



# NAVAL AIR STATION JOINT RESERVE BASE (NAS JRB) WILLOW GROVE Restoration Advisory Board (RAB) Meeting Minutes RAB Meeting No. 48

Meeting Date: March 7, 2012

Meeting Time: 6:00 p.m.

Meeting Place: Horsham Township Public Library

	<u>Name</u>	<u>Organization</u>
Attendance:	Rick Meyers (R)	RAB Member
	Karl Pfizenmayer	Community Member
	Mary Liz Gemmill (R)	RAB Community Co-Chair
	Tom Ames	Horsham Township Authority (HLRA)
	Michele Denny	Air National Guard
	Becky Clendaniel	Air National Guard
	Carlton Crenshaw	Air Force Reserve Command
	William Downs	Air Force Reserve Command
	Eric Stahl	Weston Solutions
	Charles Reinhardt	Delaware Valley Historical Aircraft Association
	John Demcisak	Delaware Valley Historical Aircraft Association
	Willie Lin (R)	Navy, BRAC PMO
	Brian Helland (R)	Navy, NAVFAC
	James Rugh	NAS JRB Navy Caretaker's Office
	Margaret Pollich (R)	PADEP
	Jessica Kasmari (R)	PADEP
	Lisa Cunningham (R)	EPA
	Andrew Frebowitz	Tetra Tech
	Scott Shaw	Tetra Tech
	(R) Designates RAB Member	

Willie Lin opened the meeting, introducing himself as the new Navy BRAC Environmental Coordinator replacing Bob Lewandowski. Mr. Lin requested that all present introduce themselves. After introductions, Mr. Lin referred to the agenda and turned the meeting over to technical support staff for the briefing.

Andrew Frebowitz commenced the briefing on the individual sites with a discussion of the status of Site 1 – Privet Road Compound. The site is now part of the Pennsylvania Air National Guard (PAANG) compound. Supply wells and monitoring wells located in the compound are sampled by the Navy on a periodic basis. Mr. Frebowitz discussed the results of the August 2011 land use control (LUC) inspection and groundwater monitoring. No risks or compliance issues were observed during the LUC inspection and monitoring well samples showed levels of contamination below project action levels. One of the supply wells contained tetrachloroethene (PCE) above drinking water standards; the water continues to be treated. Mr. Frebowitz noted that the operating permit for the supply wells has been transferred to the PAANG and that the

groundwater contamination associated with the supply wells is being pulled in from an off-site source by the pumping of the wells. The Navy will continue to monitor groundwater quality; another round of monitoring has been recommended for 2013. In addition, two monitoring wells that are no longer included in the groundwater monitoring program were potentially impacted by construction activities in the compound. The Navy received approval from the regulators to abandon these wells in accordance with state requirements and that work has been completed. There were no comments or questions from the attendees regarding Site 1.

Mr. Frebowitz provided an update on the investigation at Site 3 – Ninth Street Landfill. The final Remedial Investigation (RI) report was submitted in October 2011 with a recommendation to conduct chromium speciation sampling prior to preparing the feasibility study (FS). The rationale for conducting the speciation sampling was to differentiate between the different types of chromium at areas where elevated chromium was detected during the RI. Different types of chromium have different toxicities; identification of the types of chromium present will be considered in determining the risks posed by the site and developing cleanup levels for the site. The sampling was conducted in December 2011 and results are currently being received and validated. Referring to a figure, Mr. Frebowitz showed where the chromium speciation samples were collected. After the results are reviewed, the FS will be prepared. There were no comments or questions from the attendees regarding Site 3.

Mr. Frebowitz continued with a discussion of the status of Site 5 – Fire Fighting Training Area. A groundwater remediation pilot study has been ongoing for several years at Site 5 and has been very successful. Referring to a figure, Mr. Frebowitz showed a schematic of the layout of the treatment system and the associated monitoring wells. Results show that the original solvent compounds have been eliminated in some areas and significantly reduced in other areas, and intermediate degradation compounds are being formed. The system does require periodic biostimulation; a lactoil amendment has been used but it has been some time since the last injection event. In order to assess the current conditions and determine if the environment is still in an anaerobic and reducing state which is conducive to the degradation of the volatile compounds, a sampling for dissolved oxygen, pH, and oxidation-reduction potential was conducted in February 2012. Results showed favorable conditions for continued degradation of contaminants and the Navy will continue to monitor conditions to determine when additional amendments are required.

Mr. Frebowitz discussed the proposed remedy, which is continued insitu treatment of groundwater by bioremediation with monitored natural attenuation of the plume further downgradient of the source area. LUCs will be implemented to prevent use of untreated groundwater and to require that any future buildings be constructed to mitigate potential for vapor intrusion. These remedial measures are detailed in the Record of Decision (ROD) which is in review and should be issued soon.

Tom Ames asked a question to clarify if the treatment system that is currently on site is more or less a pilot program, and, if so, is it planned to be expanded in the proposed remedy. Mr. Frebowitz responded that the current system is the one used for the pilot study and the future plan is to expand the system with several more injection wells to add more amendment and increase the size of the treatment area. A design for upgrades to the system will be prepared, so

the remedy will be a continuation and expansion of that used for the pilot test. Mr. Ames added that the technology will be the same but it may not look exactly as it does now. Mr. Frebowitz confirmed that it will be generally the same system with some additional wells. There were no other comments or questions regarding Site 5.

Mr. Frebowitz provided an update on the status of Site 12 – South Landfill. The Phase I investigation included electromagnetic surveys to identify waste disposal areas which were further investigated by excavating test pits and collecting samples. This investigation showed elevated levels of contaminants such as PAHs, pesticides, metals and dioxins in surface and/or subsurface soils. There were no monitoring wells within Site 12, but Site 2 wells downgradient of Site 12 showed low levels of TCE. Surface water and sediment samples also showed PAHs, metals, and pesticides. Based on the Phase I results, it was recommended to further delineate the nature and extent of contamination at Site 12 and install monitoring wells as the site. The Phase II investigation is in progress; the soil sampling has been completed. Test pits were excavated at a couple areas that were not addressed during the Phase I investigation. Locations where contamination was identified during Phase I were investigated further to determine the extent of contamination. In addition, chromium speciation sampling was conducted at some of the locations where elevated chromium had been detected and at several new locations. Four new monitoring well clusters consisting of an overburden and shallow bedrock well each were installed at Site 12 and were sampled during the week of March 6<sup>th</sup>, 2012. In addition, wells at Site 2 will also be sampled as part of the investigation. Mr. Frebowitz referred to figures showing the soil, test pit, chromium speciation, and well sampling locations.

John Demcisak asked if the Phase I investigation disclosed all the contaminants listed on the presentation slides and if all those are present at Site 12. Mr. Frebowitz confirmed that these were all the contaminants detected and were present at Site 12. Mr. Demcisak asked if it would be necessary to remediate all those compounds. Mr. Frebowitz replied that a risk assessment will be performed to develop remediation goals for each compound presenting unacceptable risk.

Mr. Frebowitz stated that the soil and test pit sampling was completed in January 2012 and data was being received and validated. The groundwater results will lag behind the soil results as it took some time to install the wells and conduct the sampling which will be completed during the week of March 6<sup>th</sup>, 2012.

There were no additional questions regarding Site 12 and Mr. Frebowitz continued with the status of the Building 21 investigation. This building is a former paint blasting and painting facility. In 1995, an investigation showed elevated levels of lead in surface soil samples around the outside of the building. After preparation of a work plan, sampling was conducted in October 2011 at 15 soil locations for lead. Referring to a slide, Mr. Frebowitz showed where elevated levels of lead were detected in the October 2012 sampling. The impacted areas, with levels above 400 mg/kg of lead, are to the south of the building, two small grassy areas on the western side of the building, and around the transformer area. The Navy has recommended that a removal action of the impacted soils be performed.

Mr. Ames asked if the removal action needed to be approved by the BRAC cleanup team or how the removal action will be handled. Brian Helland stated that this was discussed with the

regulators and it appeared that the removal action will be conducted under the Pennsylvania Act 2 program.

Mr. Frebowitz asked if there were any additional questions regarding any of the work the Navy was performing. Eric Stahl asked if there were any projections for the time frame for the overall treatment at Site 5 or how long MNA may take to achieve cleanup. Mr. Helland indicated that the Navy was projecting ten years for budgetary purposes, but would estimate that the time may be less than that to achieve the remedial goals of MCLs. Mr. Frebowitz added that with the expansion of the treatment system and the success seen to date, a time frame of less than ten years should be achievable. Mr. Stahl asked what the possible remedial alternatives for the landfills would be barring any significant changes to what the results show. Mr. Helland replied that removal and capping are the most likely options.

There were no other questions and Mr. Frebowitz turned the meeting over to the Air Force for their presentation.

Scott Shaw presented an update on activities at the Air Force Petroleum, Oil, and Lubricant (POL) Site ST-01. The POL Site, located on the northwestern property boundary, consists of two large tanks near Graeme Park. Mr. Shaw indicated he wanted to discuss the results of a lead background investigation conducted in the last year and the types of monitoring that the Air Force has been performing. One type of monitoring is compliance monitoring which consists of quarterly groundwater monitoring to check on the nature and extent of contamination associated with a jet fuel leak that occurred in 1978 or 1979. The other monitoring is performance monitoring to evaluate the performance of the biosparge system in operation at the site. For the compliance monitoring, groundwater samples are analyzed for about 11 different contaminants of concern associated with petroleum hydrocarbons and jet fuel in particular. For the performance monitoring, those same compounds are included in the analysis along with other non-regulated parameters such as biological oxygen demand, chemical oxygen demand, and total petroleum hydrocarbons.

Mr. Shaw commenced the discussion on the lead background investigation. From October 2008 to June 2009, lead began to be detected in some of the site monitoring wells sampled during the compliance events. In 2008, lead was detected in three wells at levels below state standards. In 2009, lead was detected in 11 of the 12 wells used for compliance monitoring, and two of the wells showed levels above the state standards. Later in 2009, all the wells that were sampled showed lead, with several at levels above the groundwater standards. Mr. Shaw noted that well DM-3 was not sampled because it was dry – the water table was below the bottom of the monitoring well. When the water level came back up and sampling was conducted, well DM-3 had the highest levels of lead, while not all the wells had detectable levels of lead. Referring to slides, Mr. Shaw showed the location of the POL area and wells and the groundwater flow patterns showing groundwater discharging to the creek. Historical groundwater level data was used to determine the location of three background wells that were sampled over a one-year period at the same times compliance monitoring was conducted. None of the background wells or compliance wells showed detectable levels of lead which made a statistical computation of the background lead level impossible. However, some conclusions could be drawn from the data. After the water level in well DM-3 recovered, a higher than normal concentration of lead was

observed. Over time, that went away leading the Air Force to conclude that the lead observed in 2008 and 2009 were probably the results of natural conditions. Mr. Shaw referred to a figure and identified well GM-08 which is across the creek from the site. This well has never shown any contamination associated with the POL site, but when the water level came back up in DM-3, this well also showed elevated levels of lead.

The Air Force has also started collecting samples of surface water as it comes onto the site, near the groundwater discharge location and downstream near the bridge in Graeme Park. None of the samples collected in the past year and a half had detectable levels of the contaminants of concern.

Mr. Shaw provided an introduction of the biosparge operation. Referring to a slide, Mr. Shaw showed the POL yard, location of the tanks, and the biosparge treatment area. Monitoring well results have not shown jet fuel constituents of concern above state standards since 2006 and there have been no measurable observations of free product or light non-aqueous phase liquid (LNAPL) in any of the wells over the past two years. Compliance monitoring continues to be performed on a quarterly basis with results reported to PADEP. The current quarter's event was conducted on the day of the RAB Meeting (March 7, 2012) with the next round scheduled for June 2012.

Karl Pfizenmayer asked if lead is part of jet fuel. Mr. Shaw replied that it is. Mr. Pfizenmayer asked if June 2009 was the last time it was detected above standards. Mr. Shaw clarified that nothing but lead has been since 2009.

Mr. Demcisak asked about the high concentrations of lead in well DM-3 after the water levels came back. The Air Force has attributed the lead to natural conditions; Mr. Demcisak requested a definition of natural conditions. The fact that lead contamination was present in a well that has never been impacted by jet fuel, and the fact that it is something only seen after a low water table event, indicates that it is probably the result of something leaching from existing conditions such as lead in soil. Mr. Demcisak asked if the lead is migrating. Mr. Shaw stated that it's not migrating in the sense that it is traveling with groundwater, rather it is migrating from soil or bedrock that the groundwater comes in contact with. The term leaching is used. There is some concentration of lead in soil or bedrock that when it comes into contact with groundwater for a long period of time can concentrate in the groundwater. As soon as the water table comes up, it becomes diluted out. Mr. Demcisak asked if it was known for a fact that the bedrock in the area contains lead. Mr. Shaw replied that the Air Force has not sampled the bedrock and does not know for a fact. Mr. Demcisak followed up stating that that was only an assumption; this was confirmed by Mr. Shaw.

Mr. Pfizenmayer asked if the groundwater contours as shown on the potentiometric map flattened out with lower water levels. Mr. Shaw replied that it does a little bit but not a lot and indicated he had never seen the condition where water from the stream is going into groundwater, which is called a losing stream. It has always been observed the other way around, a gaining stream, where groundwater flows into a stream. Mr. Pfizenmayer stated he was trying to figure out a reason why these conditions were occurring and Mr. Shaw, referring to the

figures, showed that the flattening of the groundwater contour during low water levels is less than one foot.

Mr. Shaw continued with a discussion of the biosparge system. The system was designed to treat dissolved contamination in groundwater. It works by injecting small amounts of air to stimulate biological activity. In the early 2000s a study was performed and determined that there was sufficient biological activity in some of the impacted area to degrade jet fuel. However, the oxygen that bacteria needs becomes quickly depleted. By adding oxygen, biological activity can be built up. The system was designed to operate for about six months in each treatment area. Mr. Shaw identified the treatment areas on a figure which also showed the associated injection wells and piping. Mr. Shaw explained that compressors on site force air into the injection wells to try to start biological activity. The system operated about six months in most of the areas, but for 16 months in Area D. Groundwater results from most of the areas show jet fuel constituents below state standards with the exception of Area D. The reason for the higher levels of these constituents is likely the presence of LNAPL in this area. The LNAPL is a sheen. The thickness cannot be measured, but it is clearly present. This small concentration of LNAPL contributes to the low levels of constituents of concern. The problem is the contaminants are persistent, and after 16 months of biosparge application it does not appear that the concentrations of contaminants have been reduced to the point where the treatment could be considered effective.

Mr. Shaw presented a slide providing a description of what LNAPL is and how it reacts and degrades after its release to the environment. The latter stage, where the site is now, is characterized by the LNAPL below the saturation point and below the water table. The thickness of the product can no longer be measured and contamination is attributable to dissolved constituents in groundwater. Mr. Shaw indicated that the process is even further along as the constituents of concern are, for the most part, below state standards. The next step is to determine where the remaining LNAPL is located. One of the benefits of operating the biosparge system is the impacted area has been narrowed down to a small area- Area D. The compliance monitoring maintains the ability to continue to monitor the extent and nature of the groundwater contamination. The Air Force will continue to fill some of the data gaps to support potential closure under Pennsylvania's Act 2.

Mr. Shaw concluded the presentation and asked if there were any questions. Mr. Pfizenmayer asked where was the location of the release that the Air Force is now cleaning up. Mr. Shaw, referring to an aerial photograph, showed the location of the tanks. He explained, from what he knew, that the release was not from a breach of the tanks. It was a failure to close a valve one night when the largest release occurred. Mr. Pfizenmayer asked if the soil in the release area was cleaned up. Mr. Shaw stated that soil excavation did not occur due to the operations in the area and there was no apparent contamination at that time. Mr. Pfizenmayer stated that it could still be a source of contamination. Bill Downs stated that the leak came from pipes that were underneath the distribution pipes. Mr. Shaw added that the release came from outside the berm of the POL and tank farm.

Rick Myers asked about the road and gate construction from the base supply to the motor pool and if that could potentially spread contamination. Jim Rugh replied that the construction was by

the fuel farm near public works and those tanks were removed and the soil cleanup and testing was complete.

Mr. Stahl asked what PADEP Act 2 standard would be achieved for the Building 21 soil removal. Jessica Kasmari replied that the standard for soils with used aquifers is 450 mg/kg, so PADEP was looking at 450 mg/kg or the EPA standard of 400 mg/kg. Mr. Stahl asked if this was the residential statewide standard, and Ms. Kasmari confirmed. Mr. Helland added the Navy will have to confirm with EPA to make sure the right program is being followed, but the cleanup goal will be in the 400 mg/kg range. Ms. Kasmari added that the residential standard will be the appropriate goal whether it's 400 or 450 mg/kg.

Mr. Lin asked for any other questions or comments; there was no response.

The attendees discussed potential meeting dates for the next meeting and set June 6, 2012 at 6:00 pm at the Horsham Township Library for the next RAB meeting.

Mr. Lin reminded the attendees that the administrative record is located at the library or on the Internet site identified on the agenda and the RAB meeting minutes are posted on the library website or the BRAC site.

Meeting adjourned.



# NAS JRB WILLOW GROVE

## RESTORATION ADVISORY BOARD (RAB)

March 7, 2012  
Meeting Number 48



# Agenda

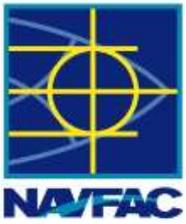


- Welcome Community RAB Members
- Site 1 – Privet Road Compound Status
- Site 3 – Ninth Street Landfill Status
- Site 5 – Fire Training Area Groundwater Remediation Status
- Site 12 – South Landfill Phase II Investigation Status
- Building 21 Lead Investigation
- Air Force Remediation of POL Site
- Closing Remarks

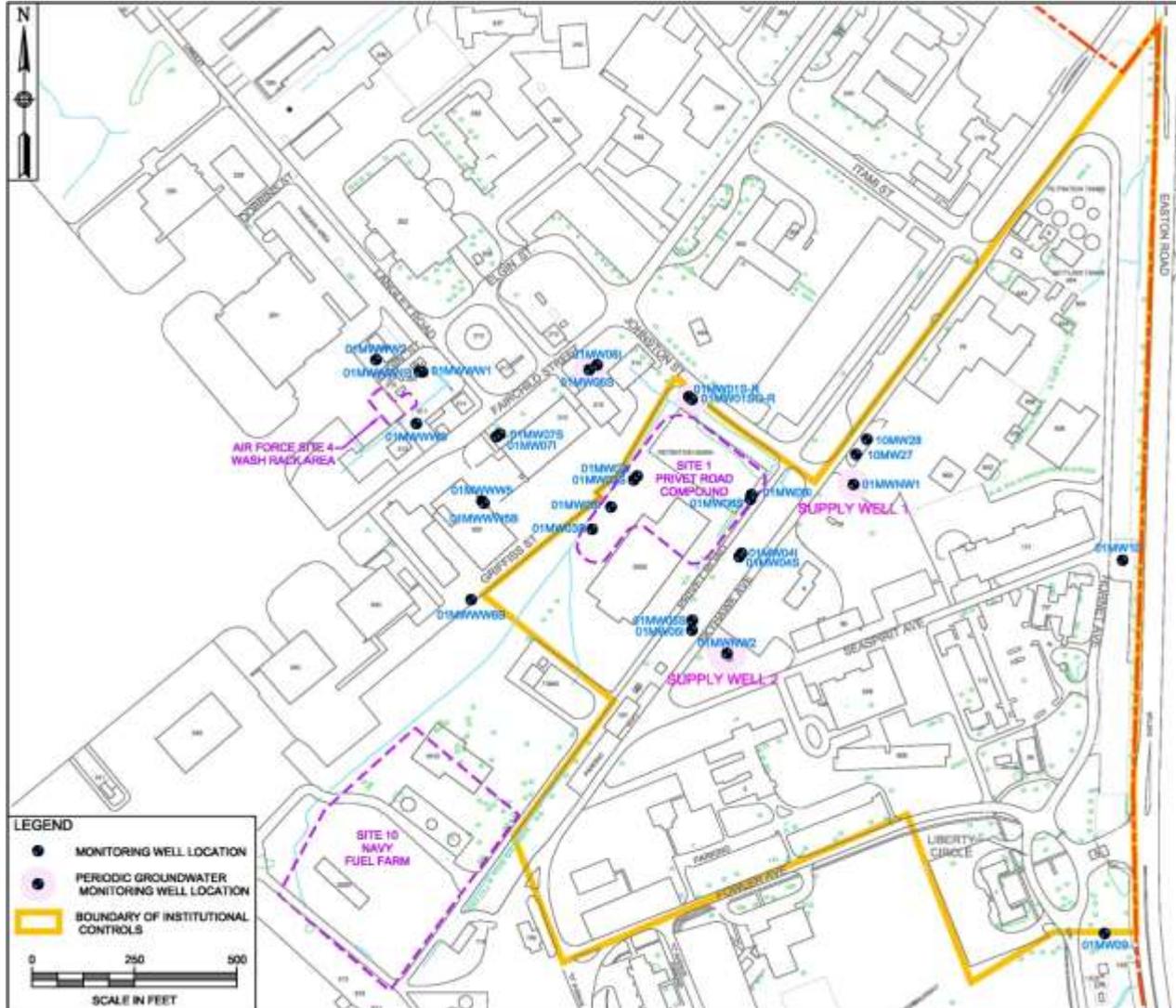


# Site 1 – Privet Road Compound





# Site 1 – Privet Road Compound





# Site 1 – Privet Road Compound



- Annual Land Use Control Inspection and Groundwater Monitoring conducted August 2011
  - No compliance issues identified
  - No risks identified
  - Monitoring well results below project action levels
  - PCE in one supply well remains above drinking water standards and continue to be treated
    - Operating permit for supply wells transferred to PAANG
  - Recommendation for additional round of sampling in 2013
- Construction in compound near Site 1 Monitoring Wells
  - 10MW27 and 10MW28 no longer used for monitoring
  - Wells abandoned in accordance with PADEP requirements

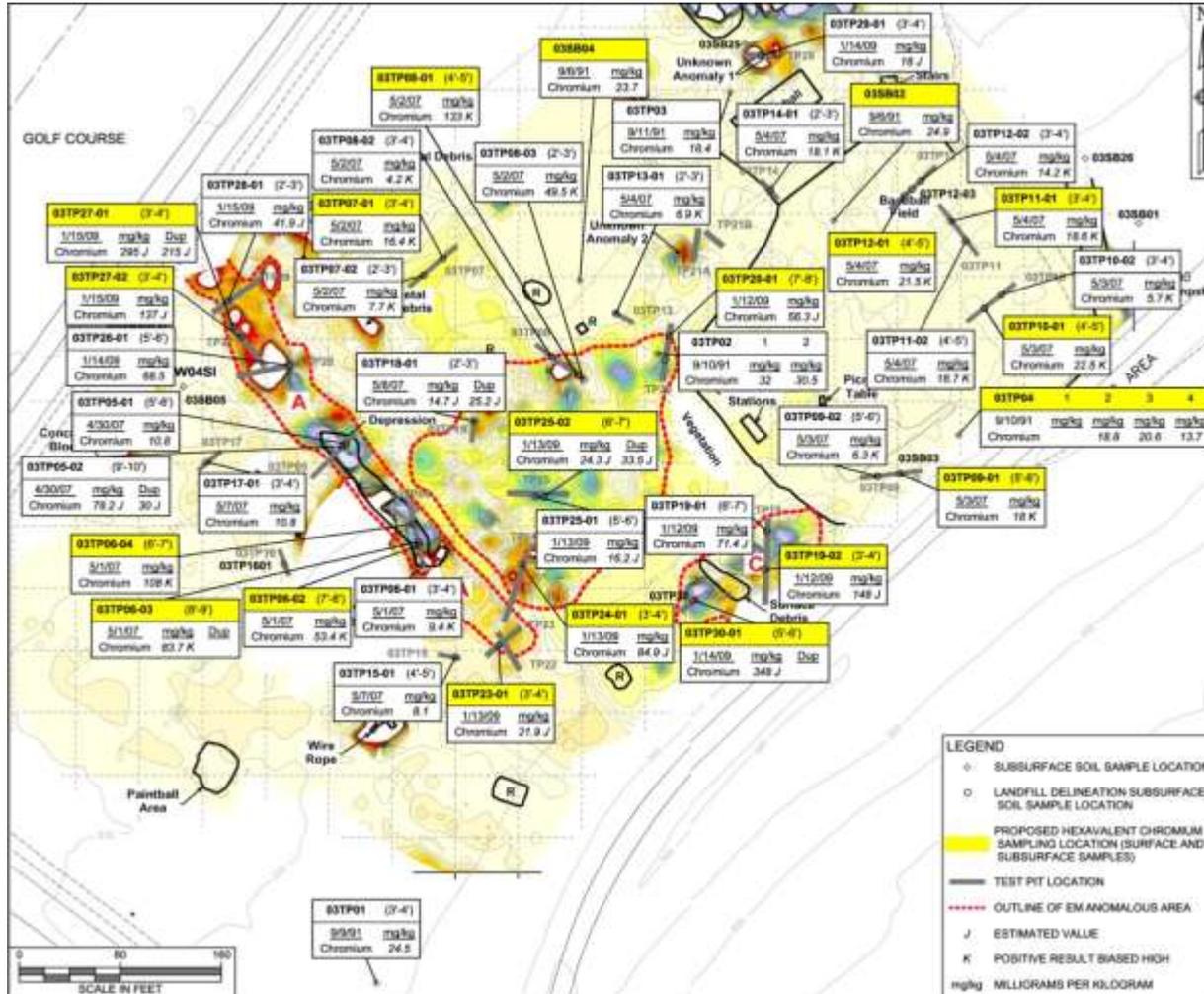


## Site 3 – Ninth Street Landfill



- Final RI Report – October 2011
  - Recommendation for chromium speciation at samples with elevated levels of chromium
- Chromium speciation conducted concurrently with Site 12 Phase II field investigation
  - Sampling conducted December 2011
  - Analysis for total chromium and hexavalent chromium
  - Hexavalent chromium has higher toxicity than total chromium
  - Data validation in progress
  - Results will be used to develop remediation goals for the FS

# Site 3 – Ninth Street Landfill



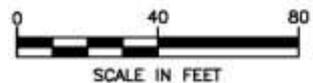


# Site 5 – Fire Training Area Groundwater





# Site 5 – Fire Training Area Groundwater



## LEGEND

- MONITORING WELL LOCATION
- INJECTION/EXTRACTION WELL LOCATION
- UNDERGROUND ELECTRIC AND WATER LINE
- UNDERGROUND ELECTRIC LINE



## Site 5 – Fire Training Area Groundwater



- Current Status

- Original solvent compounds sharply reduced to absent
- Intermediate compounds steady to declining
- End stage compounds appearing
- Periodic biostimulation is required
- February 2012 – sampling for field parameters
  - Dissolved oxygen levels and oxidation-reduction potential readings show subsurface environment maintaining an anaerobic and reducing state



# Site 5 Groundwater Proposed Remedy



- In-situ treatment of groundwater by anaerobic bioremediation in and around the former drum storage source area
- Natural Attenuation
- LUCs will be initiated to preclude use of untreated groundwater and require that future buildings are constructed to mitigate the potential for vapor intrusion of VOCs from the subsurface into the buildings



# Site 12 – South Landfill Phase II Remedial Investigation





# Site 12 – South Landfill Phase I Remedial Investigation



- Field investigation including test pits, soil borings, soil samples, surface water/sediment samples completed January 2010
- Soil sampling biased to areas with buried wastes based on results of electromagnetic (EM) survey
- Test pits at EM anomalies confirmed presence of buried waste
- Contaminants exceeded project screening levels
  - Surface Soils: PAHs, pesticides, metals
  - Subsurface Soils: PAHs, pesticides, dioxins, metals
  - Groundwater results from Site 2 wells showed low levels of TCE (<MCL)
  - Surface Water/Sediment: PAHs, pesticides, metals
- Recommendations for Phase II investigation to delineate nature and extent of surface and subsurface soil contamination and installation and sampling of groundwater monitoring wells



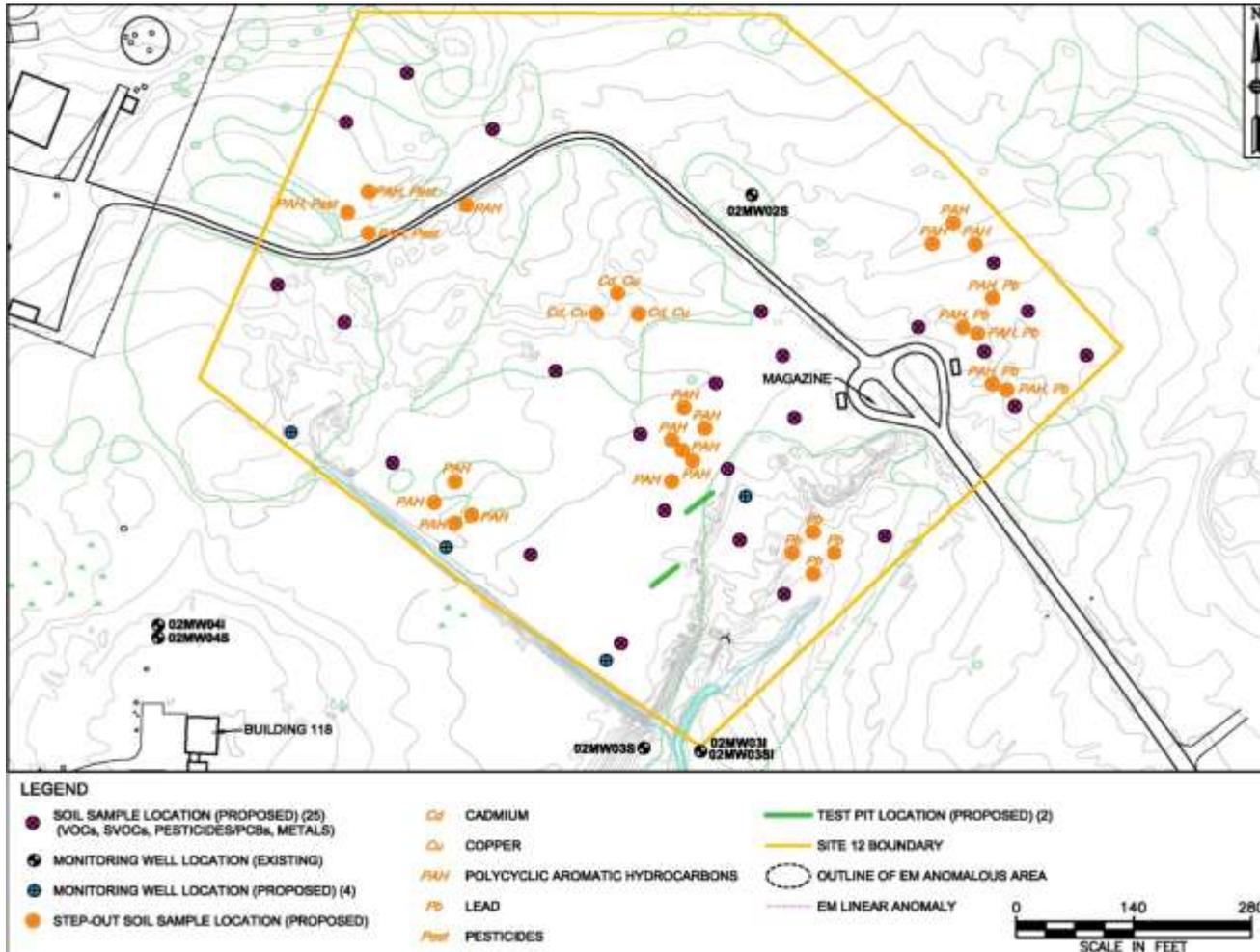
# Site 12 – South Landfill Phase II Remedial Investigation



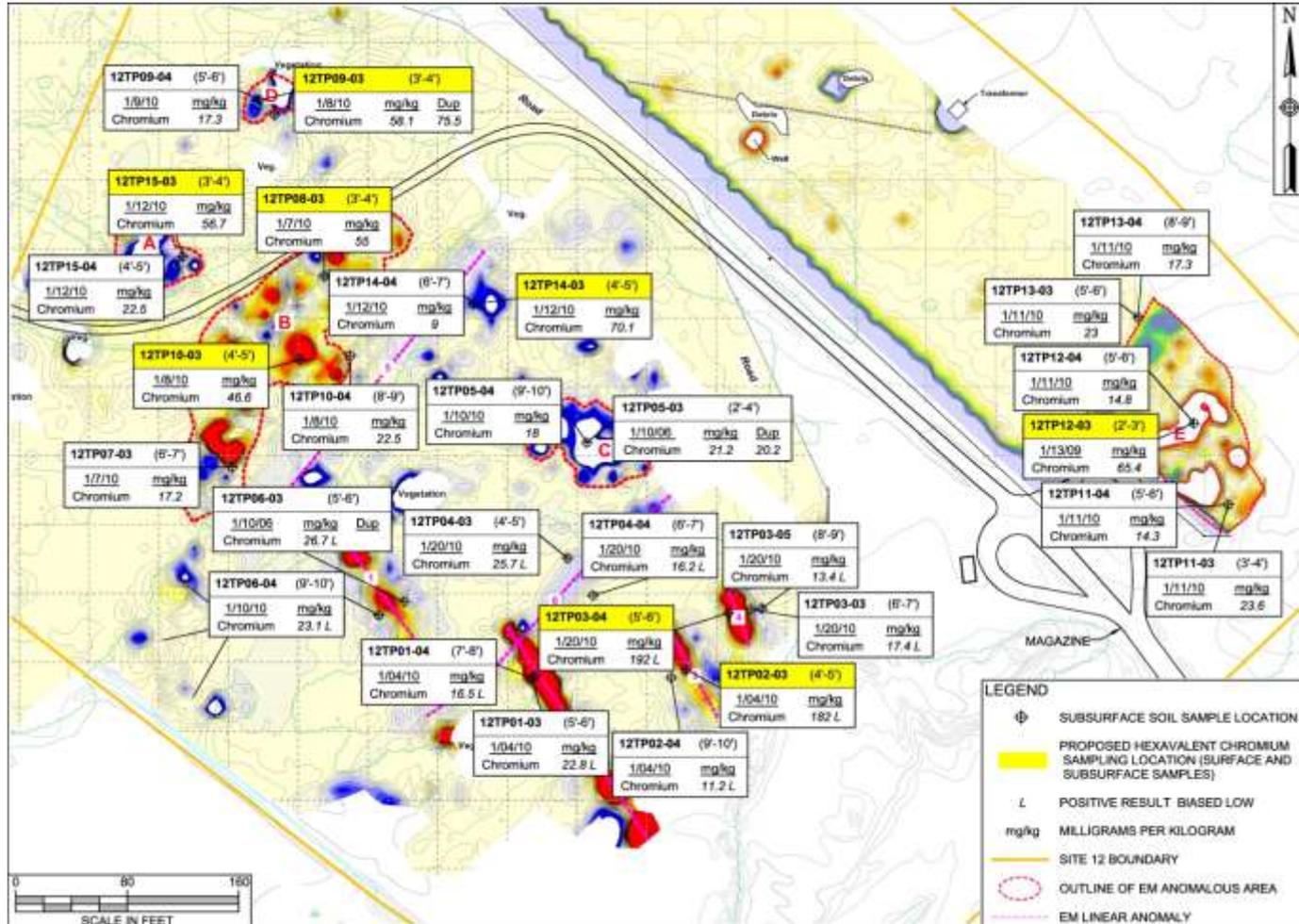
- Phase II investigation – In Progress
  - Test pits at 2 linear anomalies in southeastern portion
  - 25 shallow soil borings outside EM anomalies (VOCs, SVOCs, metals/cyanide, pesticides, PCBs; hexavalent chromium at some locations)
  - 29 shallow soil borings at step-out locations based on Phase I results (low level PAHs and/or metals or pesticides)
  - Chromium speciation at some Phase I locations
  - 4 new monitoring well clusters (overburden, shallow bedrock) within the landfill (VOCs, SVOCs, pesticides, PCBs, metals/cyanide; dioxins and furans at well cluster downgradient of Phase I test pit 12TP02)
  - Site 2 monitoring wells (VOCs)



# Site 12 – South Landfill Phase II Remedial Investigation



# Site 12 Chromium Speciation





# Building 21 Lead Investigation



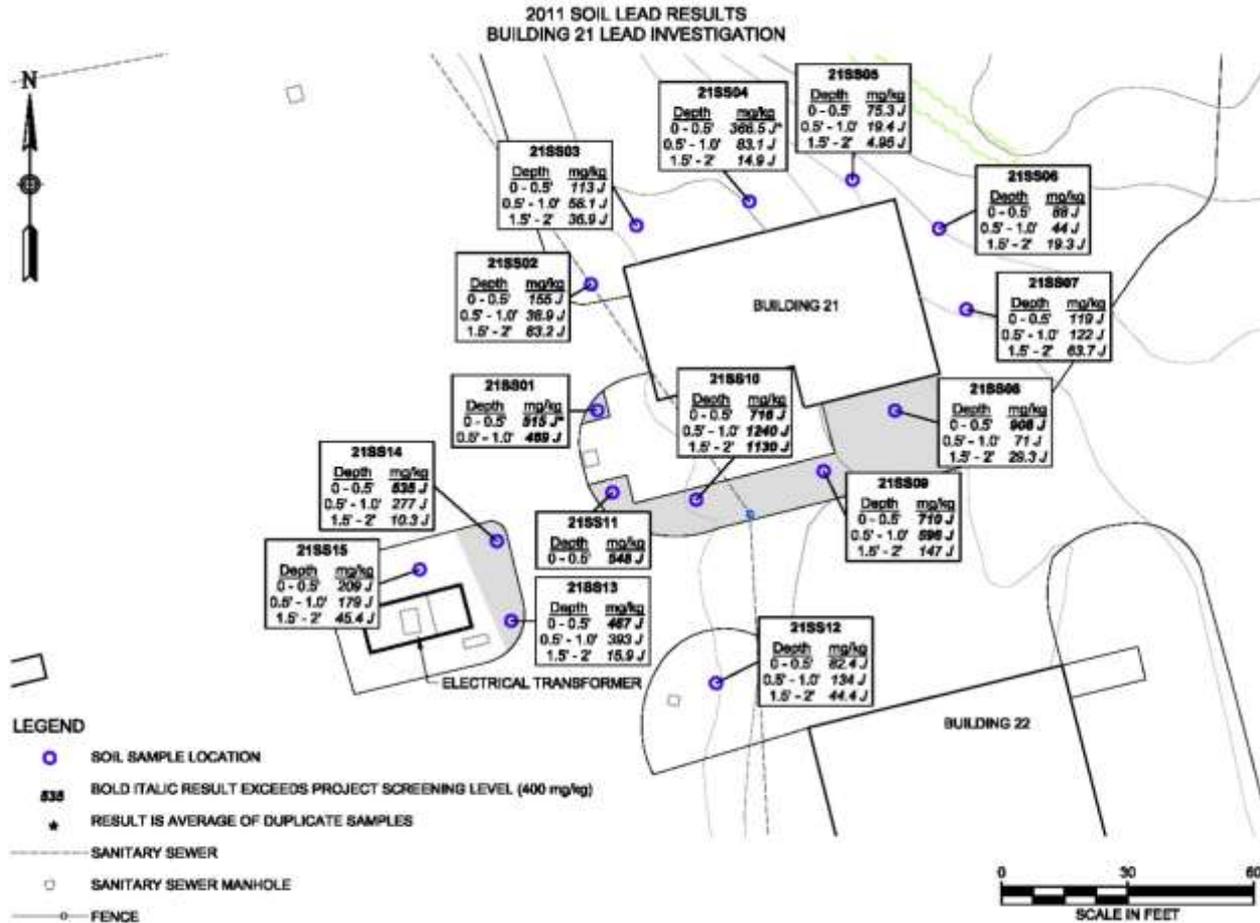


# Building 21 Lead Investigation



- Former paint blasting and painting facility
- 1995 soil investigation showed lead in five surface soil samples from 186 mg/kg to 2,210 mg/kg
- Work plan for additional sampling approved by EPA and PADEP (September 2010)
- Lead sampling at 15 locations from 0 -0.5 ft, 0.5 to 1.0 feet, and 1.5 to 2.0 feet conducted October 2011
- Results show lead-impacted soil on southern side of building and near transformer area (shaded area on next slide)
- Recommendation for removal of lead-impacted (>400 mg/kg) soil

# Building 21 Lead Investigation Sampling Results





# Air Force POL Site Remediation



Point of Contact

Bill Downs (478) 327-1073



# NAS JRB Willow Grove RAB Meeting 48



- Closing Remarks
- Questions or Comments From The Community?
- Next Meeting Date (Proposed Date June \_\_, 2012)



# NAS JRB Willow Grove RAB Meeting 48



THE END



# Willow Grove Air Reserve Station Petroleum, Oil and Lubricants (ERP Site ST-01)

Restoration Advisory Board Meeting

Wednesday March 7, 2012

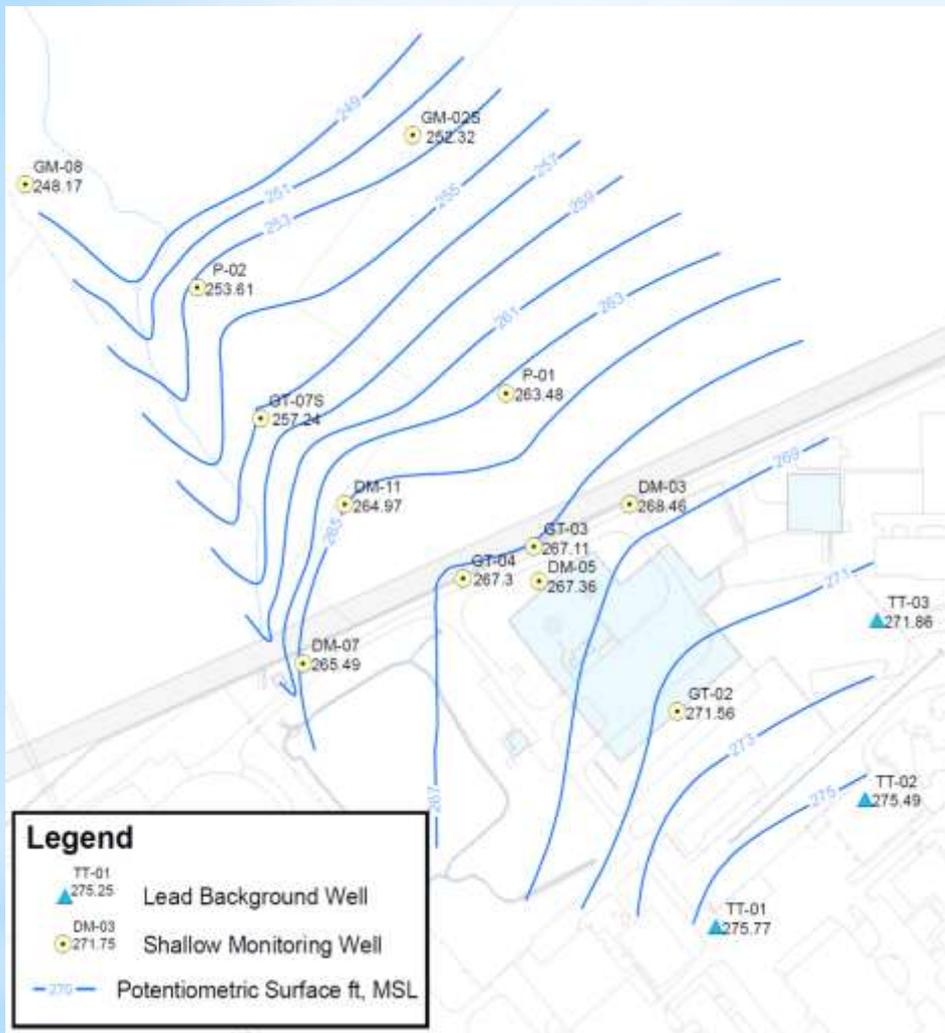
# Presentation Outline

- \* Lead Background Investigation
- \* Compliance Monitoring Results
- \* Biosparge System Design and Operation

# Lead Background Investigation

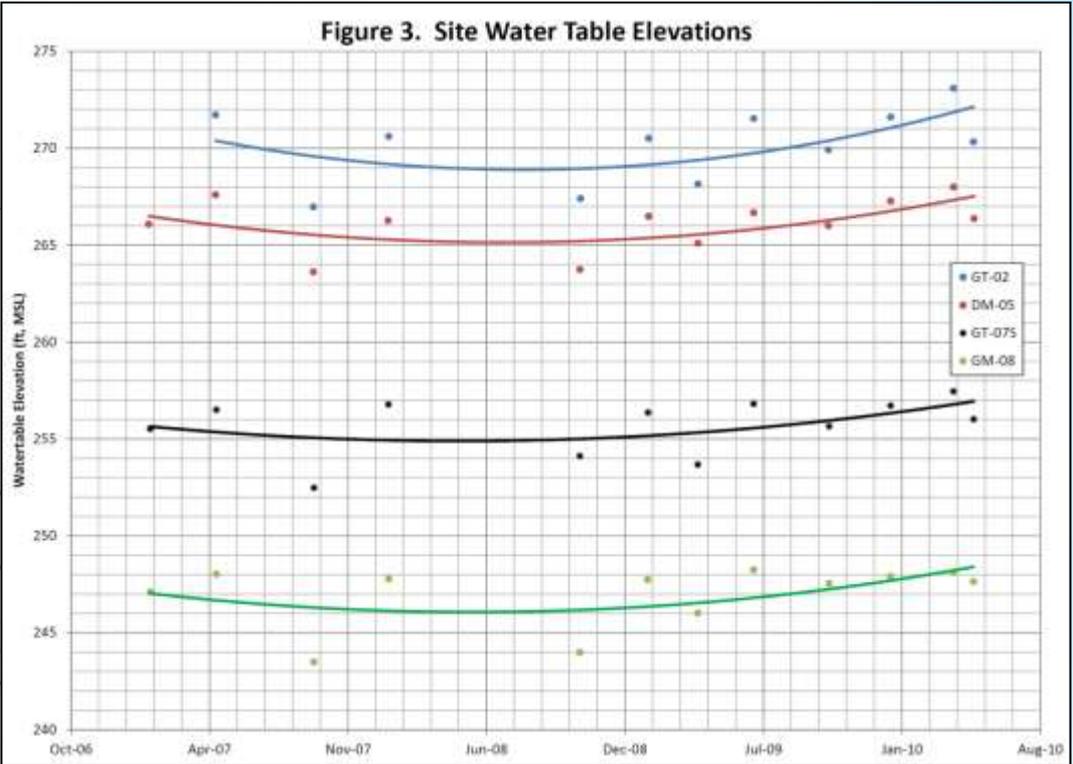
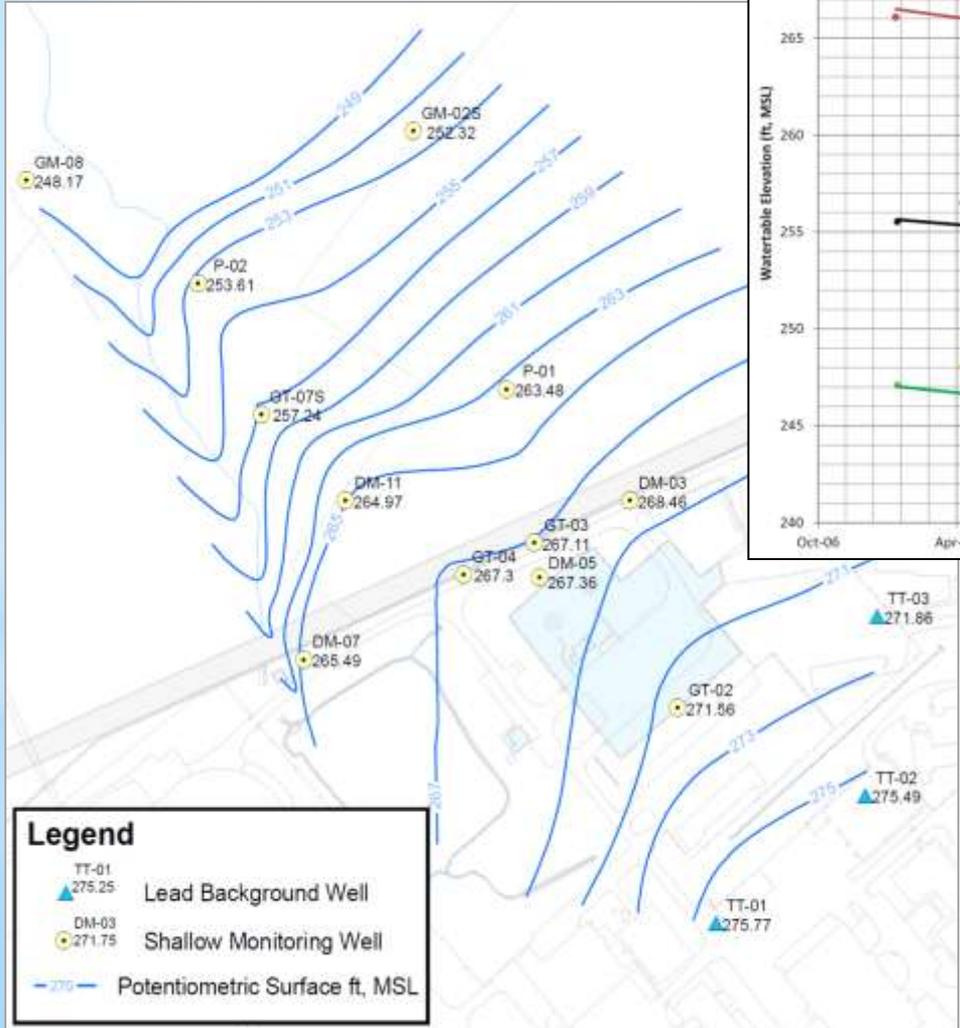
- \* From October 2008 to June 2009 dissolved lead was detected in site monitoring wells.
- \* October 2008 - dissolved lead detected in 3 wells at a maximum concentration of 2.3 ppb.
- \* January 2009 - dissolved lead detected in 11 of the 12 compliance monitoring wells and two of the wells had concentrations slightly above the statewide health standard medium specific concentration (MSC) of 5 ppb.
- \* April 2009 - All of the sampled wells had detectable concentrations of dissolved lead. Two of the sampled wells had concentrations above the MSC. Monitoring well DM-03 was not sampled because the elevation of the water table was beneath the bottom of the well.
- \* June 2009 - Dissolved lead detected in four wells. Three of the four wells had concentrations above the MSC. The highest concentration (6.9 ppb) was detected in a sample from DM-03.

# Lead Background Investigation

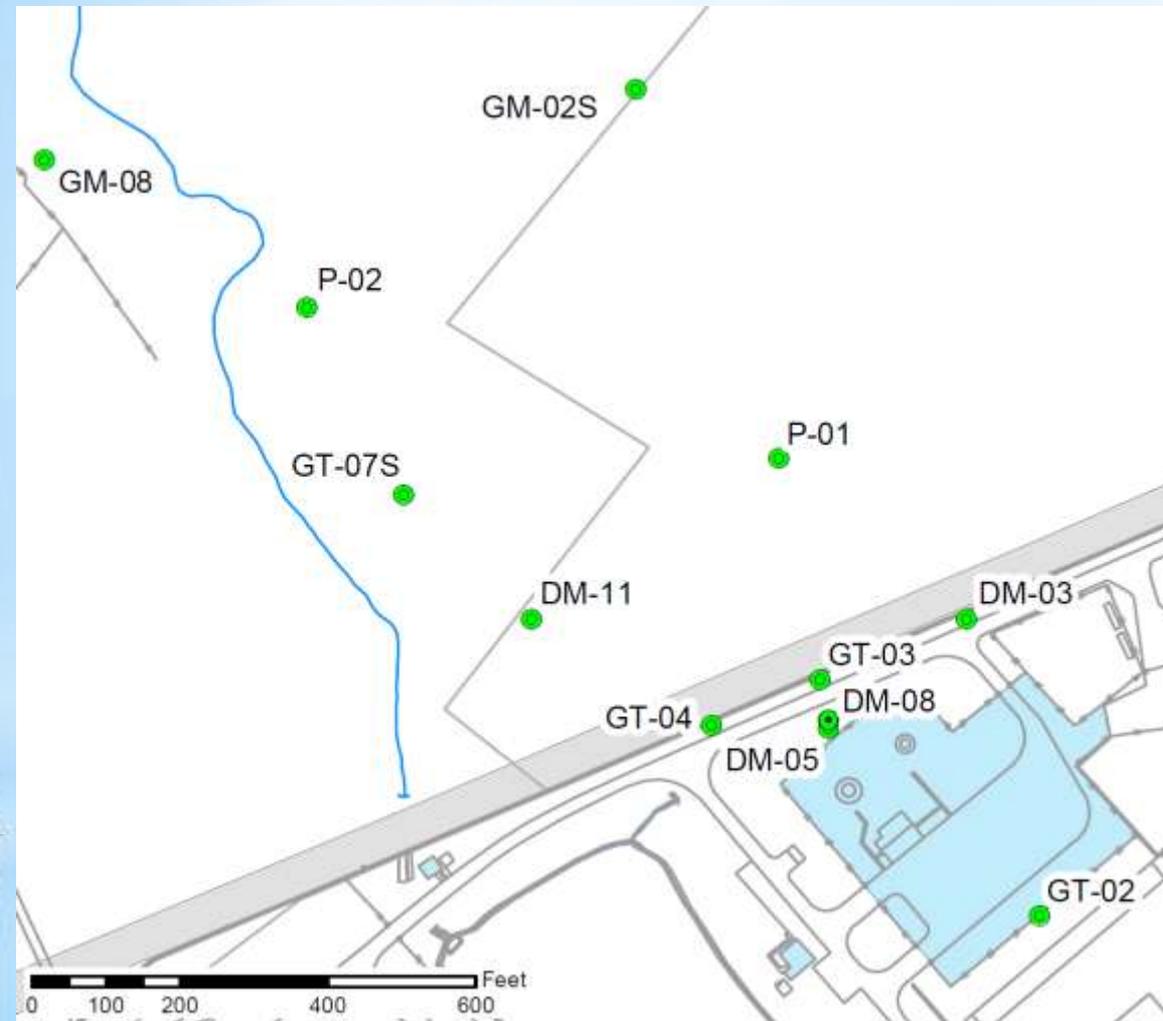


- \* Used water level records to locate and install three temporary up gradient monitoring wells
- \* Collected groundwater samples from each new well for one year (4 quarters)
- \* During the investigation none of the groundwater samples collected from either the existing compliance monitoring wells or the temporary monitoring wells had detectable concentrations of dissolved lead

# Lead Background: Water Level Trends



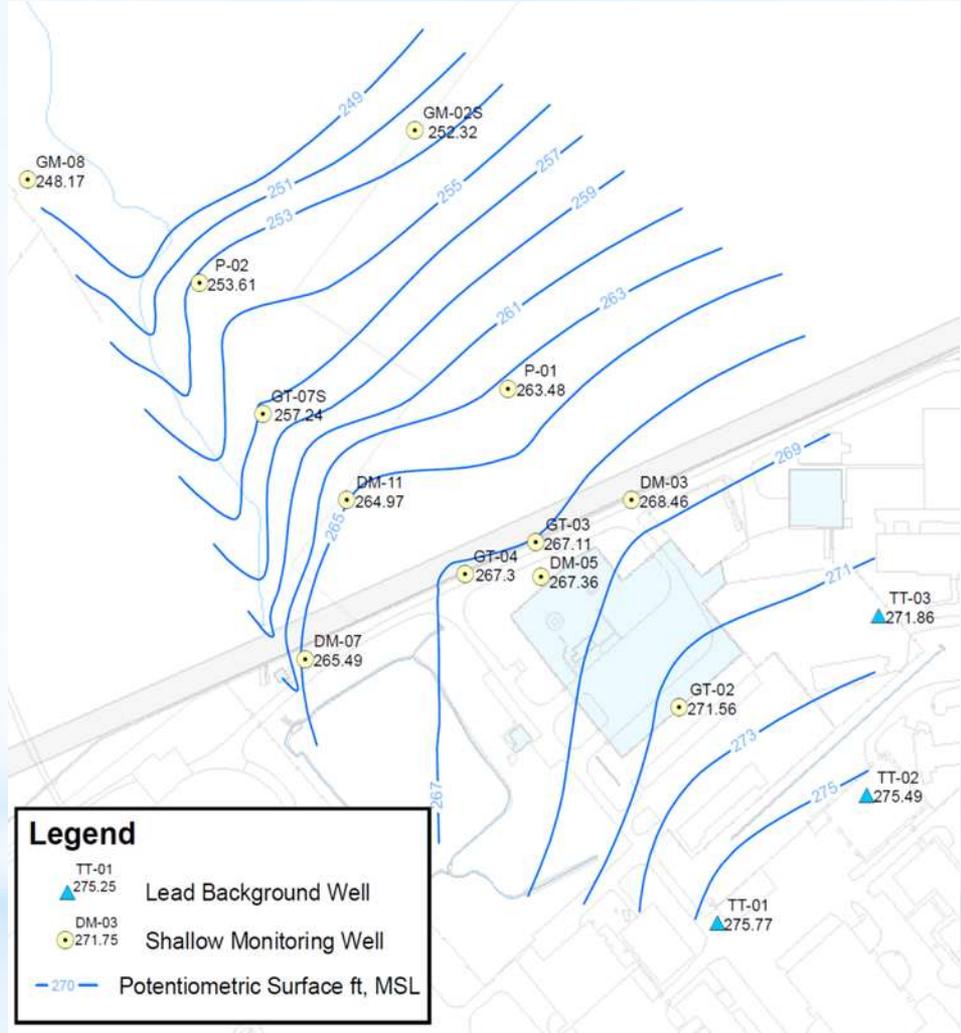
# Compliance Monitoring



- \* Collect groundwater samples on a quarterly basis from twelve monitoring wells
  - \* Eleven Shallow/Overburden
  - \* DM-08 - Bedrock Well
- \* Collect groundwater samples and water level data
- \* Analyze samples for PADEP Jet Fuels COCs

# Compliance Monitoring Surface Water Samples



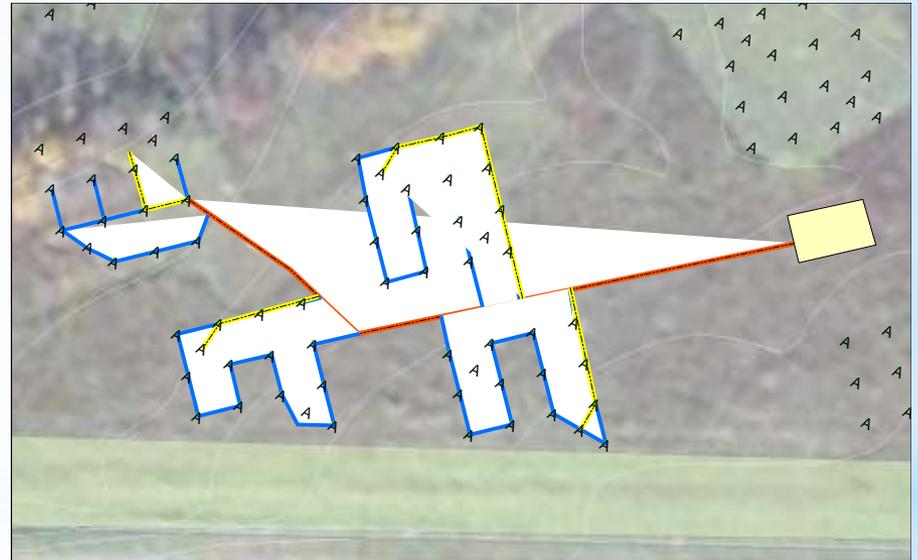


# Compliance Monitoring Field and Analytical Results

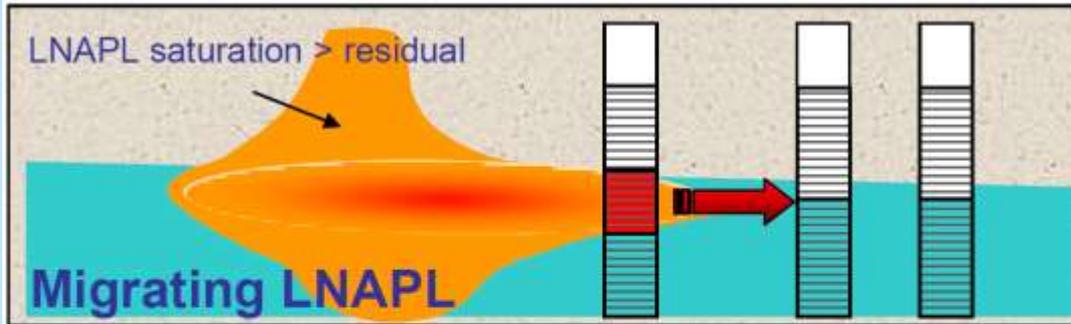
- \* No detections of jet fuel COCs above MSCs since 2006 in groundwater
- \* No concentrations of jet fuel CoCs above laboratory detection limits in surface water
- \* No measurable observations of light non-aqueous phase liquid (LNAPL) in on- or off-site wells in last two years
- \* Compliance monitoring will continue on a quarterly basis
- \* Results reported to PADEP on an annual basis (June 2012)

# Biosparge System Design and Operation

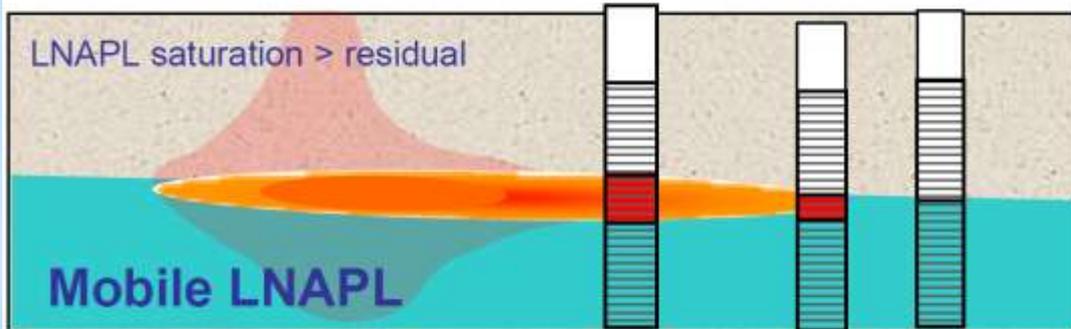
- \* System designed to treat dissolved contamination
- \* System installed in six treatment areas
- \* System operated and performance monitored in each treatment area for at least six months
- \* System operated in treatment area D for 16 months
- \* Concentrations of several COCs remain above MSCs and LNAPL observed in treatment area D



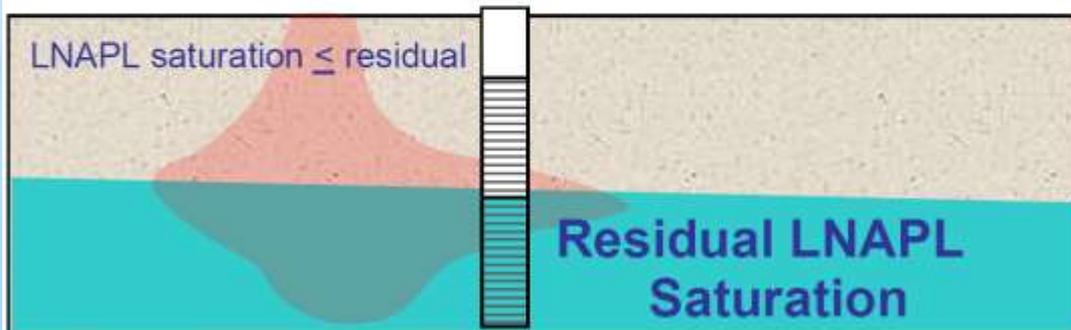
# LNAPL: Three Stages



Stage 1 - Site is characterized by the amount of LNAPL both above and below the water table. Focus of any investigation is on the removal LNAPL.



Stage 2 - LNAPL encountered in monitoring wells and appears to be migrating. Focus of the investigation is slowing LNAPL migration and mapping dissolved plume.



Stage 3 - LNAPL well below saturation. More LNAPL present below the water table than above. Remediation focuses on dissolved constituent concentrations which can remain high unless LNAPL is addressed.

# Future Investigations

- \* Investigate the extent of residual LNAPL contamination in and around treatment area D
- \* Continue compliance monitoring to confirm nature and extent of contamination
- \* Fill data gaps in support of potential pathways to site closure under Act 2

# Questions