

# Introductions

- Liberty Environmental, Inc.
  - James Cinelli, P.E.
  - Kelly Kinkaid, P.G.
- PA Dept. of Environmental Protection
  - Barbara Bloomfield, P.G. – case manager
  - George Horvat – supervisor
- Warwick Township
  - Gail Weniger, Township Manager
- Bucks County Health Department
  - Jason Wood
  - Andy Schafer

# Chronology

- Dec 20, 2005: Customers of garage reported water in their tanks.
- Dec 21, 2005: Owner discovered water in Tank #2, believed it was from a broken fill pipe cap.
- Dec 23, 2005
  - Tank monitoring system indicates a problem with Tank #2.
  - Owner begins removing product from Tank #2.

# Chronology

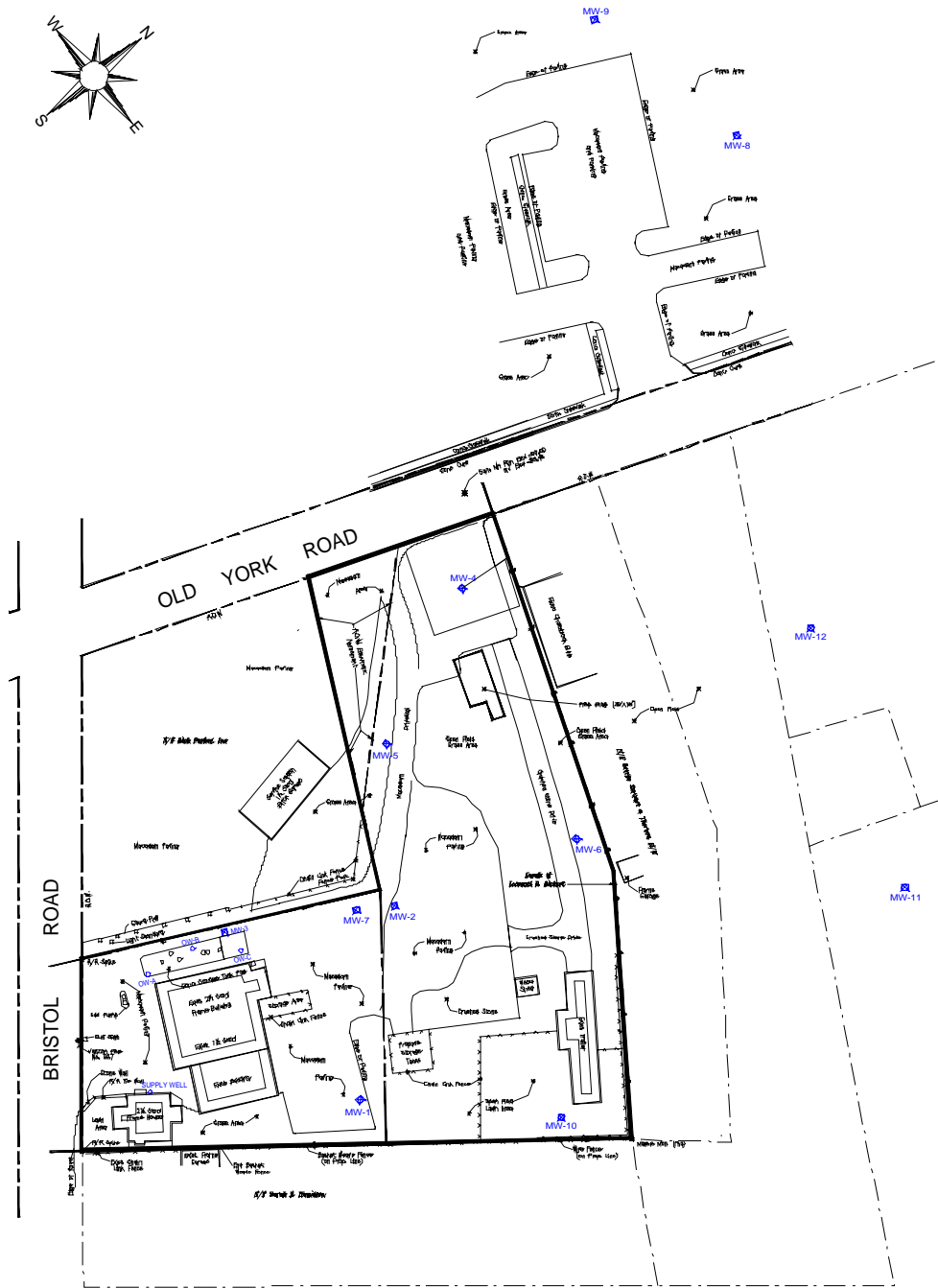
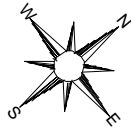
- Dec 26, 2005: Gasoline discovered in tankfield observation well. Owner begins pumping water & product from well.
- Jan 4, 2006: Owner confirmed release was from tank and notified DEP. Also contacts tank manufacturer and installer to determine reason for tank failure.
- Jan 5, 2006: Owner contacts Liberty to conduct site characterization.

# Chronology

- Jan 9, 2006: Additional water and product pumped out of observation well.
- Jan 17, 2006: Tank inspection reveals two cracks in tank. Additional water and product are pumped out of observation well. Tank repairs began.
- Jan 25-26, 2006: Liberty installs four groundwater monitoring wells (MW-1 to MW-4)

# Chronology

- Feb 6, 2006: Liberty samples groundwater from monitoring wells and the garage's supply well. Discover separate phase liquid (SPL) in one monitoring well (MW-2).
- Feb 21, 006: Downgradient well MW-4 has benzene and MTBE above DEP action levels. Garage's supply well is clean.



# Chronology

- Feb 22, 2006
  - Begin research to determine locations of other supply wells in the area.
  - Contact Warwick Township and Bucks Co. Health Dept. to obtain map of domestic wells.
  - On-line well database search performed.
- Feb 23, 2006: Confirmed with Warwick Twp. that wells are located along Old York Road, Hart Lane and Graeme Way.

# Chronology

- March 6, 2006: Liberty begins contacting owners of homes closest to the site (1176, 1186, 1195 and 1196 Hart Lane, and 1419 and 1425 Old York Road).
- March 9, 2006
  - Collected water sample from 1186 Hart Lane.
  - Installed SPL recovery system in MW-2.
- March 22, 2006
  - 1186 Hart Lane sample results are non-detect.
  - 90-Day Update Report submitted to DEP.

# Chronology

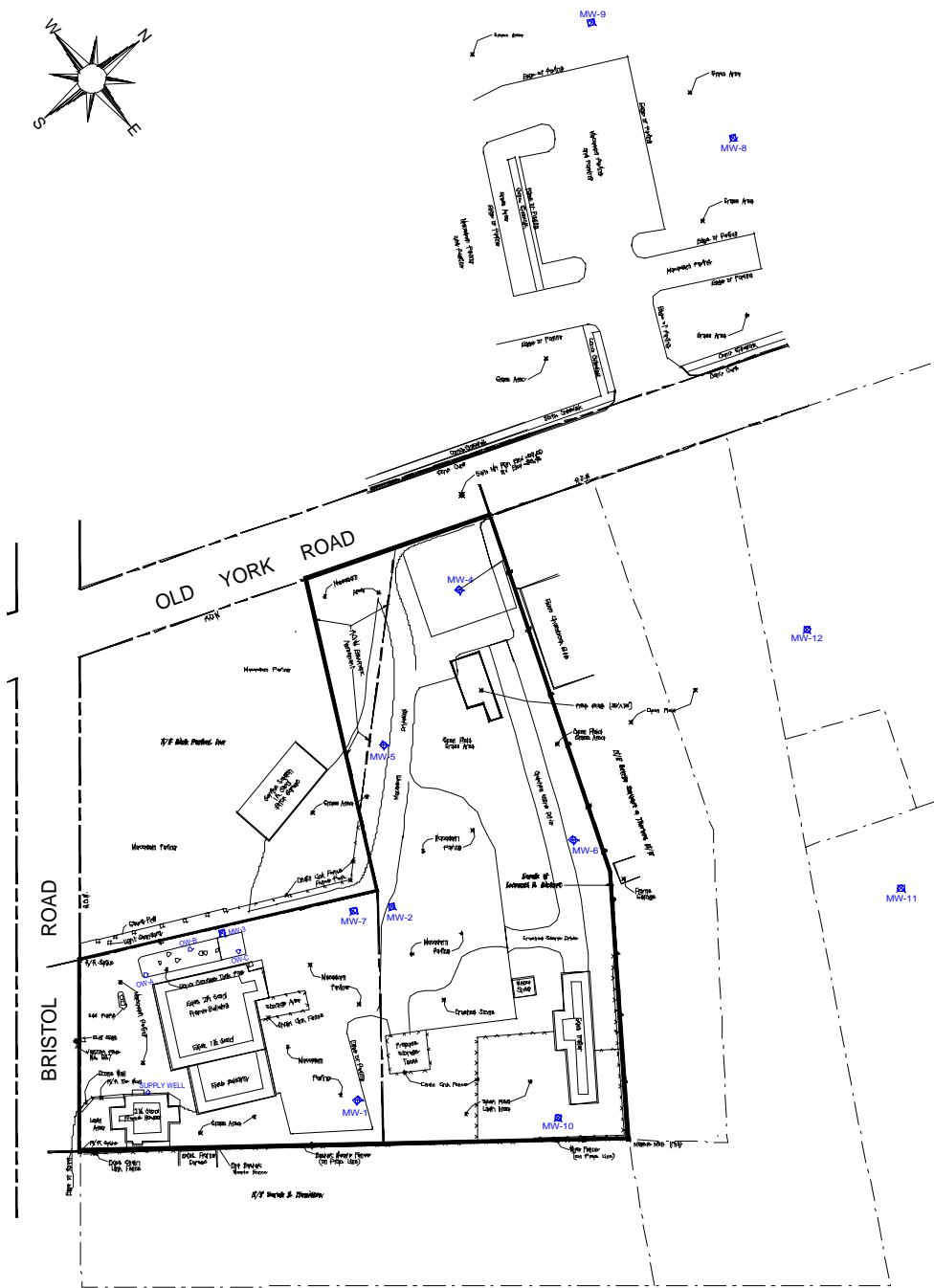
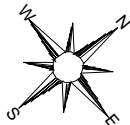
- April 12, 2006: Two additional monitoring wells, MW-5 and MW-6, installed.
- April 28, 2006: Conducted groundwater monitoring. SPL only found in MW-2, Thin layer seen in one of tankfield observation wells.
- May 10, 2006
  - Lab results indicate increase in MTBE in MW-4.
  - DEP advised of results.
  - Remediation system planning begins.

# Chronology

- June 1, 2006: Site meeting with Warwick Twp. and Warminster Muni. Authority to discuss discharge of treated groundwater. WMA refuses to accept discharge. Liberty researches other discharge options.
- June 20, 2006: Install MW-7 on site.
- Aug 15, 2006: Submit Site Characterization Report to DEP.

# Chronology

- Aug 16, 2006: Install off-site wells MW-8 and MW-9 at 1400 Old York Road.
- Aug 30, 2006: Sampled all monitoring wells.
- Sept 19, 2006: Received laboratory results. Concentrations at MW-4 and MW-5 decreased. No contaminants detected in off-site monitoring wells MW-8 and MW-9.



# Chronology

- Nov. 7, 2006: Sampled monitoring and observation wells.
- Nov. 21, 2006: Received analytical results. No detections in off-site monitoring wells MW-8 and MW-9.
- Dec. 5, 2006: Began construction of remediation system.

# Chronology

- Feb. 8, 2007: Sampled monitoring and observation wells.
- Feb. 17, 2007: Submitted Site Characterization Addendum and Remedial Action Plan to DEP.
- March 14, 2007: Began operation of groundwater remediation system. Extracted groundwater stored in tank and hauled off-site for disposal.

# Chronology

- May 15, 2007: Samples monitoring and observation wells.
- June 1, 2007: DEP approves SCR Update and RAP.
- July 11, 2007: Received permission from Warminster Muni. Authority to discharge to their sewer system.
- Aug 14, 2007: Sampled all monitoring and observation wells.

# Chronology

- Aug. 27, 2007: Received results from August 14th sampling. MTBE, Naphthalene, 1,2,4-TMB and 1,3,5-TMB detected in off-site well MW-9.
- August 30, 2007:
  - Resampled MW-8 and MW-9. Sampled homeowner wells at 1176, 1186, and 1196 Hart Lane and 1451 Graeme Way.
  - Visited several other homes to verify if they have wells.
- September 7, 2007: Sampled homeowner well at 1195 Hart Lane.

# Chronology

- September 14, 2007: Received results of August 30th sampling (1176, 1186, and 1196 Hart Lane and 1451 Graeme Way). No gasoline parameters identified in the homeowner wells. MTBE present in both MW-8 and MW-9 but no other parameters present.
- September 20, 2007: Received results of September 7th sampling at 1195 Hart Lane. No gasoline parameters detected.

# Chronology

- Sept. 25-26, 2007: Install monitor wells MW-10 and MW-11 (off-site)
- Oct. 18, 2007: Sampled MW-10 and MW-11.
- Oct. 31, 2007: Received results for MW-10 and MW-11. MTBE present in both wells above residential standards.
- Nov. 20, 2007: Sampled all monitoring wells and observation wells.

# Chronology

- Dec. 10, 2007: Received results of November 20th sampling. MTBE present in MW-8, but not MW-9. MTBE Continues to be present in MW-10 and MW-11, but at lower levels.
- Feb. 7, 2008: Install MW-12 on PECO property.
- Feb. 21, 2008: Sample all monitoring and observation wells.

# Chronology

- March 7, 2008: Received analytical results for February 21st sampling. No MTBE in MW-8 or MW-9. MTBE levels in MW-10 and MW-11 continue to decrease, but TMBs and other compounds now present in MW-11. MTBE present in MW-12.
- March 18, 2008: Began discharging system effluent to sanitary sewer.
- March 25, 2008: Sample 1195 Hart Lane.
- March 27, 2008: Sample 1186 and 1196 Hart Lane and 1451 Graeme Way.

# Chronology

- **April 8, 2008:** Received homeowner analytical results. 1,2,4- and 1,3,5-TMBs present at 1451 Graeme Way with 1,2,4-TMB above residential standard. Delivered bottled water to 1451 Graeme Way.
- April 8, 2008: Resampled 1451 Graeme Way and sampled surrounding homes (1454 and 1457 Graeme Way, 1174 and 1184 Old York Road, and 1176 Hart Lane)
- April 10, 2008: Received results from April 8th sampling. MTBE and 1,2,4-TMB detected at 1176 Hart Lane (below standards). No detection in the other wells sampled that day.



# Chronology

- April 10, 2008: Receive notice from DEP clarifying which domestic wells that are to be sampled.
- April 11–15, 2008: Continued to sample domestic wells.
- April 21-23, 2008: Received analytical results for homeowner wells sampled April 11th to 15th.

# Chronology

- April 22, 2008: Re-sampled 1176 Hart Lane and 1451 Graeme Way. Sampled 1481 Graeme Way and 1207 Hart Lane.
- April 22, 2008: Telephoned 1235 Hart Lane to advise of analytical results and make arrangements to provide bottled water. Very low level of naphthalene detected in this well.
- April 24, 2008: Re-sampled 1235 Hart Lane.

# Chronology

- April 29, 2008: Analytical results received for wells sampled on April 22nd. MTBE detected at 1176 Hart Lane. No gasoline compounds detected at 1451 or 1481 Graeme Way or 1207 Hart Lane.

# Remediation Summary

- Continuously extracting groundwater from 6 wells.
- As of May 15, 2008, pumped 486,000 gallons.
- 8 gallons of SPL recovered from MW-2.

# Future Actions

- Continue groundwater pump-and-treat to the satisfaction of DEP.
- Continue quarterly sampling of monitoring wells to monitor remedial progress.
- Continue periodic sampling of some domestic wells, with frequency to be determined by DEP, with results provided to homeowners.

Location/Date	Benzene	Ethylbenzene	Cumene	MTBE	Naphthalene	Toluene	Xylenes	1,2,4 TMB <sup>6</sup>	1,3,5 TMB <sup>7</sup>
Act 2 Standard (µg/L)	5	700	1,100	20	100	1,000	10,000	16	16
<b>MW-1</b>									
2/9/2006	<1	<2	<2	20	<5	<2	<6	NA	NA
4/28/2006	<1	<2	<2	16	<5	<2	<6	NA	NA
8/30/2006	<1	<2	<2	<20	<5	<2	<6	NA	NA
11/7/2006	<1	<2	<2	28	<5	<2	<6	NA	NA
2/8/2007	<1	<2	<2	<5	<5	<2	<6	<2	<2
5/15/2007	<1	<2	<2	<2	<5	<2	<6	<2	<2
8/14/2007	<1	<2	<2	17	<5	<2	<6	<2	<2
11/20/2007	<1	<2	<2	7.3	<5	<2	<6	<2	<2
2/21/2008	<1	<2	<2	150	<5	<2	<6	<2	<2
3/25/2008	<1	<2	<2	63	<5	<2	<6	<2	<2
<b>MW-2/RW-2</b>									<2
4/28/2006	6,000	850	39	220,000	280	13,000	7,500	NA	NA
8/30/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA
11/7/2006	NA	NA	NA	NA	NA	NA	NA	NA	NA
2/8/2007	NA	NA	NA	NA	NA	NA	NA	NA	NA
5/15/2007	1,000	350	19	11,000	210	2,800	5,000	750	240
11/20/2007	690	32	<10	6,400	62	230	2,400	360	200
2/21/2008	560	150	<40	2,700	<100	230	2,300	330	260
<b>MW-3</b>									
2/9/2006	15	<2	<2	19,000	<5	4.8	57	NA	NA
4/28/2006	<1	<2	<2	12,000	<5	<2	<6	NA	NA
8/30/2006	<1	<2	<2	23,000	<5	<2	<6	NA	NA
11/7/2006	<1	<2	<2	45,000	<5	<2	<6	NA	NA
2/8/2007	<1	<2	<2	28,000	<5	<2	<6	<2	<2
	<1	<2	<2	18,000	<5	<2	<6	<2	<2
8/14/2007	<1	<2	<2	32,000	<5	<2	<6	<2	<2
11/20/2007	<1	<2	<2	19,000	<5	<2	<6	<2	<2
2/21/2008	<1	<2	<2	16,000	<5	<2	<6	<2	<2
<b>MW-4 / RW-4<sup>8</sup></b>									
2/9/2006	27	<2	<2	4,400	<5	14	<6	NA	NA
4/28/2006	1,600	160	7	70,000	32	2,000	880	NA	NA
8/30/2006	1,100	110	<40	36,000	<100	1,200	530	NA	NA
11/7/2006	290	15	2.4	1,900	<5	10	<6	NA	NA
2/8/2007	260	39	2.7	2,200	9.8	210	170	20	4.2
5/15/2007	15	6.2	<2	1,100	<5	12	17	4.3	<2
8/14/2007	<10	<20	<20	1,900	<50	<20	61	60	<20

Location/Date	Benzene	Ethylbenzene	Cumene	MTBE	Naphthalene	Toluene	Xylenes	1,2,4 TMB <sup>6</sup>	1,3,5 TMB <sup>7</sup>
Act 2 Standard (µg/L)	5	700	1,100	20	100	1,000	10,000	16	16
<b>MW-5 / RW-5<sup>5</sup></b>									
4/28/2008	2,600	920	<2	150,000	<5	1,800	2,100	NA	NA
5/17/2008 <sup>4</sup>	300	21	<2	18,000	13	190	130	NA	NA
8/30/2008	380	66	3	29,000	17	190	280	NA	NA
11/7/2008	310	51	2.4	16,000	5	210	230	NA	NA
2/8/2007	17	<2	<2	9,700	9.9	<2	<6	2.8	<2
5/15/2007	15	<2	<2	2,000	<5	<2	<6	<2	<2
8/14/2007	4.3	<2	<2	2,800	<5	<2	<6	<2	<2
11/20/2007	<1	<2	<2	300	<5	<2	<6	<2	<2
2/21/2008	<1	<2	<2	1,400	<5	<2	<6	<2	<2
<b>MW-6</b>									
4/28/2008	760	44	<2	25,000	31	700	910	NA	NA
8/30/2008	530	43	<40	25,000	<100	<60	<160	NA	NA
11/7/2008	420	62	6.8	11,000	14	33	160	NA	NA
2/8/2007	170	24	3.9	6,200	5.5	10	7.8	<2	<2
5/15/2007	140	32	3.2	3,900	19	14	39	44	<2
8/14/2007	7.9	4.2	2.6	2,100	18	8	150	87	27
11/20/2007	52	9.6	5.2	1,300	<5	4	<6	<2	<2
2/21/2008	<1	<2	<2	600	<5	<2	<6	<2	<2
<b>MW-7 / RW-7<sup>5</sup></b>									
8/30/2008	550	6.8	4.7	38,000	28	100	91	NA	NA
11/7/2008	810	15	4.2	42,000	20	200	190	NA	NA
2/8/2007	320	17	5.6	23,000	24	50	120	32	7.6
5/15/2007	39	<2	<2	12,000	<5	3	20	3.5	<2
8/14/2007	<1	<2	<2	7,400	<5	<2	<6	<2	<2
11/20/2007	7.4	11	<2	6,900	<5	3	87	13	3.8
2/21/2008	48	11	<2	8,100	<5	14	100	14	8
<b>MW-8</b>									
8/30/2008	<1	<2	<2	<20	<5	<2	<6	NA	NA
11/7/2008	<1	<2	<2	<10	<5	<2	<6	NA	NA
2/8/2007	<1	<2	<2	<5	<5	<2	<6	<2	<2
5/15/2007	<1	<2	<2	<2	<5	<2	<6	<2	<2
8/14/2007	<1	<2	<2	<6	<5	<2	<2	<2	<2
8/30/2007	<1	<2	<2	6.2	<5	<2	<6	<2	<2
11/20/2007	<1	<2	<2	2.6	<5	<2	<6	<2	<2
2/21/2008	<1	<2	<2	<2	<5	<2	<6	<2	<2

Location/Date	Benzene	Ethylbenzene	Cumene	MTBE	Naphthalene	Toluene	Xylenes	1,2,4 TMB <sup>6</sup>	1,3,5 TMB <sup>7</sup>
Act 2 Standard (µg/L)	5	700	1,100	20	100	1,000	10,000	16	16
<b>MW-9</b>									
8/30/2006	<1	<2	<2	<20	<5	<2	<6	NA	NA
11/7/2006	<1	<2	<2	<10	<5	<2	<6	NA	NA
2/8/2007	<1	<2	<2	<5	<5	<2	<6	<2	<2
5/15/2007	<1	<2	<2	<2	<5	<2	<6	<2	<2
8/14/2007	<1	<2	<2	14	22	<2	<6	21	5.6
8/30/2007	<1	<2	<2	11	<5	<2	<6	<2	<2
11/20/2007	<1	<2	<2	<2	<5	<2	<6	<2	<2
2/21/2008	<1	<2	<2	<2	<5	<2	<6	<2	<2
<b>MW-10<sup>8</sup></b>									
10/18/2007	<1	<2	<2	400	<5	<2	<6	<2	<2
11/20/2007	<1	<2	<2	14	<5	<2	<6	<2	<2
2/21/2008	<1	<2	<2	4.2	<5	<2	<6	<2	<2
<b>MW-11<sup>8</sup></b>									
10/18/2007	<1.0	<2.0	<2.0	690	<5.0	<2.0	<6.0	<2.0	<2.0
11/20/2007	<1	<2	<2	350	<5	<2	<6	<2	<2
2/21/2008	2.5	17	3.7	120	7	<2	32	78	28
3/25/2008	1	7.2	<2	45	<5	<2	16	<2	<2
<b>MW-12<sup>8</sup></b>									
2/21/2007	<1	<2	<2	140	<5	<2	<6	<2	<2
3/25/2008	<1	<2	<2	<5	<5	<2	<6	<2	.2

Notes:

1. All concentrations in micrograms per liter (ug/L).
2. Act 2 Standard: PADEP Residential Statewide Health Standard for Used Aquifers, TDS <2,500 mg/L.
3. NA: Not analyzed.
4. May 2006 sample from MW-5 at the conclusion of the short-term constant rate pump test
5. Shaded cell indicates detected concentration exceeds Act 2 Standard
6. 1,2,4 Trimethylbenzene
7. 1,3,5 Trimethylbenzene
8. Recovery wells first operational on 3/13/2007
9. Monitor wells MW-4-S, MW-10, and MW-11 installed on 9/25/2007 and 9/26/2007. MW-12 installed on February 7, 2008