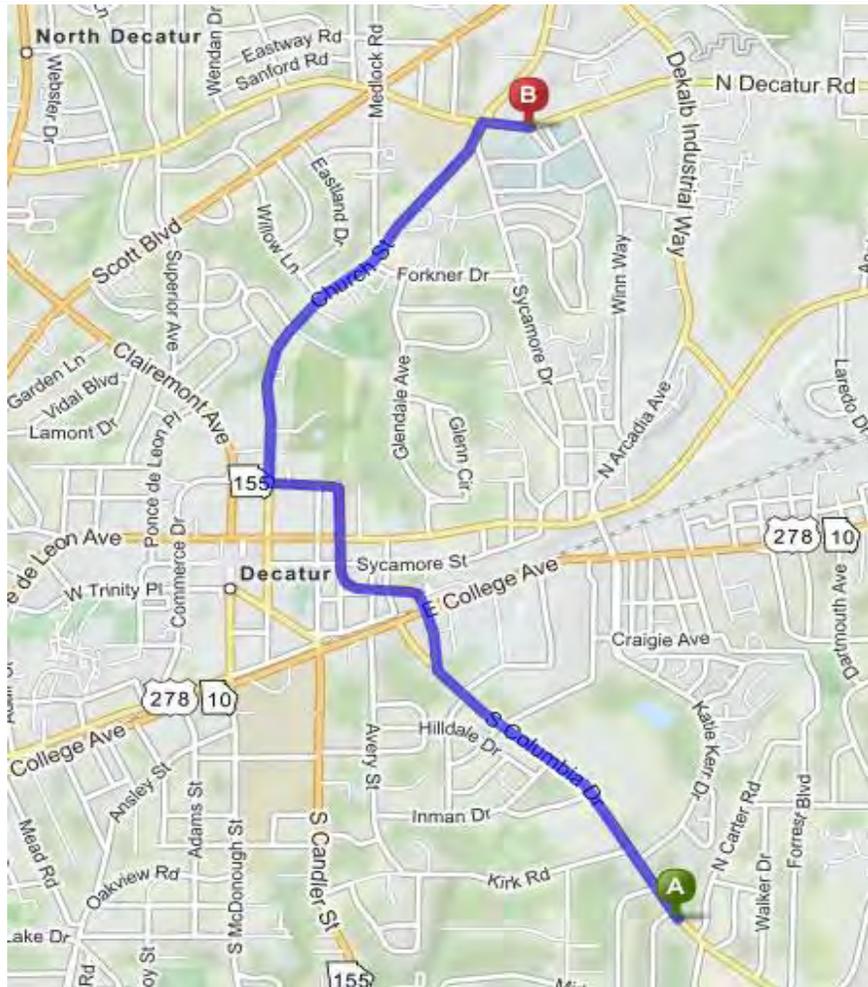
### **Call 911**

**Please refer to Figure 1 .**



*Figure 1*

---



- 1. Start out going **northwest** on **Columbia Dr** toward **Thomas Rd.** 0.9 mi

---

- ↶ 2. Turn **slight right** onto **Commerce Dr.** 0.9 mi  
*Commerce Dr is just past Talley St*

---

- ↷ 3. Turn **right** onto **Church St.** 1.2 mi  
*Church St is just past Hunter Aly  
 Blimpie is on the corner  
 If you reach Clairemont Ave you've gone a little too far*

---

- ↷ 4. Turn **right** onto **N Decatur Rd.** 0.1 mi  
*N Decatur Rd is just past Sycamore Dr  
 Lucky China is on the corner  
 If you reach Milscoot Dr you've gone about 0.2 miles too far*

---

- 5. **2701 N DECATUR RD.**  
*If you reach Winn Way you've gone about 0.1 miles too far*

Source: Mapquest.com

**ETRI**

Environmental Technology Resources, Inc.  
 4780 Ashford Dunwoody Rd.  
 Suite A-456  
 Atlanta, Georgia 30338  
 Scale: Noted

**FIGURE 1**

**ROUTE TO HOSPITAL**  
 890 South Columbia Drive  
 Decatur, Georgia

Project Number 13-148

*Appendix A – Chemical Characteristics and Health and Safety Information for  
Contaminants of Concern*

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## Search the NIOSH Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Benzene

**Synonyms & Trade Names** Benzol, Phenyl hydride**CAS No.** 71-43-2**RTECS No.** CY1400000 ([/niosh-rtecs/CY155CCo.html](http://www.niosh-rtecs/CY155CCo.html))**DOT ID & Guide** 1114 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide130/>) [Ⓔ](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>)**Formula** C<sub>6</sub>H<sub>6</sub>**Conversion** 1 ppm = 3.19 mg/m<sup>3</sup>**IDLH** Ca [500 ppm]  
See: [71432 \(/niosh/IDLH/71432.html\)](http://www.niosh.gov/IDLH/71432.html)**Exposure Limits** **NIOSH REL** :Ca TWA 0.1 ppm ST 1 ppm See [Appendix A \(nengapdxa.html\)](http://www.niosh.gov/AppendixA/nengapdxa.html)**OSHA PEL** : [1910.1028] TWA 1 ppm ST 5 ppm See [Appendix F \(nengapdx.html\)](http://www.niosh.gov/AppendixF/nengapdx.html)**Measurement Methods****NIOSH 1500** [Ⓔ \(/niosh/docs/2003-154/pdfs/1500.pdf\)](http://www.niosh.gov/docs/2003-154/pdfs/1500.pdf), **1501** [Ⓔ \(/niosh/docs/2003-154/pdfs/1501.pdf\)](http://www.niosh.gov/docs/2003-154/pdfs/1501.pdf), **3700** [Ⓔ \(/niosh/docs/2003-154/pdfs/3700.pdf\)](http://www.niosh.gov/docs/2003-154/pdfs/3700.pdf), **3800** [Ⓔ \(/niosh/docs/2003-154/pdfs/3800.pdf\)](http://www.niosh.gov/docs/2003-154/pdfs/3800.pdf);**OSHA 12**<http://www.osha.gov/dts/sltc/methods/organic/org012/org012.html>[Ⓔ](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>), **1005**<http://www.osha.gov/dts/sltc/methods/validated/1005/1005.html>[Ⓔ](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>)See: **NMAM** ([/niosh/docs/2003-154/](http://www.niosh.gov/docs/2003-154/)) or **OSHA Methods**<http://www.osha.gov/dts/sltc/methods/index.html>) [Ⓔ](http://www.cdc.gov/Other/disclaimer.html)<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]**MW:** 78.1**BP:** 176°F**FRZ:** 42°F**Sol:** 0.07%**VP:** 75 mmHg**IP:** 9.24 eV**Sp.Gr:** 0.88**Fl.P:** 12°F**UEL:** 7.8%**LEL:** 1.2%

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers, many fluorides & perchlorates, nitric acid**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]**Target Organs** Eyes, skin, respiratory system, blood, central nervous system, bone marrow

Cancer Site [leukemia]

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

**Skin:** Prevent skin contact

**Eyes:** Prevent eye contact

**Wash skin:** When contaminated

**Remove:** When wet (flammable)

**Change:** No recommendation

**Provide:** Eyewash, Quick drench

**First Aid** (See [procedures \(firstaid.html\)](#))

**Eye:** Irrigate immediately

**Skin:** Soap wash immediately

**Breathing:** Respiratory support

**Swallow:** Medical attention immediately

**Respirator Recommendations**

(See [Appendix E \(nengapdx.html\)](#))

## NIOSH

**At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0015 \(/niosh/ipcsneng/neng0015.html\)](#) See MEDICAL TESTS: [0022 \(/niosh/docs/2005-110/nmed0022.html\)](#)

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Centers for Disease Control and Prevention 1600 Clifton Road Atlanta, GA 30329-4027,  
USA

800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - [Contact CDC-INFO](#)

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## Search the NIOSH Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Toluene

**Synonyms & Trade Names** Methyl benzene, Methyl benzol, Phenyl methane, Toluol**CAS No.** 108-88-3**RTECS No.**  
XS5250000 ([/niosh-rtecs/XS501BDo.html](http://niosh-rtecs/XS501BDo.html))**DOT ID & Guide** 1294 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide130/>) [☒](http://www.cdc.gov/Other/disclaimer.html)  
(<http://www.cdc.gov/Other/disclaimer.html>)**Formula** C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>**Conversion** 1 ppm =  
3.77 mg/m<sup>3</sup>**IDLH** 500 ppm  
See: [108883 \(/niosh/idlh/108883.html\)](http://niosh/idlh/108883.html)**Exposure Limits** **NIOSH REL** :TWA 100 ppm (375 mg/m<sup>3</sup>) ST 150  
ppm (560 mg/m<sup>3</sup>)**OSHA PEL** † ([nengapdxg.html](http://nengapdxg.html)): TWA 200  
ppm C 300 ppm 500 ppm (10-minute  
maximum peak)**Measurement Methods****NIOSH 1500** [☒](http://niosh/docs/2003-154/pdfs/1500.pdf) ([/niosh/docs/2003-154/pdfs/1500.pdf](http://niosh/docs/2003-154/pdfs/1500.pdf)), **1501**[☒](http://niosh/docs/2003-154/pdfs/1501.pdf) ([/niosh/docs/2003-154/pdfs/1501.pdf](http://niosh/docs/2003-154/pdfs/1501.pdf)), **3800** [☒](http://niosh/docs/2003-154/pdfs/3800.pdf)([/niosh/docs/2003-154/pdfs/3800.pdf](http://niosh/docs/2003-154/pdfs/3800.pdf)), **4000** [☒](http://niosh/docs/2003-154/pdfs/4000.pdf)([/niosh/docs/2003-154/pdfs/4000.pdf](http://niosh/docs/2003-154/pdfs/4000.pdf));**OSHA 111**(<http://www.osha.gov/dts/sltc/methods/organic/org111/org111.html>)[☒](http://www.cdc.gov/Other/disclaimer.html) (<http://www.cdc.gov/Other/disclaimer.html>)See: **NMAM** ([/niosh/docs/2003-154/](http://niosh/docs/2003-154/)) or **OSHA Methods**(<http://www.osha.gov/dts/sltc/methods/index.html>) [☒](http://www.cdc.gov/Other/disclaimer.html)(<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless liquid with a sweet, pungent, benzene-like odor.

<b>MW:</b> 92.1	<b>BP:</b> 232°F	<b>FRZ:</b> -139°F	<b>Sol(74°F):</b> 0.07%	<b>VP:</b> 21 mmHg	<b>IP:</b> 8.82 eV
<b>Sp.Gr:</b> 0.87	<b>Fl.P:</b> 40°F	<b>UEL:</b> 7.1%	<b>LEL:</b> 1.1%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage**Target Organs** Eyes, skin, respiratory system, central nervous system, liver, kidneys**Personal Protection/Sanitation** (See  
[protection codes \(protect.html\)](http://protect.html))**First Aid** (See [procedures \(firstaid.html\)](http://firstaid.html))**Eye:** Irrigate immediately

**Skin:** Prevent skin contact  
**Eyes:** Prevent eye contact  
**Wash skin:** When contaminated  
**Remove:** When wet (flammable)  
**Change:** No recommendation

**Skin:** Soap wash promptly  
**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

#### Respirator Recommendations

### NIOSH

#### Up to 500 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*  
(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*  
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister  
(APF = 10) Any supplied-air respirator\*  
(APF = 50) Any self-contained breathing apparatus with a full facepiece

#### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode  
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister  
Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0078 \(/niosh/ipcsneng/neng0078.html\)](#) See MEDICAL TESTS: [0232 \(/niosh/docs/2005-110/nmedo232.html\)](#)

Page last reviewed: April 4, 2011

Page last updated: February 13, 2015

Content source: [National Institute for Occupational Safety and Health \(NIOSH\)](#) Education and Information Division

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<< [Back to Chemical Sampling Information](#)

## Ethyl Benzene

### General Description

**Synonyms:** Phenylethane; Ethylbenzol; Ethylbenzene

**OSHA IMIS Code Number:** 1080

**Chemical Abstracts Service (CAS) Registry Number:** 100-41-4

**NIOSH Registry of Toxic Effects of Chemical Substances (RTECS) Identification Number:** [DA0700000](#)

**Department of Transportation Regulation Number (49 CFR 172.101) and [2012 Emergency Response Guidebook](#) [4 MB PDF, 392 pages]:** 1175 130

**NIOSH Pocket Guide to Chemical Hazards - [Ethyl Benzene](#):** Physical description, chemical properties, potentially hazardous incompatibilities, and more

**U.S. Environmental Protection Agency (EPA) Hazard Summary - [Ethylbenzene](#):** Uses, sources and potential exposure, acute and chronic health hazard information, and more

### Exposure Limits and Health Effects

Exposure Limit	Limit Values	HE Codes	Health Factors and Target Organs
<b>OSHA Permissible Exposure Limit (PEL) - General Industry</b> See <a href="#">29 CFR 1910.1000 Table Z-1</a>	100 ppm (435 mg/m <sup>3</sup> ) TWA	HE15	Eye, skin, and throat irritation
<b>OSHA PEL - Construction Industry</b> See <a href="#">29 CFR 1926.55</a>	100 ppm (435 mg/m <sup>3</sup> ) TWA	HE15	Eye, skin, and throat irritation
<b>OSHA PEL - Shipyard Employment</b> See <a href="#">29 CFR 1915.1000 Table Z-Shipyards</a>	100 ppm (435 mg/m <sup>3</sup> ) TWA	HE15	Eye, skin, and throat irritation
<b>National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL)</b>	100 ppm (435 mg/m <sup>3</sup> ) TWA	HE7	Weakness, dizziness, drowsiness, or unconsciousness; depression of the central nervous system
		HE8	Narcosis
		HE11	Edema and hemorrhage of lung tissue
		HE15	Eye, nose, throat, and skin irritation
<b>American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (2011)</b>	20 ppm (87 mg/m <sup>3</sup> ) TWA A3; BEI	HE3	Hearing loss (cochlear impairment)
		HE3	Kidney damage
		HE15	Upper respiratory tract irritation
<b><a href="#">CAL/OSHA PELs</a></b>	100 ppm (435 mg/m <sup>3</sup> ) TWA  125 ppm (545 mg/m <sup>3</sup> ) STEL	HE3	Hearing loss (cochlear impairment)
		HE3	Kidney damage
		HE15	Upper respiratory tract irritation

**National Toxicology Program (NTP) carcinogenic classification:** Not listed

**International Agency for Research on Cancer (IARC) carcinogenic classification:** [Group 2B](#) [200 KB PDF, 40 pages] (possibly carcinogenic to humans)

**EPA carcinogenic classification:** [Not classifiable as to human carcinogenicity](#)

**EPA Inhalation Reference Concentration (RfC):** [1 mg/m<sup>3</sup>](#)

**Agency for Toxic Substances and Disease Registry (ATSDR) Inhalation Minimal Risk Level (MRL):** [5 ppm \(acute\)](#); [2 ppm \(intermediate\)](#); [0.06 ppm \(chronic\)](#)

**NIOSH Immediately Dangerous To Life or Health Concentration (IDLH):** [800 ppm](#)

#### Chemical Sampling Information (CSI)

Search (use word(s)/phrase)

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By CAS Number

Quick Links

- Field Label Abbreviations & Descriptions
- OSHA Occupational Chemical Database

## Notes on Other Potential Health Effects and Hazards

1. Ethylbenzene is highly flammable (NIOSH/IPCS 2007).
2. Ethylbenzene was tested by inhalation exposure in single experiments in mice and rats. In mice, it increased the incidence of lung adenomas in males and of liver adenomas in females. In male rats, it increased the incidence of renal tubule adenomas and carcinomas. An increase in the incidence of renal adenomas was seen in females only after step-sectioning. (IARC 1999)
3. The EPA reference concentration was established based on laboratory studies observing developmental deficits in rats and rabbits exposed by inhalation.
4. The EPA carcinogen assessment was made before the IARC or NTP studies were published.
5. Laboratory inhalation studies in rats and mice observed kidney, liver, lung and thyroid effects. (NTP 1999)
6. The ATSDR minimal risk level is based on neurological and developmental effects.

**Date Last Revised:** 11/16/2012

## Literature Basis:

- ACGIH: Documentation of the Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) - Ethyl Benzene. 2011.
- Andrew, F.D., R.L. Buschbom, W.C. Cannon, R.A. Miller, L.F. Montgomery, D.W. Phelps, et al. 1981. Teratologic assessment of ethylbenzene and 2-ethoxyethanol. Battelle Pacific Northwest Laboratory, Richland, WA. PB 83- 208074., 108.
- [ATSDR Toxicological Profile Ethyl Benzene, 2010](#) [6 MB PDF, 341 pages].
- Hardin, B.D., G.P. Bond, M.R. Sikov, F.D. Andrew, R.P. Beliles and R.W. Niemeier. 1981. Testing of selected workplace chemicals for teratogenic potential. Scand. J. Work Environ. Health. 7(suppl 4): 66-75. [EPA IRIS Ethyl Benzene, 1991](#)
- [IARC Monographs on Carcinogenicity Volume 77 Ethyl Benzene, 1999](#) [200 KB PDF, 40 pages].
- [National Toxicology Program Toxicology and Carcinogenesis Studies & Ethyl Benzene \(inhalation studies\), 1999](#) [13 MB PDF, 31 pages].
- NIOSH: Occupational Health Guideline for Ethyl Benzene. September 1978.
- NIOSH/IPCS: International Chemical Safety Card - [Ethylbenzene](#). November 2007.

## Monitoring Methods used by OSHA

### Laboratory Sampling/Analytical Method:

- **sampling media:** Charcoal Tube (100/50 mg sections, 20/40 mesh)  
**analytical solvent:** Carbon Disulfide  
**alternate solvent:** (99:1) Carbon Disulfide/Dimethylformamide  
**maximum volume:** 12 Liters  
**maximum flow rate:** 0.05 L/min (TWA)  
**maximum volume:** 0.25 Liter  
**maximum flow rate:** 0.05 L/min (STEL)  
**current analytical method:** Gas Chromatography; GC/FID  
**method reference:** OSHA Manual of Analytical Methods ([OSHA 1002](#))  
**method classification:** Fully Validated
- **sampling media:** Diffusive Sampler (SKC 575-002 Passive Sampler)  
**sampling time:** 5 to 240 Minutes (TWA)  
**analytical solvent:** Carbon Disulfide  
**current analytical method:** Gas Chromatography; GC/FID  
**method reference:** OSHA Manual of Analytical Methods ([OSHA 1002](#))  
**method classification:** Fully Validated

### On-Site Sampling Techniques/Methods:

- **device:** Detector Tube  
**manufacturer:** AUER/MSA  
**model/type:** Tol-5, MSA P/N 803947, AUER P/N 5085-828  
**sampling information:** follow manufacturer's instructions  
**upper measurement limit:** 1800 ppm  
**detection limit:** approx. 5 ppm  
**overall uncertainty:** unknown  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Dräger  
**model/type:** Ethyl Benzene 30/a, order no. 67 28381  
**sampling information:** 6 strokes  
**upper measurement limit:** 400 ppm  
**detection limit:** approx. 10 ppm  
**overall uncertainty:** 16%  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Gastec  
**model/type:** 122L  
**sampling information:** 2 strokes  
**upper measurement limit:** 70 ppm  
**detection limit:** approx. 1 ppm  
**overall uncertainty:** unknown  
**method reference:** on-site air secondary (manufacturer)
- **device:** Detector Tube  
**manufacturer:** Matheson-Kitagawa  
**model/type:** 8014-179S  
**sampling information:** follow manufacturer's instructions  
**upper measurement limit:** 500 ppm  
**detection limit:** approx. 10 ppm

**overall uncertainty:** unknown

**method reference:** on-site air secondary (manufacturer)

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<< Back to Chemical Sampling Information

Xylene

General Description

Synonyms: o-, m-, and p-Isomers; Xylol; Dimethylbenzene; Methyl toluene

OSHA IMIS Code Number: 2590

Chemical Abstracts Service (CAS) Registry Number: 1330-20-7

Other Chemical Abstracts Service (CAS) Registry Numbers: 108-38-3 (m-Xylene); 95-47-6 (o-Xylene); 106-42-3 (p-Xylene)

NIOSH Registry of Toxic Effects of Chemical Substances (RTECS) Identification Number: ZF2275000 (m-Xylene); ZF2450000 (o-Xylene); ZF2625000 (p-Xylene)

Department of Transportation Regulation Number (49 CFR 172.101) and 2012 Emergency Response Guidebook [4 MB PDF, 392 pages]: 1307 130

NIOSH Pocket Guide to Chemical Hazards - m-Xylene, o-Xylene, and p-Xylene: Physical description, chemical properties, potentially hazardous incompatibilities, and more

EPA Hazard Summary - Xylenes: Uses, sources and potential exposure, acute and chronic health hazard information, and more

Exposure Limits

Table with 4 columns: Exposure Limit, Limit Values, HE Codes, Health Factors and Target Organs. Rows include OSHA Permissible Exposure Limit (PEL) for General Industry, Construction Industry, and Shipyard Employment; NIOSH Recommended Exposure Limit (REL); American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV); and CAL/OSHA PELs.

Chemical Sampling Information (CSI) Search (use word(s)/phrase) Go. Table of Contents: By Name (A-Z), By CAS Number, Quick Links (Field Label Abbreviations & Descriptions, OSHA Occupational Chemical Database).

**National Toxicology Program (NTP) carcinogenic classification:** Not listed

**International Agency for Research on Cancer (IARC) carcinogenic classification:** [Group 3](#) [74 KB PDF, 20 pages] (not classifiable as to its carcinogenicity in humans)

**U.S. Environmental Protection Agency (EPA) carcinogenic classification:** [Data is inadequate for an assessment of human carcinogenic potential](#)

**EPA Inhalation Reference Concentration (RfC):** [0.1 mg/m<sup>3</sup>](#)

**Agency for Toxic Substances and Disease Registry (ATSDR) Inhalation Minimal Risk Level (MRL):** [2 ppm \(acute\); 0.6 ppm \(intermediate\); 0.05 ppm \(chronic\)](#)

**NIOSH Immediately Dangerous To Life or Health Concentration (IDLH):** [900 ppm](#)

#### Notes on Other Potential Health Effects and Hazards

1. The most commonly cited symptoms associated with xylene exposures are headache, fatigue, irritability, and gastrointestinal disturbances (ACGIH 2001).
2. May be involved in ototoxicity associated with exposure to solvents containing xylene (Sulkowski et al. 2002).
3. Urinary metabolites (presumed to be formed by CYP2E1), which are isomers of methylhippuric acid, are used for the biomonitoring of xylene exposure (Gonzales-Reche et al. 2003).
4. The EPA reference concentration is based on a subchronic study Impaired motor coordination (decreased rotarod performance) study in male rats (Korsak et al., 1994).
5. [ATSDR bases its minimal risk level on potential of xylenes to cause developmental liver, neurological and renal effects.](#)

**Date Last Revised:** 11/16/2012

#### Literature Basis:

- ACGIH: Documentation of the Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) - Xylene (all isomers). 2001.
- ATSDR Toxicological Profile for Xylene, 2007
- [EPA IRIS Xylenes 2003](#)
- Gonzalez-Reche, L.M., Schettgen, T. and Angerer, J.: New approaches to the metabolism of xylenes: verification of the formation of phenylmercapturic acid metabolites of xylenes. Arch. Toxicol. 77(2): 80-85, 2003.
- Korsak, Z; Wisniewska-Knypl, J; Swiercz, R. (1994) Toxic effects of subchronic combined exposure to n-butyl alcohol and m-xylene in rats. Int J Occup Med Environ Health 7:155-166.
- NIOSH: Occupational Health Guideline for Xylene. 1978.
- NIOSH/IPCS: International Chemical Safety Cards - [m-Xylene](#). 2002.
- NIOSH/IPCS: International Chemical Safety Cards - [o-Xylene](#). 2002.
- NIOSH/IPCS: International Chemical Safety Cards - [p-Xylene](#). 2002.
- Hood RD, Ottley MS Developmental effects associated with exposure to xylene: a review.
- Drug Chem Toxicol. 1985;8(4):281-97.
- Sulkowski, W.J. et al.: Effects of occupational exposure to a mixture of solvents on the inner ear - a field study. Int. J. Occup. Med. Environ. Health 15(3): 247-256, 2002.

#### Monitoring Methods used by OSHA

##### Laboratory Sampling/Analytical Method:

- **sampling media:** Charcoal Tube (100/50 mg sections, 20/40 mesh)  
**analytical solvent:** Carbon Disulfide  
**alternative solvent:** (99:1) Carbon Disulfide:Dimethylformamide  
**maximum volume:** 12 Liters  
**maximum flow rate:** 0.05 L/min (TWA)  
**minimum volume:** 0.25 Liters  
**maximum flow rate:** 0.05 L/min (STEL)  
**current analytical method:** Gas Chromatography; GC/FID  
**method reference:** OSHA Analytical Method ([OSHA 1002](#))  
**method classification:** Fully Validated
- **sampling media:** Diffusive Sampler (SKC 575-002 Passive Sampler)  
**analytical solvent:** Carbon Disulfide  
**sampling time:** 5 to 240 Minutes (TWA)  
**current analytical method:** Gas Chromatography; GC/FID  
**method reference:** OSHA Analytical Method ([OSHA 1002](#))  
**method classification:** Fully Validated

##### On-Site Sampling Techniques/Methods:

- **device:** Detector Tube  
**manufacturer:** Gastec  
**model/type:** 123  
**sampling information:** 0.5 to 2 strokes  
**upper measurement limit:** 625 ppm  
**detection limit:** 1 ppm  
**overall uncertainty:** 16% for 10 to 50 ppm, 8% for 50 to 250 ppm  
**method reference:** on-site air secondary ([SEI Certified](#))
- **device:** Detector Tube  
**manufacturer:** Matheson-Kitagawa  
**model/type:** 8014-143SA  
**sampling information:** 2 strokes  
**upper measurement limit:** 1000 ppm  
**detection limit:** approximately 2 ppm

**overall uncertainty:** unknown

**method reference:** on-site air secondary ([SEI Certified](#))

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## Search the NIOSH Pocket Guide

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## Lead

**Synonyms & Trade Names** Lead metal, Plumbum**CAS No.** 7439-92-1**RTECS No.**  
[OF7525000 \(/niosh-rtecs/OF72D288.html\)](/niosh-rtecs/OF72D288.html)**DOT ID & Guide****Formula** Pb**Conversion****IDLH** 100 mg/m<sup>3</sup> (as Pb)  
See: [7439921 \(/niosh/idlh/7439921.html\)](/niosh/idlh/7439921.html)**Exposure Limits** NIOSH REL \*

TWA (8-hour) 0.050 mg/m<sup>3</sup> See [Appendix C \(nengapdc.html\)](#) [\*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]

**OSHA PEL \***: [1910.1025] TWA 0.050 mg/m<sup>3</sup> See [Appendix C \(nengapdc.html\)](#) [\*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

**Measurement Methods**

**NIOSH 7082**  [\(/niosh/docs/2003-154/pdfs/7082.pdf\)](/niosh/docs/2003-154/pdfs/7082.pdf), **7105**  [\(/niosh/docs/2003-154/pdfs/7105.pdf\)](/niosh/docs/2003-154/pdfs/7105.pdf), **7300**  [\(/niosh/docs/2003-154/pdfs/7300.pdf\)](/niosh/docs/2003-154/pdfs/7300.pdf), **7301**  [\(/niosh/docs/2003-154/pdfs/7301.pdf\)](/niosh/docs/2003-154/pdfs/7301.pdf), **7303**  [\(/niosh/docs/2003-154/pdfs/7303.pdf\)](/niosh/docs/2003-154/pdfs/7303.pdf), **7700**  [\(/niosh/docs/2003-154/pdfs/7700.pdf\)](/niosh/docs/2003-154/pdfs/7700.pdf), **7701**  [\(/niosh/docs/2003-154/pdfs/7701.pdf\)](/niosh/docs/2003-154/pdfs/7701.pdf), **7702**  [\(/niosh/docs/2003-154/pdfs/7702.pdf\)](/niosh/docs/2003-154/pdfs/7702.pdf), **9100**  [\(/niosh/docs/2003-154/pdfs/9100.pdf\)](/niosh/docs/2003-154/pdfs/9100.pdf), **9102**  [\(/niosh/docs/2003-154/pdfs/9102.pdf\)](/niosh/docs/2003-154/pdfs/9102.pdf), **9105**  [\(/niosh/docs/2003-154/pdfs/9105.pdf\)](/niosh/docs/2003-154/pdfs/9105.pdf);

**OSHA ID121**

[\(http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html\)](http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html)  
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 [\(/http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html), **ID206**  
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 [\(/http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)  
 See: **NMAM** (</niosh/docs/2003-154/>) or **OSHA Methods**  
 [\(http://www.osha.gov/dts/sltc/methods/index.html\)](http://www.osha.gov/dts/sltc/methods/index.html)  [\(/http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)

**Physical Description** A heavy, ductile, soft, gray solid.**MW:**  
207.2**BP:**  
3164°F**MLT:**  
621°F**Sol:**  
Insoluble**VP:** 0 mmHg (approx)**IP:** NA**Sp.Gr:**  
11.34**Fl.P:**  
NA**UEL:** NA**LEL:** NA

Noncombustible Solid in bulk form.

**Incompatibilities & Reactivities** Strong oxidizers, hydrogen peroxide, acids**Exposure Routes** inhalation, ingestion, skin and/or eye contact

**Symptoms** lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

**Target Organs** Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

**Skin:** Prevent skin contact

**Eyes:** Prevent eye contact

**Wash skin:** Daily

**Remove:** When wet or contaminated

**Change:** Daily

**First Aid** (See [procedures \(firstaid.html\)](#))

**Eye:** Irrigate immediately

**Skin:** Soap flush promptly

**Breathing:** Respiratory support

**Swallow:** Medical attention immediately

#### **Respirator Recommendations**

(See [Appendix E \(nengapdx.html\)](#))

#### **NIOSH/OSHA**

##### **Up to 0.5 mg/m<sup>3</sup>:**

(APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

##### **Up to 1.25 mg/m<sup>3</sup>:**

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

##### **Up to 2.5 mg/m<sup>3</sup>:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

##### **Up to 50 mg/m<sup>3</sup>:**

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

##### **Up to 100 mg/m<sup>3</sup>:**

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

##### **Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

##### **Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus