NAVAL AIR STATION JOINT RESERVE BASE
(NAS JRB) WILLOW GROVE
Restoration Advisory Board (RAB) Meeting Minutes

Meeting Date: May 10, 2017
Meeting Time: 2:00 p.m.
Meeting Place: Horsham Township Library

<table>
<thead>
<tr>
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<th>Organization</th>
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<tbody>
<tr>
<td>Willie Lin (R)</td>
<td>Navy, BRAC PMO (Co-Chair)</td>
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<td>Brian Helland (R)</td>
<td>Navy, NAVFAC</td>
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<td>Marty Schy</td>
<td>NAS JRB Navy Caretaker’s Office</td>
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<td>Lisa Cunningham (R)</td>
<td>EPA</td>
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<td>Larry Brown</td>
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<td>Mark Leipert</td>
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<td>Andrea Barbieri</td>
<td>EPA</td>
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<td>Colin Wade (R)</td>
<td>PADEP</td>
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<td>Jessica Kasmari (R)</td>
<td>PADEP</td>
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<td>Andrew Frebowitz</td>
<td>Tetra Tech</td>
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<td>Mike Shannon</td>
<td>AECOM</td>
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<td>Lt Col Jacqueline Siciliano</td>
<td>PA Air National Guard</td>
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<td>Keith Freihofer</td>
<td>Air National Guard</td>
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<td>Chris Botzum</td>
<td>PA Air National Guard</td>
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<td>Lt. Col. Claudia Malone</td>
<td>Air National Guard</td>
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<td>Lt. Christine Lloyd</td>
<td>ATSDR</td>
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<td>Lora Werner</td>
<td>ATSDR</td>
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<td>Lisa Senior</td>
<td>USGS</td>
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<td>Dan Goode</td>
<td>USGS</td>
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<td>Tina O’Rourke</td>
<td>Horsham Water and Sewer Authority</td>
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<td>Farhad Ahmed</td>
<td>Pennsylvania Department of Health</td>
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<td>Amil Nair</td>
<td>Pennsylvania Department of Health</td>
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<td>Toby Kessler</td>
<td>Gilmore Associates/Horsham Water and Sewer</td>
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<td>Christian Jones</td>
<td>Warrington Township</td>
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<td>Tom Ames</td>
<td>HLRA</td>
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<td>Mike McGee</td>
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<td>Larry Burns</td>
<td>Horsham Township</td>
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<td>Charles Hertz</td>
<td>Aqua America</td>
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<td>Jim Ventrini (R)</td>
<td>Resident</td>
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<td>William Rothert</td>
<td>Resident</td>
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<td>Matt Machusick</td>
<td>Leidos</td>
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<td>Tracy Carluccio</td>
<td>Delaware Riverkeeper Network</td>
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<td>Kyle Bagenstose</td>
<td>The Intelligencer</td>
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<td>Joseph McGrath</td>
<td>Former Employee at NASJRB Willow Grove</td>
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<td>Lorraine Sciuto-Ballasy</td>
<td>State Representative Bernie O’Neill’s Office</td>
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Willie Lin, the Navy’s Base Realignment and Closure (BRAC) environmental coordinator and RAB Co-Chair, opened the meeting by greeting the attendees. Mr. Lin noted that this meeting will include presentations from the Navy and Air National Guard (ANG). Mr. Lin indicated that Mary Gemmill, the Community RAB Co-Chair could not attend. Mr. Lin acknowledged Keith Freihofer representing the ANG. Mr. Lin asked RAB members and government representatives to introduce themselves. After introductions, Mr. Lin commenced with the Navy presentation.

Mr. Lin discussed the background and status of the radiological investigation. A historical radiological assessment identified 18 potential radiological sites for additional study. Scoping surveys to identify if radiological contamination was present at these 18 sites, were performed. The scoping surveys were conducted in three groups: buildings, footprints of former buildings, and landfills. The survey reports for the buildings were completed in 2016, the landfills were completed in March 2017, and the building footprint reports were completed in May 2017. Results showed no radiological concerns for future use of the buildings, footprints, or landfill surface soils. No additional radiological investigation is required; therefore, this agenda item will not be included in future RAB meetings.

Mr. Lin introduced Andrew Frebowitz to provide an update on the surplus sites including landfill Sites 3 and 12 and Site 5, the former Fire Training Area. Mr. Frebowitz provided background on Sites 3 and 12 stating that they were former landfills used by the Public Works Department at the former facility. Wastes were buried in trenches and covered. Results from the remedial investigations (RIs) at both sites showed soils with elevated levels of metals, and polycyclic aromatic hydrocarbons. In addition, groundwater at Site 3 also showed elevated levels of the volatile organic compound (VOC) tetrachloroethene (PCE). Feasibility studies (FSs) are in preparation to evaluate potential remedial alternatives and select a remedy for site closure.

Groundwater at Site 5 is impacted by VOCs, with the primary parent compounds of PCE and trichloroethene (TCE). The selected remedy for groundwater includes operation of an anaerobic bioremediation system which essentially degrades VOCs. The system is being maintained and monitored in accordance with approved plans. Annual monitoring is scheduled for May 2017 and injection of nutrients for the bacteria which break down the VOCs is conducted periodically.
Sampling results show decreasing trends of VOC parent compounds and other indicators that remediation is occurring.

Mr. Lin began the presentation for the next agenda item, perfluoroctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) in groundwater. Mr. Lin provided background information on these compounds. In 2016, EPA established a lifetime health advisory level of 0.07 micrograms per liter, or 70 parts per trillion (ppt), for combined PFOA and PFOS in drinking water. These levels are set as a reasonable health-based concentration above which actions to reduce exposure should be taken to reduce exposure. The Navy’s priority is eliminating exposure to PFOA and PFOS above the lifetime health advisory levels at public and private drinking water wells.

Mr. Lin stated that if there are health concerns, they should be addressed with a health professional. There are links to health information at the end of the presentation handouts and there are representatives from the Agency for Toxic Substances and Disease Registry (ATSDR) and Pennsylvania Department of Health present to answer questions at the end of the meeting.

Mr. Lin provided a summary of the Navy’s private well sampling activities. Approximately 490 wells have been sampled in the townships around the former NASJRB Willow Grove Base, of which 89 have levels above the health advisory of 70 parts per trillion combined PFOA and PFOS. Of the wells above the health advisory, 18 remain to be connected to the public water supply. Connections are being arranged through cooperative agreements with the townships. Bottled water is being provided to locations above the health advisory where connections have not yet been completed. An additional 74 wells are being monitored as these wells show levels below the health advisory but above 40 parts per trillion combined PFOA and PFOS. The Navy is also funding treatment of impacted public supply wells though the cooperative agreements. Five Horsham Water and Sewer Authority (HWSA) wells showed levels above the lifetime health advisory. Two of these have permanent treatment systems completed and the other three have temporary systems installed. Treated water from the five wells are below the lifetime health advisory and are back to drinking water service.

Mr. Lin announced that the sampling and provision of bottled water that was being supported by the EPA will transition to Tetra Tech, a Navy contractor. Mr. Frebowitz is the Tetra Tech point of contact. Each location that is being sampled or provided bottled water will be notified by letter providing contact information.

Mr. Lin introduced Mike Shannon to discuss the on-site RI for perfluoroalkyl substances (PFAS). The first phase of the investigation started last year and included installation and sampling of over 100 monitoring wells and collection of surface water, sediment and soils. The results were summarized in a draft report submitted in November 2016. The report identified data gaps and strategies to collect the needed data. Since that time, the Navy has been working with the regulators to develop the scope of work for the additional investigation and work plans for various activities have been submitted or are in preparation. Work is scheduled to begin in late May and continue through the summer with the goal of finalizing a RI report in early 2018. A FS to evaluate remedial alternatives will be prepared after the RI.
Current work also includes evaluation of potential discharges of PFAS to local surface waters. There are a series of small outfalls in the northern part of the base that discharge to Park Creek. These are being sealed and the work should be completed soon. On the western edge of the base are two outfalls that flow to the Pennypack Creek system. One of the outfalls is partially fed by artesian wells where groundwater flows to the surface. These have been sealed to stop the flow. Work will also include investigation of storm water sewer systems and potential infiltration of groundwater into the sewer system. Results will determine potential options including sealing or replacing storm sewer lines.

Tracy Carluccio asked for clarification of the sources of water entering the outfalls and if the water would be treated before it entered the outfalls. Mr. Shannon replied that the hydraulic modeling as part of the upcoming investigation would determine the sources of water and if they are impacted by PFAS as well as possible remedies including closing the outfalls or treating the discharge. Ms. Carluccio asked if there would be a public comment period on the plans. Brian Helland replied that was not envisioned but the Navy would discuss internally.

Kyle Bagenstose asked about the potential impacts on hydrology of the capped artesian wells. Mr. Shannon replied that capping shouldn’t impact groundwater flow as it is already known groundwater has migrated off-base. Mr. Bagenstose asked if there were maps showing groundwater flow direction and concentrations of PFAS. Mr. Shannon replied those will be included in the RI report.

Charles Hertz asked how the outfalls would be capped. Mr. Shannon replied that they will be sealed with concrete. Dawn Byers asked for confirmation that outflow of contamination to Park Creek and Little Neshaminy Creek was contained with the sealing of the outfalls. Mr. Lin replied that by sealing the outfalls on the Navy side of the base near Keith Valley Road, surface water would not be entering Park Creek. Ms. Byers asked if groundwater is flowing to surface water. Mr. Lin replied groundwater is still being studied. Carl Meixsell asked where surface water would go after the outfalls are capped. Mr. Shannon replied that the pipes being capped are very small with little flow. Surface water will flow to the large basins further downstream.

Toby Kessler asked if there was a plan to study the connection between groundwater and surface water. Mr. Shannon replied that was part of the ongoing RI and Mr. Lin added that the United States Geological Survey (USGS) is also performing modeling. Mr. Lin introduced Lisa Senior of the USGS to continue with the presentation of the USGS modeling effort.

Ms. Senior stated that the USGS was asked by the Navy to support the understanding of the groundwater system in and around Willow Grove and Warminster. USGS is collecting data and preparing a regional model. USGS is taking periodic measurements of surface water under base flow conditions to calibrate the model and provide information on surface water/groundwater interaction. Ms. Senior showed the area being modeled, the pumping wells in the area which influence groundwater flow, and topography. Ms. Senior also showed slides depicting the geology and type of rock and characteristics of those formations underlying the area. Ms. Senior also showed a diabase dike running through the area, which is a formation with low permeability that can act as a barrier to groundwater flow. All these factors are in the model to help create an understanding of groundwater flow in the area.
Dan Goode showed the area to be modeled with the topography and water table elevations that form the basis of the model. Mr. Goode stated that the one of the most important pieces of information for the model is the water level in wells and the pumping rates of the wells. Changing the data in the model, such as pumping rates, will allow the model to predict how water levels, and subsequently, groundwater flow direction, will change. The model is still being developed, but Mr. Goode presented slides of a recent model for another area to show the potential uses and outputs of the model being prepared for the Willow Grove area. Mr. Goode showed various model outputs including groundwater flow direction based on pumping rates, discharge of groundwater to surface water, potential discharge locations of water that infiltrates from the surface to groundwater, and levels of contaminants at well locations. Model simulations can then predict contaminant migration pathways which will aid in selection of remedial alternatives.

Mike McGee asked when the model will be finalized. Ms. Senior replied a preliminary model using more recent groundwater data may be completed during the summer of 2017. Completing the model is complex because of the various scenarios such as municipal wells being shut off and then put back on line. It is a dynamic system and data from 2016 used to build the model may be different than 2017 data and that will all need to be evaluated. Mr. McGee asked about the former Navy production wells now on ANG property. Mr. McGee stated these wells are pumping at a much lower rate than when the Navy base was active, but since the wells are now being treated, it could make sense to pump at a higher rate to create some hydraulic containment to reduce migration. Ms. Senior replied that these are the types of scenarios the model could evaluate. Increased pumping could have a secondary effect that would draw contamination down to deeper levels in the aquifer making cleanup more difficult.

Suzanne Fairlie asked if the models will help determine where the source of contamination in private wells is located. Ms. Senior replied that the model will help make that evaluation. Ms. Carluccio asked for clarification of the ultimate purpose of the model and if the results will be used to plan for groundwater and surface water contamination. Mr. Goode replied that the model is a management tool that the Navy and regulators can use to make those decisions.

Mr. Bagenstose asked if the Navy has a good idea if they have found most of the areas where wells are above the 70 ppt health advisory level. Mr. Lin replied that there have not been many recent detections above that level and the Navy has a good understanding of where the contamination is, but there is always the potential for new locations that may show up above the health advisory level. Referring to a slide, Mr. Lin showed where there were large areas on low or non-detected results so the limits of contamination can be estimated. Mr. Bagenstose asked if there was any consideration given to sampling wells that were close to the advisory level since migration may have influenced those wells. Mr. Lin replied that the Navy is sampling wells with levels between 40 and 70 ppt to address these concerns. HSWA is also monitoring their wells which provides additional information.

Mr. Bagenstose asked why the Navy changed to Tetra Tech to supply bottled water and conduct future sampling. Mr. Lin replied that EPA supported the Navy as part of an emergency action. The situation has now changed where it is no longer an emergency action and can be performed by Navy contractors.
Ms. Byers asked if results of the wells between 40 and 70 ppt have shown increases, decreases, or stayed the same, even if they have not surpassed 70 ppt. Mr. Lin replied he could not answer that question without the data. Ms. Byers rephrased the question by saying she was more concerned if increasing levels have been detected and asked if the water authorities had any information. Christian Jones replied that the currently active Warrington wells near the ANG side have shown increasing levels over time, but are not near the health advisory. Tina O’Rourke added that since the levels under discussion are so small, from an analytical perspective a small increase or decrease is not significant and doesn’t indicate a trend.

There was additional discussion between USGS, HLRA, and HWSA representatives about the groundwater model. Well pumping rates, including obtaining data from golf course irrigation wells, were discussed.

Mr. Lin reminded attendees that information on PFAS from various sources including EPA, ATSDR, PADEP, and the townships is available and links are provided on the handouts. Mr. Lin also stated the next RAB meeting is scheduled for September 13, 2017. Mr. Lin concluded the Navy presentation and introduced Mr. Freihofer to present for the ANG.

Mr. Freihofer began the presentation with an update on Site ST01 which was a former fuel tank farm where jet fuel had leaked in the 1970s. The biosparge remediation system was replaced in 2016 with injection of persulfate and Epson salt. The tanks and approximately 175 tons of contaminated soil were removed. ANG will be conducted confirmatory sampling in the area to assess if there is residual contamination. Mr. McGee asked if the groundwater contamination was on-Base. Mr. Freihofer replied that the plume is off-Base on the northern side which is the location of the treatment area.

Mr. Freihofer provided an update on the Privet Road Site. This was a former solid waste management area that has low levels of trichloroethene and tetrachloroethene in groundwater. Levels are below drinking water standards. ANG is continuing to conduct biannual groundwater monitoring and land use control inspections.

Mr. Freihofer began the presentation of the ANG response to PFAS contamination. The ANG completed a preliminary assessment at the Horsham Air Guard Station and identified 10 potential PFC source areas. These include areas where PFCs may have been used or stored, such as hangars, or where firefighting foam may have been dispersed, such as the storm basin and waste water treatment plant. Mr. Freihofer introduced Matt Machusick of LEIDOS, who is the ANG consultant for this work, to provide more details on the PFAS investigation.

Mr. Machusick stated the investigation is ongoing. The initial investigation included sampling of soil, surface water and sediment across the Base. Samples from tanks where firefighting foam was stored were also collected. This information is in the Technical Memorandum submitted in October 2016. Based on that information, potential source areas were targeted and shallow monitoring wells were installed and sampled. Results were then used to select locations for installation of intermediate and deep wells. ANG worked with EPA, PADEP, and USGS to select locations and where to screen the wells. More recently, perimeter wells were installed with multiple sampling ports at various depths to try to determine contamination levels at different
depths. A water level study was also recently conducted. Results show that PFAS was not at high levels in soil or the rock matrix. Groundwater results indicate that PFAS levels decrease with depth in the on-Base production wells and northern boundary wells, but increase with depth in the southern portion of the ANG property. A summary report of the investigation is scheduled for July 2017.

**Mr. Freihofer** continued the presentation with a discussion on PFAS in surface water. The surface water leaving the site from the storm water basin on the northwest side of the Base contains PFAS. ANG is evaluating the source of the discharge to the basin and then to Park Creek. ANG initially thought the source was leaking infrastructure pipes that contained impacted water from the production wells. The pipes were taken off line and new pipes installed and the wells were treated with carbon filtration. In addition, artesian conditions are present in wells in the area near the basin and it is suspected that dry weather flow from the basin is surfacing groundwater. ANG is investigating engineering solutions to filter the discharge.

**Mr. McGee** asked if there will be investigation of storm sewer pipes. **Mr. Freihofer** replied that dry and wet weather flow studies are planned for the summer. **Mr. McGee** indicated he thought it may be a good idea for Navy and ANG to coordinate their study efforts to coincide at the same time. **Ms. Carluccio** asked if the basin was the source of PFAS contamination in Little Neshaminy Creek and **Mr. Freihofer** acknowledged that. **Mr. Hertz** asked what the timeframe to implement treatment of the discharge would be if the study indicates that is needed **Mr. Freihofer** replied that would be determined based on the complexity of the treatment system required, but ANG would try to implement an interim remedy before a permanent remedy could be constructed. **Ms. O’Rourke** asked if other stakeholders in addition to the regulators would be able to review the draft plan for the selected remedy. **Mr. Freihofer** replied that the plan would be made available.

**Mr. Freihofer** discussed the ANG response to drinking water contamination. A cooperative agreement with Warrington Township is in place to treat three impacted municipal wells. Installation of carbon filtration systems is currently in progress. The agreement also includes connecting private wells with levels above the health advisory to the public supply. Extension of water mains is being performed. The agreement is also being amended to include treatment of two additional municipal wells that were impacted due to the change in the health advisory level and to provide an interconnection with the North Wales Water Authority to ensure adequate access to water while treatment systems are being constructed. In addition, ANG has an agreement with EPA to perform private well sampling and provide bottled water to locations exceeding the health advisory level.

**Mr. Freihofer** provided an update of the private well sampling program. In Horsham Township, four wells were above the health advisory and have been connected to public water. In Warrington Township, 130 wells were sampled and 43 were above the health advisory. Connections for 14 of the 43 wells have been completed with the remaining receiving bottled water until the connections are completed. ANG is also transitioning the sampling and bottled water deliveries from EPA to an ANG contractor during the summer of 2017. **Ms. O’Rourke** noted that ANG also has cooperative agreements is place with Warminster and Horsham Townships in the ANG area of responsibility.
Mr. Bagenstose asked if there was any PFAS-containing fire-fighting foam remaining on the Base or if it was replaced by any other substance. Lt. Col. Jaqueline Siciliano replied there was no fire-fighting foam left on the Base and since there are no flight operations, no other material has been brought in for that purpose. Mr. Bagenstose asked about the timeline for ANG to finalize the investigation report and selection of remedial alternatives. Mr. Freihofer replied the schedule will be determined after the draft investigation report is reviewed by the regulators.

An attendee asked if the residents in Warrington Township were being provided adequate drinking water. Mr. Freihofer and Mr. Jones confirmed that private wells above the health advisory are being provided bottled water and the municipal wells are being treated before returning to service.

Tom Ames asked if the Navy and ANG share data. Mr. Freihofer confirmed there is cooperation between the two parties. Ms. Byers asked about the status of the cooperative agreements and if they are finalized. Mr. Freihofer replied the agreements with Horsham and Warminster, and the initial agreement with Warrington were finalized in 2015. Mr. Freihofer indicated the amendment to Warrington was submitted in the past 24 hours; Mr. Jones confirmed that it was signed.

A discussion of former employees and potential health effects, blood testing, and role of the VA ensued. Mr. Freihofer directed attendees with individual health concerns to direct questions to the ATSDR representatives after the meeting.

There were questions about increased water bills in Warrington Township. Mr. Jones indicated that he would be available to discuss water costs with individuals after the meeting.

Mr. Lin brought the meeting to a close by thanking attendees and noting the next RAB meeting will be scheduled for September 13, 2017.

Meeting adjourned.
• Welcome Community and RAB Members
• Radiological Status
• Environmental Restoration Status
• Perfluorinated Compounds Status
• Questions
• Closing Remarks
• 18 potential radiological impacted sites were identified

• A scoping survey was performed as an initial evaluation to identify if radionuclide contaminants exist. All field work is complete.

• The scoping survey reports for the 18 sites were submitted to regulators for review, in three groups:
  - Building Surveys (10 Buildings)
  - Building Footprints (5 Former Buildings)
  - Landfills (3 Sites)
Radiological Investigation
Potentially Impacted Sites

Legend
- Impacted Buildings
- Impacted Sites
- NAS JRB Willow Grove
- Major Roads
- Limited Access
- Highways
- Secondary Roads

Figure 8-20: Station Map Showing Impacted Sites
• Final Building survey reports (10 former buildings) were submitted to EPA/PADEP in June 2016
  – No radiological concerns for future use of the buildings
• Final Landfill reports (3 locations) submitted March 2017.
  – No radiological concerns for surface soils
  – Results are being incorporated into Feasibility Studies currently being prepared for Site 3 and Site 12 Landfills
• Final Building Footprint survey reports (five locations) were submitted to EPA/PADEP in May 2017.
  – No radiological concerns for future use of the sites
Site 3 and Site 12 Landfills

• Former landfills used by the Base Public Works Dept.
• Waste buried in trenches
• Remedial Investigations showed elevated levels of metals and PAHs in surface and subsurface soils
• Site 3 groundwater showed low levels of PCE
• Feasibility Studies in preparation to evaluate remedial alternatives
• Anaerobic bioremediation system continues to operate
• Annual performance monitoring is being conducted in accordance with approved Operation, Maintenance, and Monitoring Plan
• Additional injections of amendments will be conducted based on monitoring results
• Results continue to show good conditions for continued biodegradation of volatile organic compounds (VOCs) and decreasing trends of VOCs
• In 2016, EPA set a lifetime Health Advisory (HA) level of 70 parts per trillion (0.07 μg/L) for combined Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA).

• Per the EPA, the lifetime HA level are reasonable health based concentrations, above which actions should be taken to reduce exposure. HA levels include many safety factors to protect vulnerable populations (e.g., children).

• The Navy’s priority is eliminating exposure to PFOA/PFOS above the lifetime HA levels at public and private drinking water wells.

• Any health concerns should be addressed with your health professional. Weblinks to health information is provided at the end of this presentation.
Private drinking water wells sampled by the Navy for PFOA/PFOS (all townships) near NASJRB Willow Grove:

- Private wells sampled: \(~ 490\)
- Private wells above lifetime HA (>70 ppt): 89
- Private wells remaining to be connected: 18
- Private wells below HA/monitored (>40 ppt): 74

The Navy has funded carbon filtration systems at five Horsham Water and Sewer Authority (HWSA) public wells (#10, 17, 21, 26, and 40) which are above the lifetime HA. All are filtering water below the lifetime HA and back to drinking water service.

The Navy is providing additional funds to HWSA, over $7 million, for filtration system costs and drinking water connections above the lifetime HA. The total funding will be over $16 million.
• In 2014, the Navy requested support from the EPA to sample nearby private wells for PFOA and PFOS.

• Private drinking water well sampling or provision of bottled drinking water for perfluoroalkyl substances (PFAS) will now be performed by Tetra Tech, a U.S. Navy contractor.

• The primary point-of-contact will be:
  • Mr. Andrew Frebowitz, Tetra Tech Project Manager
  • E-mail: andy.frebowitz@tetratech.com
  • Phone: (610) 382-1170
• The Navy is performing a Remedial Investigation (RI) to better understand the nature and extent of the PFAS contamination at the Navy base. The investigation included the installation and sampling of numerous groundwater wells and sampling of soils and surface water/sediment.

• Draft RI Data Report submitted November 2016
  - Identifies data gaps for further investigation
  - Additional field investigation to be completed in 2017
  - Source control actions are developed from RI information
Timetable for next phase of the RI


- Draft SAP Addendums for further ecological evaluation and migration from soil to groundwater by the end of May 2017. Field work in July and August 2017.

- Draft RI Report by the end of 2017, final in early 2018

- Feasibility Study in 2018
Evaluating discharge of PFOS and PFOA from outfalls.

- Outfalls along the northern end of the base that discharge to Park Creek are currently being sealed.
- Two artesian (free-flowing) wells have been capped to prevent PFAS-impacted groundwater discharge to surface water.
- Currently mapping stormwater system to evaluate whether PFAS-impacted groundwater could be infiltrating into the sewers and ultimately discharging to local surface water bodies.
• Work Plan for TV inspection of storm sewer system by June 2017.

• TV inspection of storm sewers and hydraulic modeling in August 2017.

• Report with recommendations for possible sewer lining or section replacement and inlet closures by October 2017.

• Implementation timetable dependent upon report findings.
NASJRB Willow Grove
Groundwater Modeling
Department of the Navy (DON) Perfluorinated Compounds (PFC) / Perfluoroalkyl Substances (PFAS) website

NAVFAC BRAC PMO Websites (includes links to environmental information and the administrative record):

PFAS Information and Resources (continued)

Environmental Protection Agency
https://www.epa.gov/pfas

Agency for Toxic Substances and Disease Registry

Pennsylvania Department of Environmental Protection
http://www.dep.pa.gov/Citizens/My-Water/drinking_water/Pages/default.aspx

Horsham Township

Warminster Township
http://warminstertownship.org/information-on-perfluorinated-chemicals-pfoa-and-pfos/
• Questions or comments from the RAB?

• Community questions of comments?

• Next Meeting
  – September 13, 2017 @ 2:00 pm

• Closing Navy Remarks
Restoration Advisory Board
Horsham Air Guard Station
May 10, 2017

Keith Freihofer
Environmental Restoration Program Manager
Air National Guard Readiness Center
Joint Base Andrews, MD
keith.e.freihofer.civ@mail.mil
Environmental Restoration Program Sites

Horsham AGS Boundary

ST-01 POL

Privet Road Compound
• Former Air Force Reserve Petroleum Tank Area
  • Site originated from a jet fuel spill in the 1970’s
  • Injections of persulfate and Epsom salt replaced the biosparges system in 2016
  • Petroleum tanks were dismantled in 2016 allowing for removal of any petroleum impacted soil that may be present under the tanks. 175 tons of presumed petroleum impacted soil removed from beneath tanks and disposed of at licensed facility. Confirmatory sampling programmed for 2018.
Privet Road Compound

- Former waste management area for Naval Air Station Joint Reserve Base Willow Grove
- Sampling completed in June 2016 indicates very low levels of trichloroethene (TCE) and tetrachloroethene (PCE) exist in the groundwater; however, both TCE and PCE were below maximum contaminant levels set by the U.S. Environmental Protection Agency for drinking water quality
- Leidos, Inc. is contracted for continued long-term monitoring. Biannual groundwater sampling and land use control inspections will continue to be conducted pending a final site remedy
PFCs on Horsham AGS

• In 2015, ANG completed a Preliminary Assessment of potential perfluorinated compound (PFC) release sites at the Horsham Air Guard Station (AGS)

• Ten potential PFC source areas identified in the PA include:
  • Buildings that contained foam fire suppression systems
  • Areas that may have received runoff from foam releases
  • Stormwater sediment basin
  • Former waste water treatment plant
  • Former storage area for wastewater treatment sludge

• These potential source areas are being further investigated by Leidos in a PFC Facility Investigation
Potential PFC Source Areas
PFC Facility Investigation

- Shallow (11), intermediate (8), and deep (7) wells installed. Shallow wells sampled, intermediate and deep sampling completed.
- Perimeter multiport well installation completed and two rounds of sampling completed; results pending.
- Geophysical logging conducted at 15 locations
- Packer Testing conducted at base supply wells and a deep monitoring well.
- Month long water level monitoring completed on 6 monitoring wells near the Base supply wells. Drawdown was observed at each well confirming hydraulic connection in each compass direction and at various depths.
Monitoring Well Locations

Legend:
- Shallow Well
- Proposed MultiLevel Well
- Proposed Deep/Intermediate Well
- Existing Horsham AGS Well
- Building
- Installation
- Generalized Regional Groundwater Flow Direction
- Surface Water Flow Direction

Notes:
1. Source: Common Installation Picture (CIP) geodatabase provided by ANG GeoBase on 09/14/2015.
2. Background Source: ESRI World Imagery (USDA NAIP, 06/2013).

Area Shown

Horsham Air Guard Station
Horsham Township, Pennsylvania

Proposed Monitoring Well Locations

FIGURE 1

DATE: 8/31/2015

Guarding America - Defending Freedom
Interim Findings

- Well installations confirm artesian conditions and confined to semi-confined aquifers.
- Shallow well sample results are similar to pre-existing well results. No new source areas directly indicated.
- Packer tests conducted on supply well NAS-2 indicate higher concentrations of PFOA/PFOA in central portion of the borehole. Concentrations at supply well NAS-1 and monitoring well DMW-07 decline with depth.
- Additional rock sampling indicates PFOS/PFOA not present in rock matrix.
- Rock core samples illustrate the vertical and horizontal variation in lithology.
- Deep and intermediate well pair along northern boundary indicate low PFOS/PFOA concentrations.
- Deep and intermediate well pair along southern boundary indicate high PFOS/PFOA concentrations.
Next Steps

- FIR will contain results and discussion of all PFC Facility Investigation work conducted to date.
PFCs have been detected in surface water leaving the Horsham Air Guard Station. This water flows from a storm water detention basin on the northwest boundary of the Base to Park Creek which flows to the Little Neshaminy Creek.

The ANG is investigating this release of PFCs to the Creek:

- Carbon filtration installed on Base supply wells in July 2016. Since then over 20 million gallons of water have been treated by the filters. Leaking water supply infrastructure removed from service in late 2016.
- Artesian conditions are present in groundwater monitoring wells near the storm water basin. Therefore the source of the PFCs in the pond is likely surfacing groundwater.
- Investigating engineered solutions to filter effluent from detention basin.
In October 2015, Air National Guard and Warrington Township entered into a $5.8 million Cooperative Agreement to:

- Connect residents with Perfluorinated Compound (PFC) impacted drinking water wells above the Health Advisory to municipal water and abandon the impacted private wells. Water connections to begin at end of this month.
- Install water mains as needed
- Installation and maintenance of carbon filters on three Township wells

Cooperative Agreement amended in 2017 adding $7.7 million to:

- Install carbon filtration on two municipal wells taken off line in May 2016 due to lowering the Health Advisory Level to 70 parts per trillion
- Install municipal water system interconnections with North Wales Water Authority to ensure Warrington Township has adequate access to water until carbon filtration is installed on municipal wells
Private Well Sampling

- Interagency Agreement in place with EPA to provide PFC testing of private drinking water wells and supply bottled water to properties with Perfluorinated Compounds at or above the lifetime health advisory level (HAL) for residents within our area of responsibility in Horsham, Warminster, and Warrington Townships.
- The number of private wells sampled by ANG are:
  - Horsham Township: 4, all are above HAL; 4 have been connected to municipal water.
  - Warrington: 130, 43 are above HAL; 14 have been connected.
  - Warminster: 14*, 10 are above HAL; 3 have been connected.
  *Some of these properties are on Valley Road with Warminster mailing addresses but are located in Warrington Township.
- Private well sampling transitioning to new contractor Summer 2017.
- Sampling contact for ANG area of responsibility: keith.e.freihofe.24@email.mil
Not scheduled for sampling yet

![Sample Data: Weston Generated](Image)

Coordinate System: WGS84 UTM Zone 18N Feet

Legend

Health Advisory Level (HAL)
HAL is the sum of both PFOA and PFOS
PFOA 0.070 μg/L, PFOS 0.070 μg/L
- Sum of PFOA & PFOS concentrations above 0.070 μg/L
- Sum of PFOA & PFOS concentrations detected between 0.045 μg/L and 0.070 μg/L
- Sum of PFOA & PFOS concentrations detected at or below 0.045 μg/L
- PFOA & PFOS not detected
- Location sampled (no results yet)
- Not scheduled for sampling yet
- Converted to Public Water (Some not by Navy or Air National Guard)

Horsham Air Guard
Former NAS JRB Willow Grove
Air Force Administrative Order
Boundary
Sampling Area
Horsham Township
Warrington Township

Figure 1
PFC Sample Location Map as of 04/11/2017
Private Well Sampling Map
QUESTIONS?

Air National Guard Administrative Record:
select “Air National Guard”, then “Horsham AGS”, then click Search
Update on modeling to evaluate directions of groundwater flow near Willow Grove NAS and Warminster NAWC, PA

May 10, 2017 presentation
Lisa Senior and Dan Goode
U.S. Geological Survey
in cooperation with U.S. Navy

This information is preliminary or provisional and is subject to revision. It is being provided to meet the need for timely best science. The information has not received final approval by the U.S. Geological Survey (USGS) and is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the information.
Regional Model Boundary for Willow Grove/Warminster Area and Updated 3-meter DEM base

Groundwater Flow Model Boundary

Pumping rate data from USGS (1998); DEM data from USGS (2016)
Generalized Geology for Regional Model

Brunswick

Lockatong

Upper Stockton

Diabase

Lower & Middle Stockton

Willow Grove NAS

Carbonate and other metasediments

Crystalline

(Geology after Hall, 1934, and Rima, Meisler and Longwill, 1962)
Preliminary map and cross-section views of initial model grid (no longer being used)

Map view showing model area with refined grid at/near Willow Grove

Cross section view of model showing layer thicknesses, topography (10X)

4 layers
5 m Overburden
15 m Weathered
50 m Highest K
70 m Deep
Examples of groundwater model results from USGS reports on North Penn Area 7 Superfund site near Lansdale (Senior & Goode, 2013, 2017)

Areas Contributing Recharge to Wells and Streams

Simulated water-table contours

Pumping well

NP7
Simulate paths from sources and compare to TCE distribution.
Estimate model uncertainty

Uncertain Parameters – Frequency of simulations with at least 1 pathline through model cell (x,y)

- 5-25%
- 25-50%
- 50-75%
- 75-100%

Deterministic with Optimum Parameters

Pathlines - with model uncertainty

Senior & Goode (2013)
Planned Model Development

-- Add detail (hydrogeologic, spatial, temporal) in areas of greatest interest; synthesize GIS data

-- Calibrate model using groundwater levels, aquifer-test data, streamflow, point discharge rates

-- Use calibrated model for applications
  -- Simulate different pumping scenarios
  -- Optimize monitoring
  -- Interpret sampling results

-- Update model with new information, as needed
References Cited (not shown)