



FORMER NAVAL AIR WARFARE CENTER WARMINSTER

Technical Review Committee (TRC) Meeting Minutes

FORMER NAVAL AIR WARFARE CENTER (NAWC) WARMINSTER

TECHNICAL REVIEW COMMITTEE (TRC) MEETING MINUTES

APRIL 10, 2013 MEETING

REFERENCE: CLEAN CTO NO. WE23

1. Meeting Date and Time: April 10, 2013, 9:30 AM to 10:50 AM
2. Location: Warminster Municipal Authority Board Room
3. Attendees: See Attachment 1 (attendance list)
4. Summary of Meeting Discussions: See below.

Administrative Update

Willie Lin, the BRAC Environmental Coordinator (BEC) for the project working out of the Navy's Base Realignment and Closure Program Management Office (BRAC PMO) in Philadelphia, opened the meeting by welcoming the attendees and providing an agenda for the meeting (Attachment 2). This is the second TRC meeting for the former NAWC Warminster following adjournment of the Restoration Advisory Board (RAB).

Comments were solicited on the October 2012 TRC meeting minutes. No comments were offered by those in attendance and the meeting minutes were approved as-is.

Action items from the October 2012 TRC meeting were addressed as meeting agenda topics were brought up for discussion. The action items from the previous TRC meeting are summarized below:



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- PADEP/CRC is to provide an update r.e. the status of the CRC Industries investigation.
- WMA/Earth Data is to provide an update of the municipal wells status.
- The Navy is to provide updates r.e. groundwater extraction, treatment, and monitoring activities.
- The Navy is to update the progress of property transfers for the remaining Navy properties along Jacksonville Road and the Shenandoah Woods housing area.
- The Navy is to provide an update regarding the annual land use control inspections.
- The Navy is to provide an update on source area testing activities.

Off-Site Investigations

Margaret Pollich (PADEP) stated that groundwater remediation work at CRC is underway and asked Michelle Rudnick (CRC Industries) to provide an update. Ms. Rudnick indicated that the groundwater extraction/treatment system is under construction, with system piping installations and building construction currently underway. This work is expected to take another two weeks to complete. The schedule for completion of the remaining extraction/treatment system installation work is as follows:

- Component installations in May and June
- Extraction and treatment system startup in July

Ms. Rudnick also indicated that semiannual groundwater monitoring is still being performed, along with monthly DNAPL monitoring – no DNAPL has been observed recently.



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Navy Housing Transfer Update

Mr. Lin informed the TRC members that the BRAC PMO office in Philadelphia has been changed from BRAC PMO Northeast to BRAC PMO East, with responsibility for Navy base closure-related work in the southeast, northeast, and mid-west areas of the country. Regarding the Navy housing transfer status, Mr. Lin indicated that the Navy is working with local officials, including the Horsham Land Redevelopment Authority and Warminster Township officials, for transfer of the housing areas along Jacksonville Road and in Shenandoah Woods, however the transfers have not happened yet and the Navy still owns the properties. The Willow Grove Reuse Environmental Impact Statement (EIS) is in draft form and will be published this summer. Mr. Jeff Dale (BRAC PMO) Navy's remedial Project Manager (RPM) for the former NAWC Warminster, asked whether the EIS needs to be completed before transfer of the properties, since the housing areas are now part of NAS Willow Grove. Mr. Lin indicated that it was not necessary as a separate NEPA review has been prepared for the housing areas.

Groundwater Extraction, Treatment, and Monitoring Update

Jen Good (H&S Environmental, Navy contractor) provided an update on groundwater extraction, treatment, and monitoring activities (see handout in Attachment 3). Some notable points covered include:

- The treatment plant operated at an average rate of 68 gpm in March, with most flow coming from Area A and the remainder from Area C.
- Short-term extraction system shutdowns were performed in Areas A and C for well profiling activities.
- VOC removal via pumping totaled approximately 6.3 lbs in March, with 4.3 lbs of TCE the primary VOC removed. Almost all the mass removal was from Area A wells.



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- VOC recovery rates have stabilized and have been at similar levels for ~5 years.
- A pH adjustment pilot study is underway to improve the removal efficiency of Cr⁺⁶.
- NPDES and DRBC permit renewals applications were submitted in 2012 and are still in review – they will be administratively extended until the reviews have been completed by PADEP and DRBC.
- The Fall 2012 round of groundwater sampling was performed in November, and the Spring 2013 round of sampling is scheduled for May.
- The Fall 2012 round of sampling included sampling Area C wells for perfluorinated compounds (PFCs) as part of a research effort by Oregon State University.
- Profiling of Area A and Area C wells (geophysical logging, heat pulse flowmeter, PDB sampling) was performed by the USGS and H&S in support of source treatment optimization and plume characterization activities being performed by Battelle for the Navy.
- TCE concentrations in Area D continue to be close to or below the MCL, with all extraction well concentrations below 3 ug/l. Pumping is no longer being performed, but monitoring will continue for now.
- The 2012 annual land use control inspections were performed in November 2012, with no issues of note identified.

Mr. Lin requested that Ms. Pollich check into the status of the NPDES permit renewal at PADEP, because the permit is expiring at the end of April 2013. Ms. Good mentioned that reviews of new permits take precedence over renewals of existing permits, which may be why the renewal is still pending.

Dave Fennimore (Earth Data, representing Warminster Municipal Authority, WMA) asked whether WMA should be sampling water supply well WMA13 for PFCs. Mr. Dale stated that the Navy would not discourage WMA from sampling for PFCs.



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He also indicated that some municipal water authorities are required to test for this but he is not aware whether WMA has this requirement. Mr. Fennimore asked what the regulatory levels are for PFCs – Mr. Dale stated that there currently not a regulatory level, i.e., MCL, but there are health advisory levels that are low (sub-ppb).

WMA Update

Mr. Fennimore stated that there is no change in status for the municipal wells since the last meeting. Well 26 is being pumped at its normal rate and there are no operational issues.

Source Treatment Data Collection Update

Carolyn Scala (Battelle, Navy contractor) provided an update regarding Area A source treatment and Area C plume characterization data collection activities (see handout in Attachment 4). Some notable points covered for Area A include:

- Area A well profiling work included geophysical logging of extraction wells along with depth-specific chemical profiling.
- Rock coring and groundwater sampling will be performed in Area A this summer to obtain cores for VOC analysis and bench scale testing for a potential ISCO field pilot test.
- Four additional injection points may be installed within the TI Zone at Area A for use in the field pilot study.

Mr. Fennimore asked whether extraction well EW-A3 would intersect a zone of higher concentration if drilled deeper, based on a cross section shown on page 5 of the handout – Ron



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Sloto (USGS) stated that the well was drilled to the top of a mudstone unit. Jeff Orient (Tetra Tech, Navy contractor) indicated that the contamination in EW-A3 is likely pulled over from a nearby area of higher concentrations when the well is pumped. Ms. Scala mentioned that the cross section is conceptual and the mudstone contact shown may not be accurate. Mr. Fennimore asked how thick the mudstone is and whether it separates hydrogeologic unit B for hydrogeologic unit C – Mr. Orient replied that it is over ten feet thick and it does separate the two units.

Some notable points covered for Area C include:

- Discrete-depth sampling was performed to develop concentration profiles in 6 wells.
- Geophysical logging and flow measurements were performed to evaluate vertical groundwater movement within boreholes.
- This data will be used to evaluate the potential for vapor intrusion into nearby structures.

Mr. Orient noted that the vertical profiling results for PCE at wells EW-C20 and EW-C21 were encouraging in regards to potential vapor intrusion concerns at the nearby Gilda's Club facility, as shallow PCE concentrations were nondetect to sub-ppb levels.

Miscellaneous Topics and Issues – Action Items

Mr. Lin informed the TRC that Norm Kelly, the former RAB Co-chair and long-time faithful meeting attendee, is now in a nursing home and asked that the TRC members keep him in their thoughts. He also asked that everyone give some thought to whether Mr. Kelly should be replaced in some capacity at the TRC.



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Action Items that will be carried through to the upcoming TRC meeting include:

- Mr. Lin will look into the possibility of adding a community member to replace Mr. Kelly at the TRC meetings.
- Mr. Dale will send WMA some information regarding PFC sampling.
- EPA is to evaluate the new Area C data regarding vapor intrusion.
- The Navy is to provide an update on groundwater extraction, treatment, and source area testing activities.
- PADEP/CRC is to provide an update regarding the status of the CRC Industries remedial activities.
- WMA/Earth Data is to provide an update of the municipal wells status.
- The Navy is to update the TRC on the progress of property transfers for the remaining Navy properties along Jacksonville Road and the Shenandoah Woods housing area.
- The Navy is to provide an update on LTM activities (sampling, LUC inspections).

Next Meeting Date

The next TRC meeting date was confirmed for October 9, 2013 at 9:30 AM in the WMA Board Room, with the following meeting dates also set for April 9, 2014 and October 8, 2014. The meeting was adjourned at approximately 10:50 AM.



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ATTACHMENT 1 ATTENDANCE LIST



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Technical Review Committee (TRC) Meeting Minutes

ATTACHMENT 2 MEETING AGENDA



AGENDA

FORMER NAWC WARMINSTER

Technical Review Committee (TRC) Meeting



Date: 10 April 2013

Time: 9:30 AM

Location: WMA Board Room, 415 Gibson Ave., Warminster, PA

- **Administrative Update**
 - Minutes of the last meeting
 - Review action items (see below)
- **Off-Site Investigations**
 - PADEP update on CRC Chemicals
- **WMA Update**
 - Status of Well #26
- **Navy Housing Transfer Update**
 - Status of property transfer activities along Jacksonville Road and Shenandoah Woods
- **Groundwater Extraction and Treatment Update**
 - Plant operating status
 - VOC removal evaluation
 - Permit renewal status update
 - pH pilot update
- **Monitoring Activities Update**
 - Fall 2012 sampling round status
 - Plans for Spring 2013 performance monitoring
- **Source Treatment Data Collection Update**
 - Area A well profiling update
 - Area A coring planning
- **Miscellaneous Topics and Issues – Action Items**
 - Annual land use control inspections status
 - Area C well profiling update

Time and Location of Next Meeting: - October 9, 2013 (semiannual)

- **Action Items**

The following action items have been identified as a result of the October 2012 meeting:

- PADEP/CRC is to provide an update r.e. the status of the CRC Industries investigation.
- WMA/Earth Data is to provide an update of the municipal wells status.
- The Navy will provide updates r.e. groundwater extraction, treatment, and monitoring activities.
- The Navy is to update the progress of property transfers for the remaining Navy properties along Jacksonville Road and the Shenandoah Woods housing area.
- The Navy is to provide an update r.e. the Annual Land Use Control Inspections.
- The Navy is to provide an update on source area testing activities.

Directions to the WMA Board Room:

From the former NAWC - Proceed to the intersection of Street and Jacksonville Rd. Turn west (right) onto Street Rd. Continue west to York Rd. Turn south (left) onto York Rd. Continue to Henry Ave. Turn west (right) onto Henry Ave. Follow directions as above to the WMA building.

From County Line Rd - Instead of turning north (right) onto Jacksonville, continue west on County Line to York Rd. Turn north (right) onto York Rd. Continue to Henry Ave. Turn west (left) onto Henry Ave. Continue to Gibson Ave. Turn right into the parking lot shared by the Warminster Township and WMA. The WMA building is located towards the rear.



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ATTACHMENT 3 H & S PRESENTATION

Technical Review Committee Meeting



**NAWC Warminster
10 April 2013**

Presented by



Presentation Agenda

- **Treatment Plant Operation**
 - Plant Operating Status
 - VOC Removal Evaluation
 - Permit Renewal Status Update
 - pH Adjustment System Pilot Update

- **LTM Update**
 - Fall 2012 Sampling Round Status
 - Plans for Spring 2013 Performance Monitoring
 - Annual LUC Inspection Status



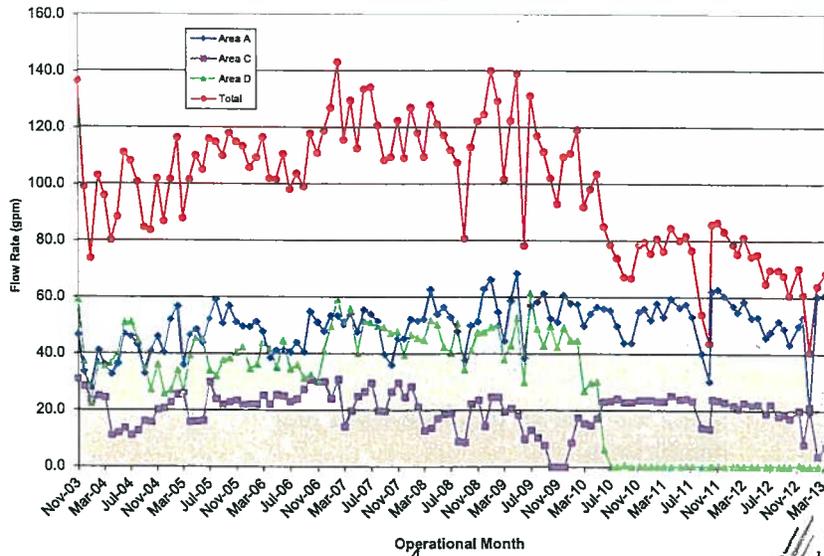
GWTP Operation

- Average flowrates for March 2013:
 - 61.1 gpm from Area A
 - 7.4 gpm from Area C
 - 0.0 gpm from Area D
 - 68.4 gpm overall
- 781,957,091 gallons treated through March 2013.

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Groundwater Treatment Plant Recovery Flow Rates



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GWTP Operation

- Recent operational and maintenance activities (since previous meeting in Oct 2012):
 - 10/28-11/5/12 – System down due to power outage resulting from Hurricane Sandy.
 - 12/10/12 – Area C shut down for profiling work.
 - 12/27/12 – Area C partially back on-line – electrical issues with EW-C18 and EW-C19.
 - 1/2/13 – Area A shut down for profiling work.
 - 1/3/13 – New pump/motor installed in EW-C19 and operation resumes, fails 1/19/13 due to electrical issues, resumes operation 1/24/13.
 - 1/23/13 – Area A back on-line – electrical issues with EW-A4.

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GWTP Operation

- 2/11/13 – Failure of Area C primary transfer pump/motor. Secondary pump unable to convey needed flowrate back to GWTP. Area C EWs shut off pending repair.
- 2/20/13 – Pump/motor for EW-A4 pulled and repaired. Confined space entry of Area C sump. Primary transfer pump/motor pulled, evaluated, replacement ordered.
- 3/21/13 – Confined space entry to replace Area C primary transfer pump/motor. Area C back on-line temporarily. Bag filter unit replaced. Area C back on-line permanently 3/25/13.
- 3/27/13 – EW-A11 motor failed. Pull and replace early April 2013.
- 3/28/13 – Brief power outage. EW-C18 not operable due to electrical issues. EW-C18 resumes operation 4/4/13.

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GWTP Operation – pH adjustment system update

- Obtained concurrence from PADEP and EPA for implementation of pH adjustment system pilot study
 - Objective: To improve the removal efficiency of Cr+6 from the Area A process stream using the existing ion exchange treatment system.
 - System installation complete. Electrical lines run, HCl delivered, metering pump/piping installed, resin changed out, instrumentation work completed.
 - Pilot testing begun in April 2013. Weekly samples of resin influent and effluent to be collected to determine life cycle of resin using pH adjustment.

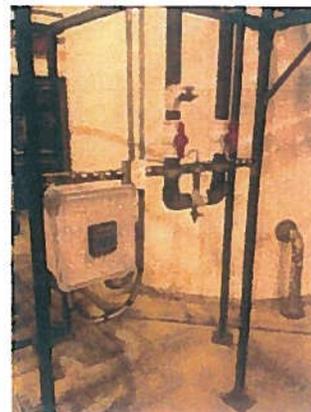
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GWTP Operation – pH adjustment system update



Resin Unit, HCl,
metering pump



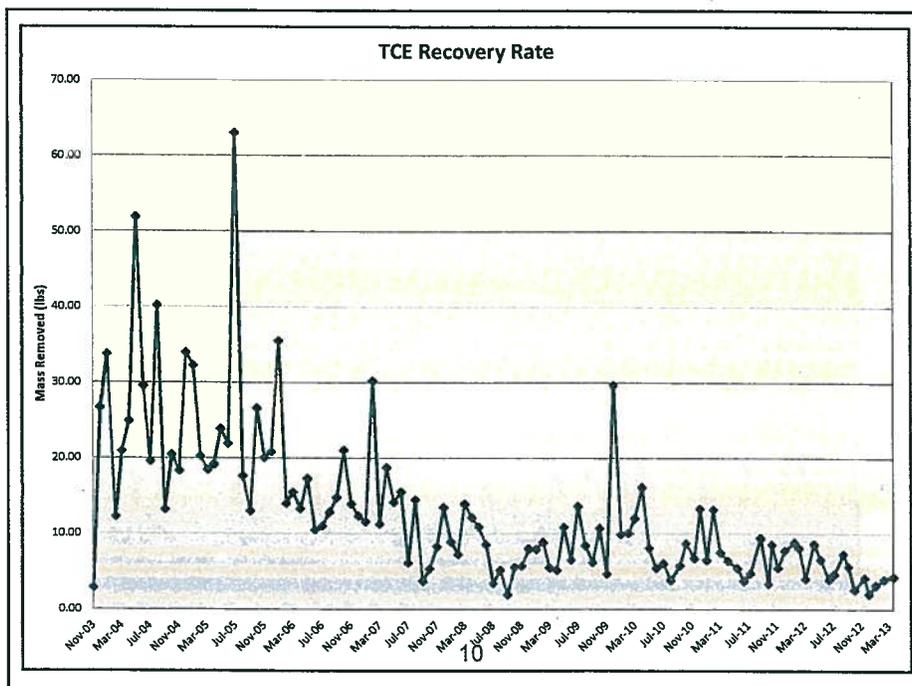
pH meter/controller

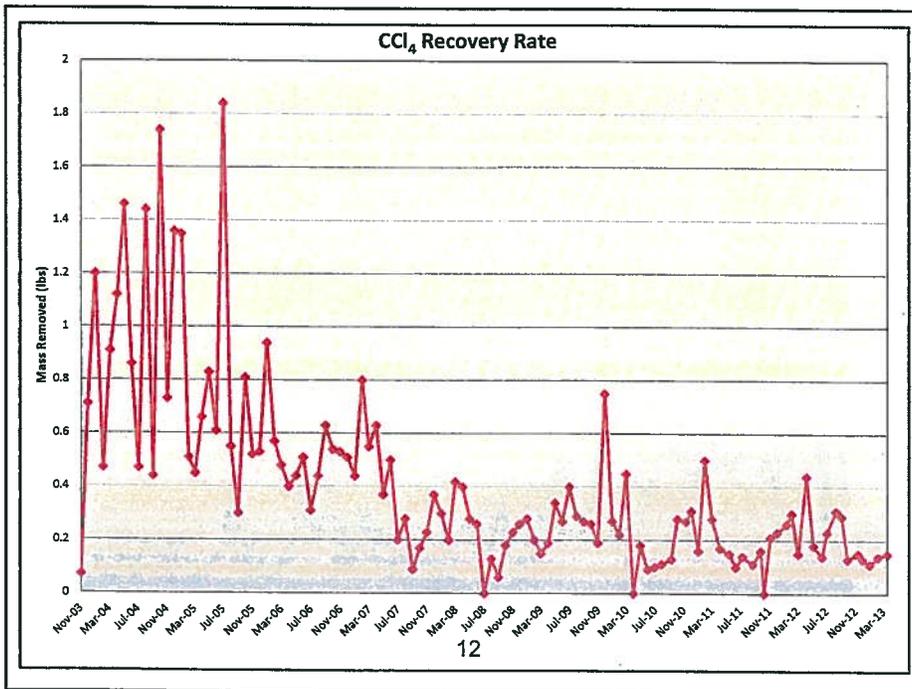
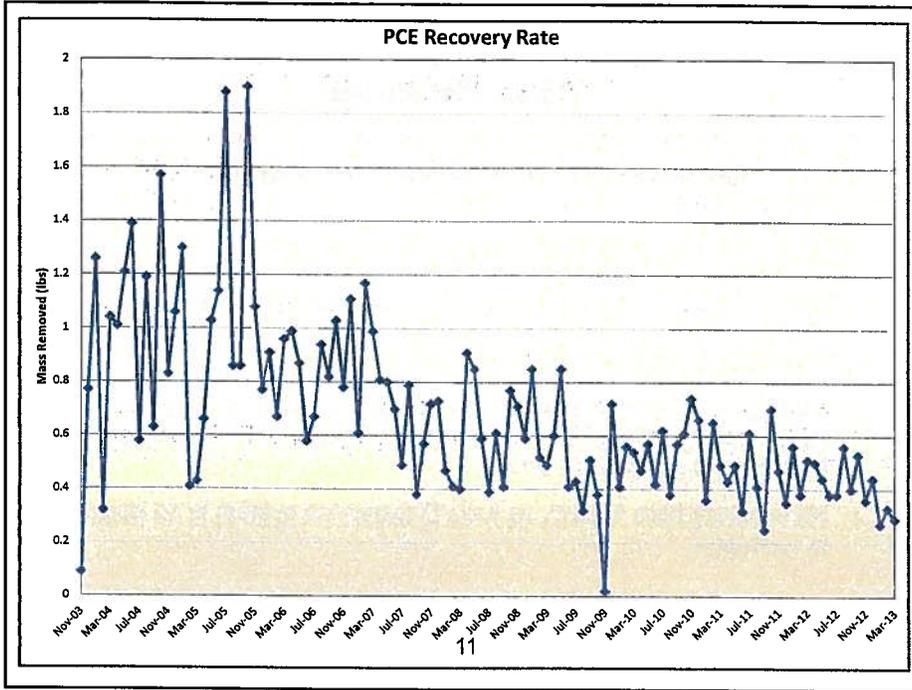
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Mass Removal

- Cumulative dissolved-phase VOC recovery through March 2013 reporting period:
 - Trichloroethene (TCE) – 4,730.5 pounds (4.31 lbs in 3/13)
 - Tetrachloroethene (PCE) – 143.3 pounds (0.29 lbs in 3/13)
 - Carbon Tetrachloride (CCl₄) – 160.7 pounds (0.15 lbs in 3/13)
- Majority of VOC recovery is from Area A (4.31 lbs TCE, 0.26 lbs PCE, and 0.15 lbs CCl₄ in 3/13), with remainder of PCE recovery from Area C (0.03 lbs in 3/13).
- No recovery from Area D, as Area D extraction system is no longer in operation.





GWTP Permit Renewal Status

- NPDES Permit:
 - Current permit expires 30 April 2013.
 - Renewal application submitted 25 October 2012.
 - Will be administratively extended pending review by PADEP.

- DRBC Renewal:
 - Current docket expires 30 April 2013.
 - Renewal application submitted 27 April 2012.
 - Will be administratively extended pending review by DRBC.

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LTM Update

- Fall 2012 groundwater sampling event performed in November 2012 (11/27/12 – 11/30/12):
 - Area A – 24 wells sampled, GW elevations from 66 wells.
 - Area C – 11 wells sampled, GW elevations from 25 wells.
 - Area D – 14 wells sampled (5 additional wells: HN-57S, HN-58I, HN-74I, OW-D10, HN-17S that are usually only sampled annually), GW elevations from 37 wells.
 - Draft LTM Report to be submitted April 2013.

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LTM Update

- Spring 2013 groundwater sampling event scheduled for mid-May 2013.
 - Routine LTM :
 - Area A – sample 45 wells, GW elevations from 66 wells.
 - Area C – sample 12 wells, GW elevations from 25 wells.
 - Area D – sample 16 wells, GW elevations from 37 wells.
 - LTM Report to follow.

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Additional Sampling Performed

- Conducted in conjunction with / after Fall 2012 LTM event
- Additional sampling in support of SERDP Project ER-2128 (analytical methods for perfluorinated compounds)
 - Identifying fluorochemicals and refining analytical methods in real world samples.
 - Collected samples from Area C wells, analysis for perfluorinated compounds by Oregon State University
 - At former fire training area (DG-14) and distant from FTA (HN-23A, HN-28S, EW-C19)
- In support of Area A Source Treatment design and Area C VI eval
 - Conducted vertical profiling of 9 Area A and 6 Area C wells:
 - Heat pulse flow meter (HPFM) testing by USGS
 - PDB profiling for VOC analysis

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Annual LUC Inspection

- Objective: To document the compliance status of the land use controls and deed restrictions for the various land parcels of the former NAWC (and adjacent areas as appropriate).
- Inspection of four general Areas
 - Area A (Sites 1, 2, and 3)
 - Area B (Sites 5, 6, and 7)
 - Area C (Sites 4, 8)
 - Area D (Site 9)
- Inspections include field inspection and documentation research / contact with local authorities to assess LUC compliance and identify and correct any breaches / deficiencies.

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Annual LUC Inspection

- Area A Restrictions:
 - Non-industrial use prohibited without Navy/EPA approval.
 - No groundwater wells/withdrawals without Navy/EPA approval.
 - Maintenance of erosion controls.
 - No excavation at Sites 2 or 3 without Navy/EPA approval.
- Area B Restrictions:
 - Residential and commercial/industrial use prohibited without Navy/EPA approval – reserved for recreational (park) use.
 - No disturbance of the 2-ft soil cover or excavation of subsurface soils without NAVY/EPA approval.

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Annual LUC Inspection

- Area C Restrictions:
 - No groundwater wells/withdrawals without Navy/EPA approval.

- Area D Restrictions:
 - No groundwater wells/withdrawals without Navy/EPA approval.

- Schedule:
 - 2012 annual inspection performed in November 2012. No issues of note. Inspection report to be submitted April 2013.
 - Next annual inspection scheduled for Fall 2013.

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Area D LTM TEG Recommendation Status

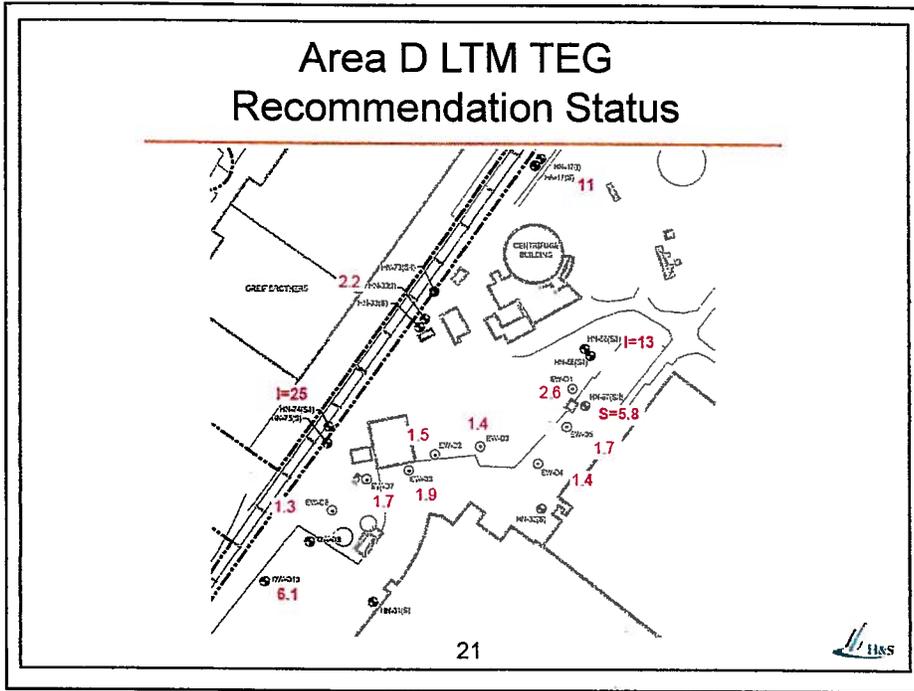
- Fall 2012 sampling results were consistent with those observed in Spring 2012 indicating there may be some slight TCE concentration rebound in several wells (HN-58I, HN-74I, OW-D10).

- Based on the increases in these wells, the Navy decided to postpone considering changes to the Area D LTM program.

- TCE levels in all extraction wells remain <3 ug/L (MCL is 5 ug/L).

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ATTACHMENT 4 BATTELLE PRESENTATION

Battelle
The Business of Innovation

Summary of Data Collection Efforts in Support of Source Treatment at Area A and Plume Characterization at Area C, Former NAWC Warminster, PA

**Technical Review Committee Meeting
April 10, 2013**

Carolyn Scala and Andrew Barton
Battelle



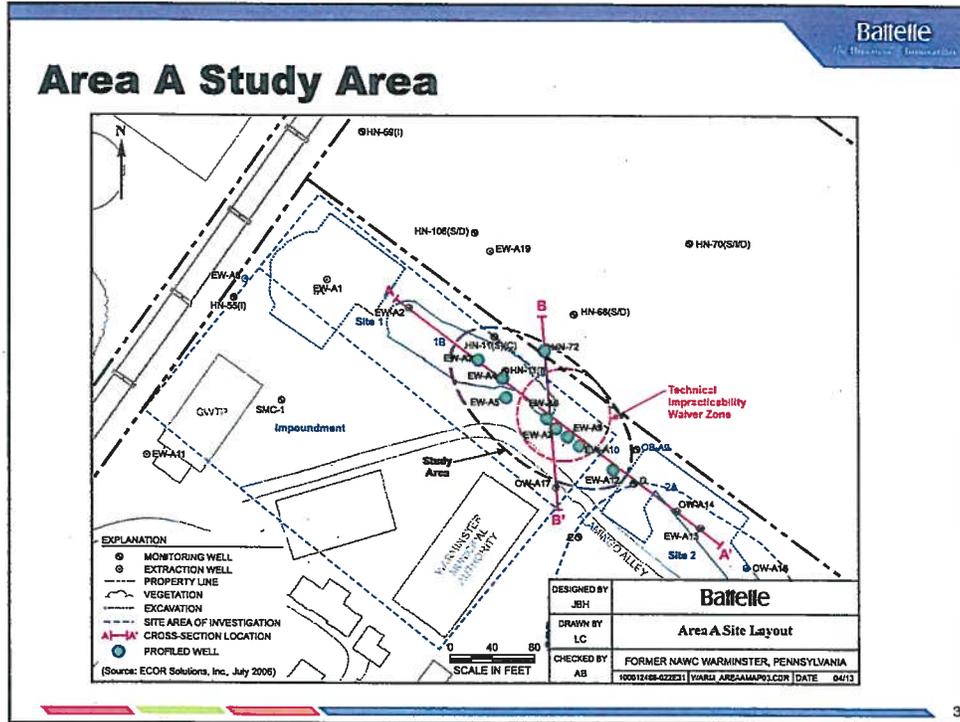
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Battelle
The Business of Innovation

Area A Source Area Characterization

- **Objective**
 - Conduct discrete-depth groundwater sampling and evaluate the potential for vertical borehole flow within the proposed study area
 - Better define the source area treatment zone
 - Provide additional information for designing the pilot- and full-scale source area treatment approach
- **Activities**
 - Extraction well shutoff and pump removal
 - Vertical borehole flow measurements
 - Groundwater-level elevation monitoring
 - Groundwater sampling
 - Pump reinsertion and extraction well startup

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Area A EW Shutoff and Pump Removal

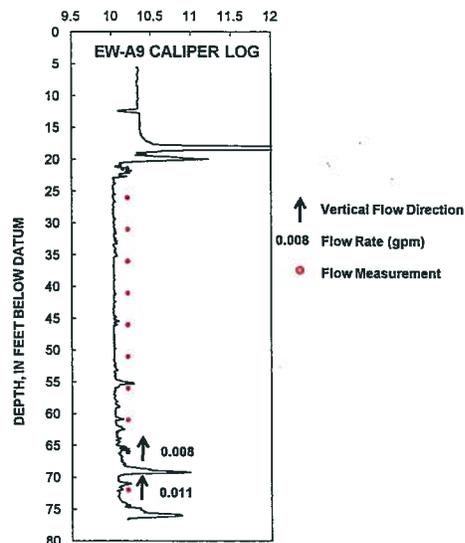
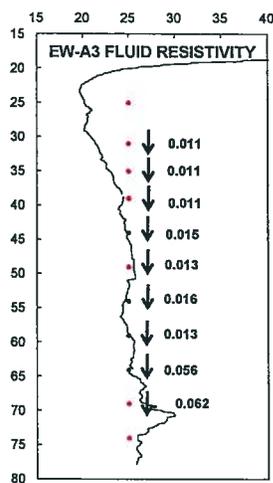
- All Area A EWs turned off on 01/02/13
- Pumps/motors pulled from 9 profiled wells from 01/02/13 through 01/04/13
 - EW-A3, EW-A4, EW-A5, EW-A6, EW-A7, EW-A9, EW-A10, EW-A12, HN-72

Area A Borehole Flow Measurements

- Vertical borehole flow measurements collected from 9 study area wells by USGS
 - Used heat-pulse flowmeter (HPFM)
 - Collected from identified fracture depths and at 5-ft increments
 - Completed under non-pumping and pumping (≤ 1.5 gpm) conditions
- Identified minor/major water-bearing zones and vertical flow rate/direction
- Prepared fluid resistivity, fluid temperature, and caliper logs
- Results used to revise chemical concentration profiling depths

Area A Borehole Flow Measurements

- Example logs



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Area A GW Level Elevation Monitoring

- Collected groundwater levels from 9 study area wells under non-pumping conditions prior to groundwater sampling
 - Samples collected on 01/17/13, 15 days after well shut-off
- Prepared contour map of groundwater surface in study area for use in cross-section preparation and mass estimates

Well ID	Non-Pumping Elev. (ft amsl)	Pumping (11/12) Elev. (ft amsl)	Difference (ft)
EW-A3	294.05	279.24	14.81
EW-A4	294.20	263.92	30.28
EW-A5	295.27	255.69	39.58
EW-A6	295.95	249.57	46.38
EW-A7	294.85	269.42	25.43
EW-A9	297.38	261.19	36.19
EW-A10	294.30	275.35	18.95
EW-A12	294.42	265.17	29.25
HN-72	293.52	281.20	12.32

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Area A Source Area GW Sampling

- Collected groundwater samples for VOC analysis from discrete depths in 9 study area wells using PDB samplers
 - Depths selected based on fracture zones and results of borehole flow measurements
 - PDB samplers deployed for 7 days
- Collected conventional (3-volume purge) samples after recovering PDB samplers
- Created 3-D plume map within study area
 - Constructed 2-D isoconcentration contour cross-sections through study area

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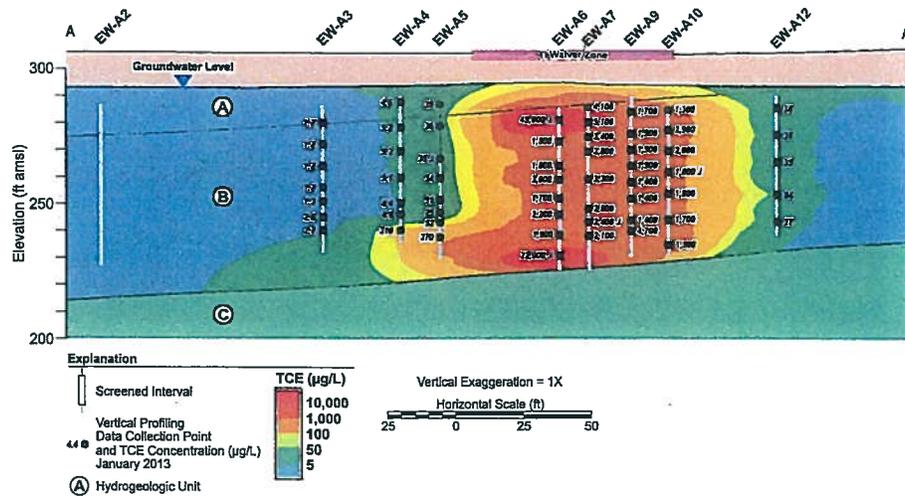
Area A Source Area TCE Results

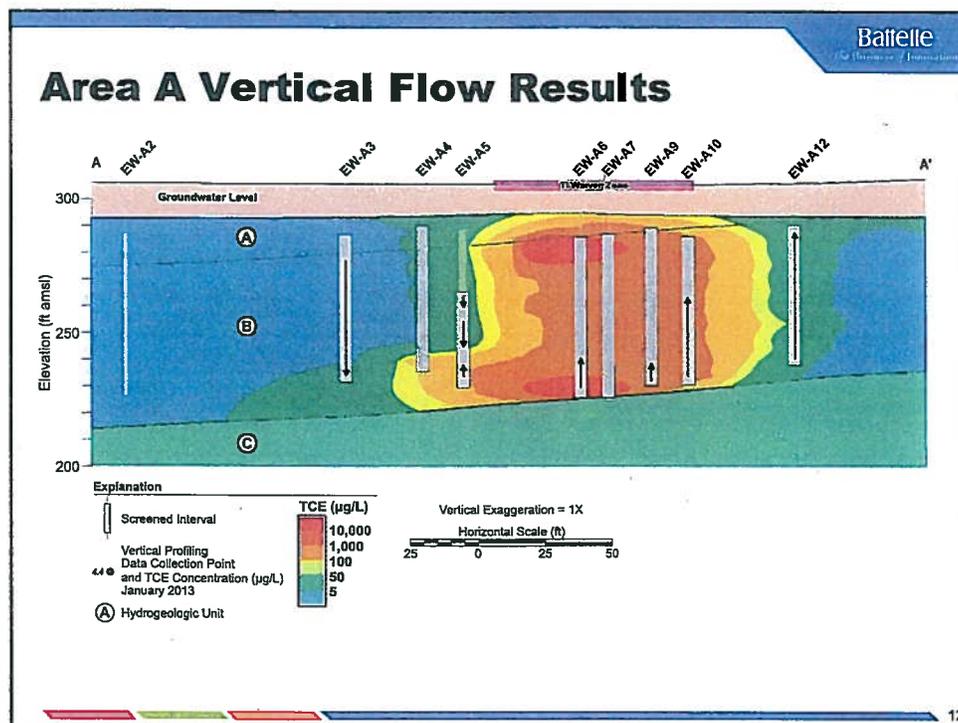
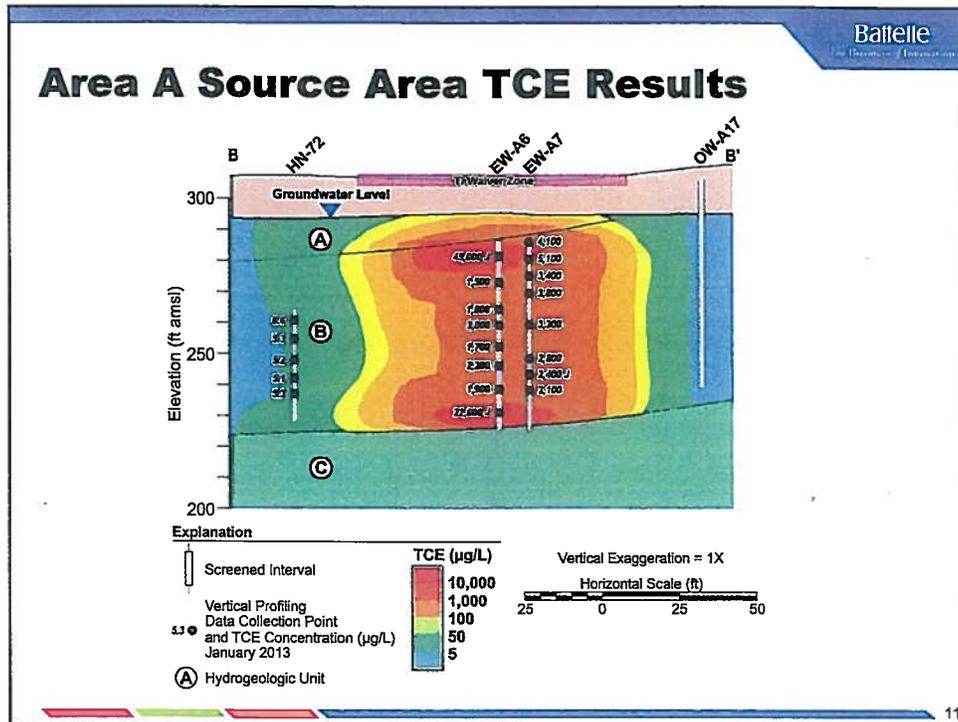
Well ID	PDB Depth (ft btoc)	PDB Result (ug/L)	LTM Result (ug/L)
EW-A3	26.5	1.7	39
	34.5	1.2	
	42.5	1.2	
	42.5	1.2	
	50.5	1.2	
	55.5	1.3	
	61.5	2.6	
66.5	2.7	300	
EW-A4	18		4.6
	27.5		5.2
	36.5		5.2
	46		5.1
	55.5		4.3
	55.5		4.1
	59.5	4.8	
65.5	310	680	
EW-A5	18.5		39
	26.5		36
	38.5		35 J
	46		34
	54		31
	58.5		25
	62.5	52	
67.5	370		

Well ID	PDB Depth (ft btoc)	PDB Result (ug/L)	LTM Result (ug/L)
EW-A6	24.5	45,000 J	3,700
	32.5	1,500	
	41.5	1,800	
	46.5	3,000	
	53.5	1,700	
	59.5	2,200	
	67	1,900	
	74.5	22,000 J	
	74.5	15,000 J	
	74.5	15,000 J	
EW-A7	19.5	4,100	6,200
	25	5,100	
	30.5	3,300	
	30.5	3,400	
	36	3,800	
	46	3,300	
	57	2,800	
	62	2,400 J	
	67	2,100	
	67	2,100	
EW-A9	21.5	1,700	2,900
	29.5	1,500	
	35.5	1,500	
	41.5	1,500	
	47.5	1,400	
	53.5	1,400	
	61.5	1,400	
	65.5	4,000	
	65.5	4,700	
	65.5	4,700	

Well ID	PDB Depth (ft btoc)	PDB Result (ug/L)	LTM Result (ug/L)
EW-A10	21	1,300	370
	28.5	2,900	
	36	2,000	
	44	1,600 J	
	52	1,800	
	61.5	1,700	
	71	1,500	
EW-A12	19.5	38	76
	19.5	36	
	29.5	36	
	39.5	35	
	51.5	84	
	61.5	37	
HN-72	47.5	6.6	83
	53.5	5.3	
	60	5.1	
	60	5.2	
	66	5.1	
71	5.3		

Area A Source Area TCE Results





Area A EW Startup and Pump Insertion

- All non-study area wells restarted on 01/23/13
 - 21 days after shutoff
- Pumps/motors reinstalled in 8 study area EWs on 01/23/13 and 01/24/13
 - New motors in EW-A3, EW-A7, EW-A9, and EW-A12

Area A Rock Core Collection

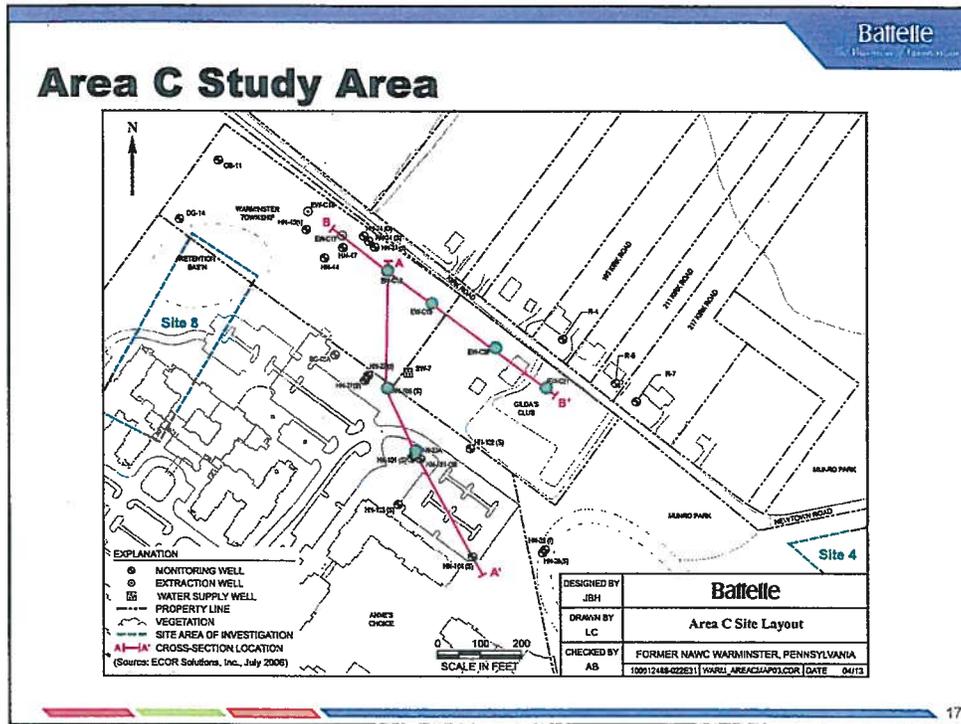
- Rock coring to be completed in source area in August 2013 pending work plan concurrence from BCT
 - Draft Rock Coring and Bench-Scale ISCO Testing Work Plan available early May 2013
 - Single rock core location based on results of vertical chemical profiling (likely in the vicinity of EW-A6)
- >50 core samples to be collected for VOC analysis
 - Will be collected and preserved using modified USGS procedure
 - Sample depths based on vertical profiling and will include unsaturated zone samples

Area A Rock Core Collection (cont.)

- Groundwater and rock samples collected for bench scale testing
 - Analyze groundwater for select water quality parameters
 - Evaluate oxidants for ISCO pilot test
- Pending review of rock core sample analysis, 4 additional injection points to be installed in TI waiver area

Area C Source Area Characterization

- Objectives
 - Conduct discrete-depth groundwater sampling for VOCs to evaluate contaminant distribution within the open interval of selected wells
 - Evaluate the potential for vertical borehole flow in selected source area wells
 - Evaluate the potential for vapor intrusion into adjacent structures
- Activities
 - Extraction well shutoff and pump removal
 - Vertical borehole flow measurements
 - Groundwater-level elevation monitoring
 - Groundwater sampling
 - Pump reinsertion and extraction well startup



Area C EW Shutoff and Pump Removal

- All Area C EWs turned off on 12/10/12
- Pumps/motors pulled from 6 profiled wells from 12/10/12 through 12/12/12
 - EW-C18, EW-C19, EW-C20, EW-C21, HN-23A, HN-105S

Area C Borehole Flow Measurements

- Vertical borehole flow measurements collected from 6 study area wells by USGS using approach similar to Area A
- Identified minor/major water-bearing zones and vertical flow rate/direction
- Prepared fluid resistivity, fluid temperature, and/or caliper logs
- Results used to revise chemical concentration profiling depths

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Area C GW Level Elevation Monitoring

- Collected groundwater levels from 6 study area wells under non-pumping conditions prior to groundwater sampling
 - Samples collected on 01/27/13, 17 days after well shut-off
- Prepared contour map of groundwater surface in study area for use in cross-section preparation and mass estimates

Well ID	Non-Pumping Elev. (ft amsl)	Pumping (11/12) Elev. (ft amsl)	Difference (ft)
EW-C18	312.05	298.58	13.47
EW-C19	312.28	297.49	14.79
EW-C20	317.03	307.46	9.57
EW-C21	317.85	315.54	2.31
HN-23A	321.77	320.49	1.28
HN-105S	318.61	-	-

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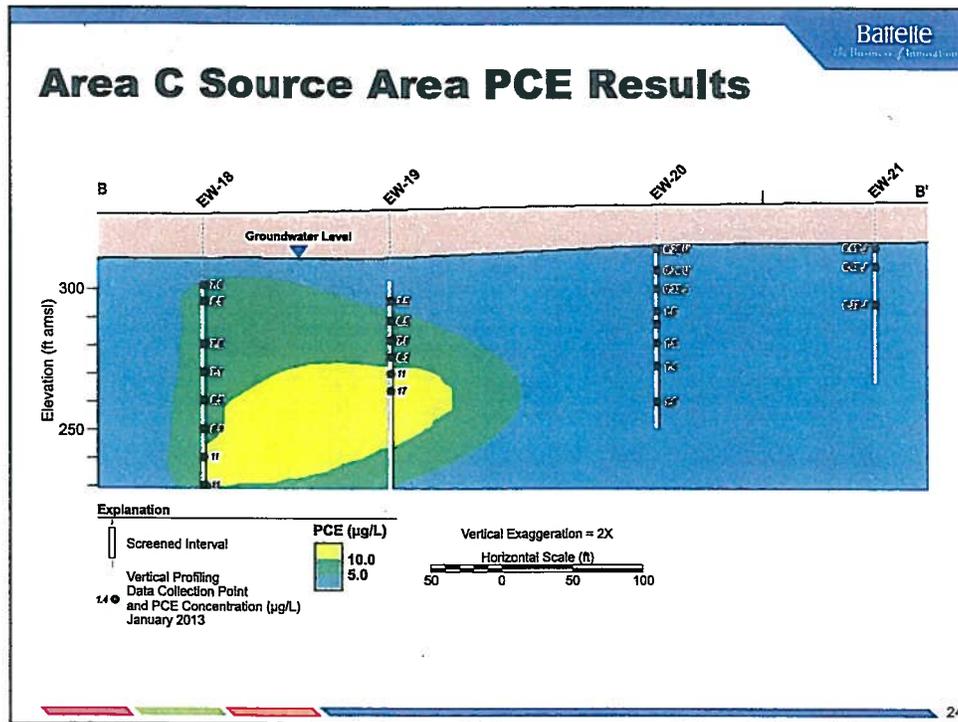
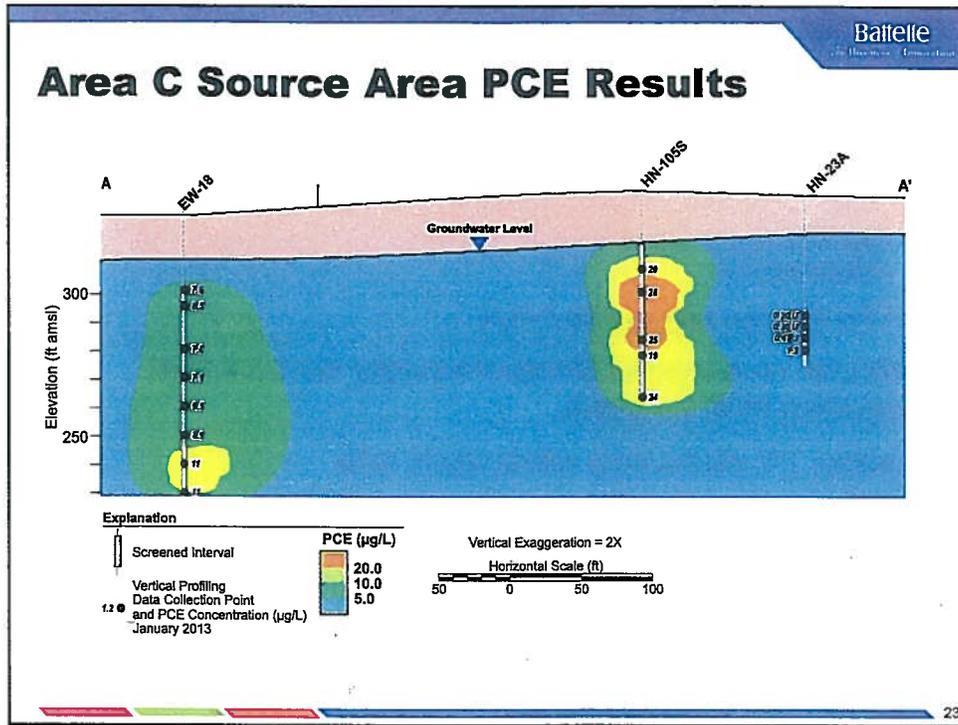
Area C Source Area GW Sampling

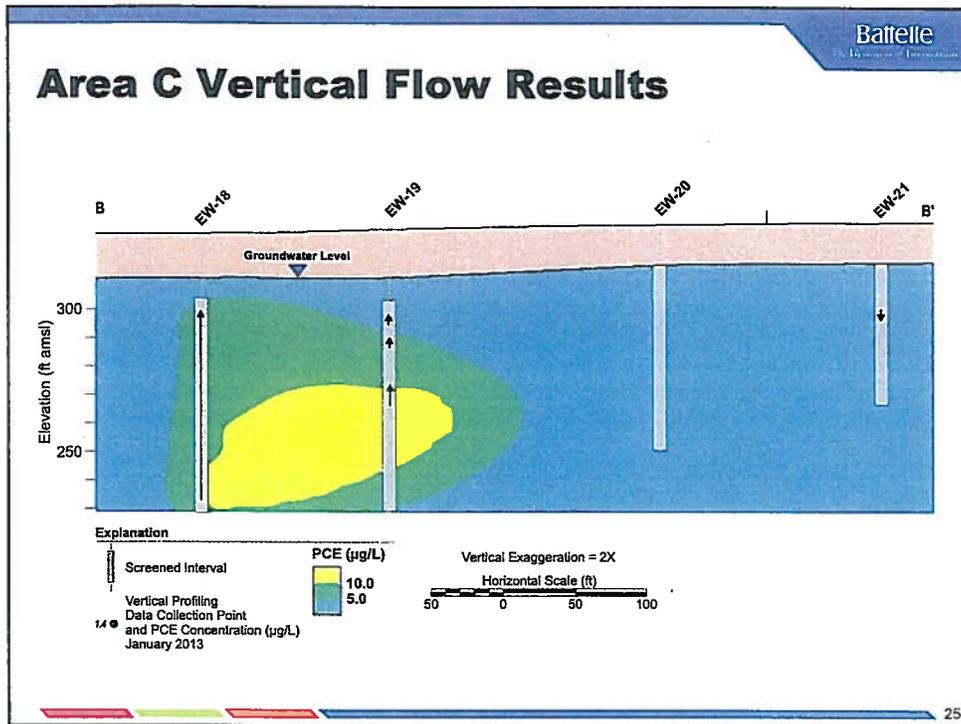
- Collected groundwater samples for VOC analysis from discrete depths in 6 study area wells using PDB samplers
 - Depths selected based on fracture zones and results of borehole flow measurements
 - PDB samplers deployed for 7 days
- Collected conventional (3-volume purge) samples after recovering PDB samplers
- Created 3-D plume map within study area
 - Constructed 2-D isoconcentration contour cross-sections through study area

Area C Source Area PCE Results

Well ID	PDB Depth (ft btoc)	PDB Result (ug/L)	LTM Result (ug/L)
EW-C18	22.5	7.6	22
	28	8.5	
	43	7.8	
	53	7.1	
	63	9.5	
	73	8.9	
	83	11	
EW-C19	93	11	12
	28.2	3.5	
	35.2	6.4	
	35.2	6.5	
	42.2	7.8	
	48.2	8.2	
	54.2	11	
60.2	17		

Well ID	PDB Depth (ft btoc)	PDB Result (ug/L)	LTM Result (ug/L)
EW-C20	11.6	0.20 U	7.1
	11.6	0.20 U	
	19	0.20 U	
	25.5	0.33 J	
	33.5	1.6	
	38	1.5	
	53	1.4	
	65.5	1.6	
EW-C21	8.4	0.69 J	0.87 J
	15	0.48 J	
	28.5	0.32 J	
HN-23A	44	0.20 U	71
	48	0.20 U	
	48	0.20 U	
	52	0.47 J	
	56	1.2	
HN-105S	27.5	20	NA
	36	28	
	52.2	25	
	57.5	19	
	57.5	19	
	72	24	





- Battelle
The University of Tennessee System
- ## Area C EW Startup and Pump Insertion
- New motors installed in EW-C18, EW-C19, and EW-C20
 - EW-C20 pump/motor reinstalled and restarted 12/27/12
 - 17 days after shutdown
 - EW-C18 inoperable
 - EW-C17 turned on as replacement on 12/28/12
 - EW-C19 pump/motor reinstalled and restarted 01/11/13
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