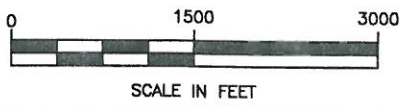
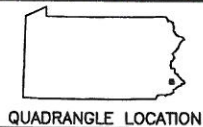


- INSTALLATION RESTORATION PROGRAM SITES**
- NAS 1 PRIVET ROAD COMPOUND
 - NAS 2 ANTENNA FIELD LANDFILL
 - NAS 3 9TH STREET LANDFILL
 - NAS 4 NORTH END LANDFILL
 - NAS 5 FIRE TRAINING AREA
 - NAS 6 ABANDONED RIFLE RANGE NO. 1
 - NAS 7 ABANDONED RIFLE RANGE NO. 2
 - NAS 8 BLDG. 11B ABANDONED FUEL TANK
 - NAS 9 STEAM PLANT BLDG. 6 TANK OVERFILL
 - NAS 10 NAVY FUEL FARM
 - NAS 12 SOUTH LANDFILL

BASE MAP IS A PORTION OF THE AMBLER, PA U.S.G.S. 7.5 MINUTE QUADRANGLE MAP, DATED 1963, PHOTOREVISED IN 1983.



**LOCATION OF IR SITES
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA**

SCALE AS NOTED	
FILE 112G02014CM03	
REV 0	DATE 06/29/09
FIGURE NUMBER FIGURE 3-1	

TABLE 1-1
SITE SUMMARY
INSTALLATION RESTORATION PROGRAM
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA

SITE	NAME	OPERABLE UNIT (OU)	STATUS
1	Privet Road Compound	Soil - OU 1 Groundwater - OU 3	NFA ROD Signed September 2006 Interim ROD Signed September 2008
2	Antenna Field landfill	Soil - OU 5 Groundwater- OU 9	No Action ROD Signed June 17, 2010
3	Ninth Street Landfill	Soil - OU 6 Groundwater- OU 10	Draft (OU 6 and OU 10) RI/FS Report Pending
4	North End Landfill	----	Consensus Agreement for No Action January 2009
5	Fire Training Area	Soil - OU 4 Groundwater - OU 2	NFA ROD September 2007 Pilot Study
6	Abandoned Rifle Range No. 1	----	Consensus Agreement for No Action December 2007
7	Abandoned Rifle Range No. 2	----	Consensus Agreement for No Action August 2008
8	Site 8 - Building 118 Abandoned Fuel Tank	---	NFA Agreement October 2006
9	Steam Plant Building 6 Tank Overfill	----	NFA Agreement October 2006
10	Navy Fuel Farm	----	NFA at this time
SSA 11	Aircraft Parking Apron	---	Eliminated From Consideration
Site 12	South Landfill	Soil and G/W - OU 11	RI/FS Process

3.0 SITE DESCRIPTIONS AND INVESTIGATIONS

3.1 SITE DESCRIPTIONS

This section presents a history of disposal practices and current status of each of the 12 sites and site screening areas addressed in this SMP. This information is based on data from previous investigations and progress made to date in the Navy's IR program. Site locations are identified on Figure 3-1.

3.1.1 Site 1 - Privet Road Compound

The Privet Road Compound is located west of Privet Road, across from the steam plant (Building No. 6). The entire site area is approximately 2 acres and consists of a bowling alley, parking lot, and a 1/2-acre (formerly) fenced area. Trash handling operations at the Privet Road Compound began in 1967 when the Ninth Street Landfill (Site 3) was closed. To replace the landfill, regular trash pickup and off-site disposal were initiated. The Privet Road Compound site was used to process wastes from 1967 to 1975. A fence was erected around the compound area in 1972 to control waste disposal and handling within the compound. The suspected waste handling area, however, is believed to extend throughout Site 1, including the area where the Bowling Alley and parking lot are now located.

The Privet Road Compound was constructed as a transfer station to handle materials not accepted by the trash pickup service. During operations at the compound, wastes were temporarily stored on site to await off-site disposal or burned and/or buried on site. Burning and burial ceased by 1975; however, stored waste material was not completely removed from the site until 1977 (NEESA, 1986).

Wastes reportedly disposed at the site included paint wastes, paint stripper and solvents, Freon, general refuse, asbestos, battery acid, sewage sludge containing heavy metals, oils and lubricants, and mercury-containing dental amalgam. Transformers containing polychlorinated biphenyls (PCBs) were also stored at the site. PCB-containing liquids spilled when stored transformers overturned during an incident at the compound (NEESA, 1986).

B&R Environmental (formerly Halliburton NUS Corporation) conducted RI field activities at Site 1 in 1991. The RI report concluded that additional sampling was needed to further delineate the extent of contamination and/or potential sources at the site. The RI report recommended a Phase II RI and a feasibility study (FS) (Halliburton NUS, 1993).

In 1997, the Phase II RI fieldwork was conducted and in 1998, a draft Phase II RI report was submitted to regulators for review (Brown & Root, 1998).

In 1999, the Navy decided to de-link the reporting process for the IR sites (1, 2, 3, and 5) and submit four separate Phase II RI report documents. Also in June 1999, a removal action for PCB-contaminated soil at Site 1 was completed. A total of approximately 1,100 tons of soil was removed for disposal off-site.

In 2000, Basewide water-level studies were completed in cooperation with local municipal authorities and the United States Geological Survey (USGS). Access to the two deep Navy production well boreholes (NW-1 and NW-2) was necessary for geophysical, groundwater quality, and production rate studies performed by the USGS. These two wells are the sole supply of potable and emergency (fire fighting) water for the entire Willow Grove Air Station facility. This project allowed the Navy to obtain the Navy supply well water quality analytical data requested by EPA to help analyze Site 1 groundwater conditions.

In 2002, the Site 1 RI report was finalized and submitted to the regulators and the RAB (Tetra Tech, July 2002).

In 2004, a draft Addendum RI Report was submitted. The draft Addendum RI Report determined that the chlorinated solvents found in the local groundwater do not originate substantially from the Privet Road Compound area, but appear to be from an off-Base location southeast of Site 1, across Pennsylvania Route 611 in the vicinity of the former Kellet Aircraft manufacturing facility. Also in 2004, the Navy Public Works Officer had the fence removed from around the compound area and reseeded the soil with grass to improve the appearance of the area.

In September 2004, the Navy submitted the final Proposed Plan for Site 1 soil (Tetra Tech, September 2004). A public meeting was held to present the Navy's plan for no further action for Site 1 soil, based on the PCB-contaminated soil removal. A public comment period was set for September 27 through October 27, 2004, to encourage public participation in the decision process for the Privet Road Compound.

Based on concerns from EPA, the Navy performed two additional studies to support the no further action recommendation in the Site 1 soil Proposed Plan. The Site 1 RI Addendum 1, Residual Risk Evaluation Letter Report for Soil (Tetra Tech, June 2005) reviewed the residual risk remaining after the Site 1 soil removal was completed, and the Site 1 RI Addendum 4, Soil Investigation for Volatile Organic Compound Soil to Groundwater Impact (Tetra Tech, March 2006) confirmed earlier RI results regarding the absence of VOCs in soil. Both of these reports confirmed earlier RI results and the conclusions found in the Proposed Plan, leading to the NFA recommendation.

The Site 1 Soil (OU 1) ROD (Tetra Tech, September 2006), specifying no further action for Site 1 soil, was accepted by PADEP (PADEP, September 2006) and signed by the Navy and EPA in September 2006.

The Navy installed three new monitoring wells upgradient of Site 1 at the Base property line in accordance with the work plan approved by PADEP and EPA. Three new monitoring wells were installed and sampled in 2006 by ECOR. Results from the new wells confirmed that the major contributor to solvent contamination in groundwater beneath Site 1 is an off-Base source (Site 1 RI Addendum 5 for Groundwater report, Tetra Tech, September 2006). However, based on information presented in the Site 1 RI Addendum 5 for Groundwater report, EPA requested that the document be reissued to include more of the background information from previous study reports that had been only referenced. In July 2007, the revised draft Site 1 RI Addendum 5 for Groundwater was submitted to regulators for review. In January 2008, the Navy submitted the final Site 1 RI Addendum 5 for Groundwater report (Tetra Tech, January 2008). This RI addendum report demonstrated that VOCs are migrating onto the Base from an upgradient, off-Base source area.

In September 2007, Tetra Tech prepared a draft FFS report for Site 1 Groundwater and submitted it to regulators for review. In February 2008, the Navy submitted the final Focused Feasibility Study for Site 1 Groundwater (Tetra Tech, January 2008). The FFS report developed the remedial alternatives for Site 1 groundwater and provided a detailed analysis and comparison of these alternatives which would be used by the Navy and EPA in agreement with PADEP to select a preferred remedy to deal with contaminated groundwater.

In January 2008, the draft Proposed Plan for Site 1 groundwater (OU 3) was submitted to regulators for review (Tetra Tech, January 2008). In April 2008, the Navy submitted the final Proposed Plan for Site 1 groundwater (Tetra Tech, April 2008). This Proposed Plan recommended that limited action, including implementation of institutional controls and periodic groundwater monitoring in conjunction with a review of site conditions and risks every five years, would be taken as an interim measure to address risks associated with the groundwater located beneath Site 1. Interim measures would be in effect while EPA investigates the off-site source of the groundwater contamination. A public meeting was held to present the Navy's plan for the interim action for the groundwater of Site 1. A public comment period was set for April 16 through May 30, to encourage public participation in the decision process for the Privet Road Compound. Several comments were received from the public during the public meeting, but no additional comments were received during the public comment period.

The Record of Decision (ROD) for Site 1 Groundwater (OU 3) (Tetra Tech, September 2008), was produced, incorporating all comments from regulatory agency reviewers, as well as including comments from the public in the Responsiveness Summary Section. The ROD for Site 1 Groundwater (OU 3) was signed by the Navy and forwarded to EPA for signature on September 5, 2008. EPA signed the OU 3 ROD on September 26, 2008.

The selected interim remedy for Site 1 Groundwater (OU 3) consisted of LUCs, periodic groundwater monitoring, and five-year reviews. In February 2009, Tetra Tech prepared a draft RD for LUCs for Site 1 Groundwater (OU 3) and submitted it to regulators for review. This RD presented the LUC methods current or future landowners will follow to preclude unrestricted use of untreated groundwater from beneath the site.

In July 2009, Tetra Tech prepared the draft SAP for Site 1 Groundwater Monitoring and submitted it to the regulators for review. The first round of Site 1 Groundwater Monitoring was conducted in September 2009. The final Site 1 Groundwater Monitoring Results report was distributed in November 2009.

Under provisions of BRAC 2005, the land associated with Site 1 and Site 10 will be conveyed to the Army to construct an "Armed Forces Reserve Center" to consolidate regional Army Reserve training activities into a central location at a military enclave to be established at NAS JRB Willow Grove. Construction planning for the Armed Forces Reserve Center was underway in 2008/2009. Preliminary planning included a concept design for placement of structures and utility facilities needed for the Army Reserve. Issues such as proper building construction and planning to take into account the existing environmental restrictions at Site 1 and Site 10 were included in the preliminary design effort by the Army. In September 2009, the Navy transferred 18.25 acres to the Air Force as part of the BRAC 2005 requirement to construct a consolidated Armed Forces Reserve Center.

In June 2010 construction of the Army Reserve Center training enclave was on hold, pending approvals.

3.1.2 Site 2 - Antenna Field Landfill

The Antenna Field Landfill is located in the southern portion of the Naval Air Station, southwest of Runway 10/28 (Figure 3-1). The landfill has been estimated to be approximately 4 acres in size.

The landfill was used between 1948 and 1960 as the principal disposal area for solid waste generated by the facility. Waste disposal activities included the excavation of trenches where wastes were subsequently burned and/or buried. In addition to general wastes, bulk items such as furniture, tires, and shingles were disposed. Paint wastes and sewage sludge were also reportedly disposed (NEESA, 1986).

In the mid 1990's, an antenna array consisting of five antennae was constructed at the site to replace an older antenna array.

B&R Environmental conducted RI field activities at Site 2 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The RI recommended a Phase II RI and a FS (Halliburton NUS, 1993).

In 1997, the Phase II RI fieldwork was conducted and in 1998, a draft Phase II combined Sites 1, 2, 3, and 5 RI report was submitted to regulators for review (Brown & Root, 1998). In 1999, the Navy decided to de-link the reporting process for IR Sites 1, 2, 3, and 5, and submit four separate Phase II RI documents.

A draft (Navy internal) Site 2 RI report was completed in 2002 (Tetra Tech, 2002). During this time period, the Navy discovered debris and discarded empty drums in an area between Site 2 and Site 5, and subsequently designated this area as SSA 12. The Navy contracted with RMC Environmental (RMC) to remove the drums, obtain samples of the drum/contents (residues only) and soils that could have been impacted. When field conditions were appropriate, RMC removed drums and sampled beneath the drums at SSA 12 (RMC, 2003). Information from the RMC report was sent to the Navy's contractor Tetra Tech for tabulation, evaluation, and possible incorporation into a Final RI Report for Site 2. Tetra Tech combined the results and conclusions of the drum removal and confirmatory sampling into the revised draft Site 2 RI report (Navy internal review - 10/06/04). However, due to unacceptably high analytical detection limits, comparisons to typical health-based benchmarks (e.g., EPA RBCs or PADEP MSCs) did not lead to a clear resolution of the status of SSA 12. The draft Site 2 RI report remained on hold as the Navy waited to evaluate results of the drum and debris removal from SSA 12. In September 2006, the Navy directed Tetra Tech to prepare a work plan to resample soils at SSA 12. At that time, the Navy also directed Tetra Tech to proceed with preparation of the draft RI report for Site 2.

In May of 2007, after a preliminary draft (Navy internal) Site 2 RI report was reviewed, the Navy instructed Tetra Tech to update the ecological risk assessment approach to comply with current EPA and Navy guidelines, including food-chain modeling. In August 2008, a draft Site 2 RI report was submitted to the regulators for review. Based on EPA comments, a draft final Site 2 RI report was completed (Tetra Tech, March 2009) and the Navy Response to EPA Comments (RTC) was also submitted. There were no further comments on the March 2009 draft final Site 2 RI report, so it was considered as final in April 2009.

In April 2009, EPA reviewers of the Site 2 RI Report expressed concern with the date of the most recent Site 2 HHRA update (July 2006) and the age of the groundwater data (1997) used in the Site 2 RI Report. These concerns prompted the Navy to agree to perform an updated evaluation of the Site 2 HHRA, and to obtain groundwater samples and analysis at all Site 2 monitoring wells in May 2009.

At the NAS JRB Willow Grove Team meeting held on June 10, 2009 at EPA Region 3 offices, the Navy submitted the draft Remedial Investigation Report Addendum for Site 2- Antenna Field Landfill (Tetra Tech, June 2009) and the Site 2 Groundwater Confirmation Sampling Report (Tetra Tech, June 2009). The draft RI Report Addendum includes an updated evaluation of risk to supersede the July 2006 HHRA evaluation; incorporates the revised data set corresponding to the reduced size of the exposure unit for Site 2 resulting from the new Site 2 boundaries after Site 12 was defined in December 2008; and updates the risk calculations for Site 2 to comply with the EPA HHRA guidelines current in May 2009. There were no comments on the June 2009 Remedial Investigation Report Addendum, so it was considered as final in June 2009. The Site 2 Groundwater Confirmation Sampling Report summarizes the results of groundwater sampling of all Site 2 monitoring wells performed in May 2009 in accordance with the UFP SAP for Site 2 Groundwater Sampling (Tetra Tech May, 2009). The Site 2 Groundwater Confirmation Sampling Report was accepted by all parties at the Team meeting with no revision.

In June 2009, the draft Proposed Plan for Site 2 was submitted to regulators for review (Tetra Tech, June 2009). In July 2009, the Navy submitted the final Proposed Plan for Site 2. This Proposed Plan recommended that no action be taken at Site 2. A public meeting was held August 5, 2009 to present the Navy's plan for Site 2 on. A public comment period was established from July 29 through September 11, 2009, to encourage public participation in the decision process for the Antenna Field Landfill.

In August 2009, the draft ROD for Site 2 was submitted to regulators for review (Tetra Tech, August 2008). The final ROD for Site 2 (Tetra Tech, February 2010), was produced, incorporating all comments from regulatory agency reviewers, as well as including comments from the public in the Responsiveness Summary Section. The No Action ROD for Site 2 was fully executed by the Navy and EPA on June 17, 2010.

3.1.3 Site 3 - Ninth Street Landfill

The Ninth Street Landfill site is located at the western boundary of the facility, immediately north of Ninth Street. Disposal operations at the 9-acre site were initiated as a replacement for the Antenna Field Landfill in 1960. Wastes were disposed by burning and burial in excavated trenches. Wastes were similar to those at Site 2, including general wastes, bulk items, paint waste, asbestos, and sewage sludge (NEESA, 1986). Transformers containing PCBs were also stored and serviced in a salvage yard established on the landfill after the landfill's closure in 1967 (EA Engineering, 1990).

B&R Environmental conducted RI field activities at Site 3 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The RI recommended a Phase II RI and a FS (Halliburton NUS, 1993).

In 1997, the Phase II RI fieldwork was conducted and in 1998, a draft Phase II RI report was submitted to regulators for review (Brown & Root, 1998). In 1999, the Navy decided to de-link the reporting process for the IR sites (1, 2, 3, and 5) and submit four separate Phase II RI documents. In response to comments, the Navy performed minor investigations at Site 3 since the draft Phase II RI report was submitted to regulators for review in 1998. USGS performed geophysical logging of two irrigation wells owned by the golf course (the adjacent, downgradient off-site property) in March 1998. Sediments from the retention basin located north of Site 3 (part of the NAS JRB Willow Grove storm water control system) were sampled and analyzed for contamination in 2002 (Woodward and Curran 20543901, May 2002).

During the period from 1999 through 2004, progress at Site 3 was a lower priority than other IRP sites at NAS JRB Willow Grove. No individual Site 3 RI report was prepared for submission or separate review, and Site 3 did not progress further past Phase II RI investigations due to funding and priority issues as well as a lack of cooperation from the nearby golf course. Requests for access to golf course monitoring wells for RI efforts were met with limited acceptance (for instance geophysical logging of some of the golf course wells was permitted). In 2007, the Navy requested access to sample the flowing irrigation well and obtain two surface water samples on Lot 1. The managers of the golf course informed the Navy that they would allow those additional RI efforts on golf course property.

With the passage of BRAC 2005, priority and funding issues changed for Site 3. To ensure compliance with the timetable for Base Closure stipulated by BRAC 2005, the Navy engaged its contractors ECOR and Tetra Tech to begin a series of IR program RI/FS tasks at Site 3. By agreement among the Navy, EPA and PADEP, two new monitoring wells were installed to investigate potential groundwater contamination sources upgradient of Site 3 near the Army Reserve vehicle maintenance facility. Fieldwork completed in 2005/2006 included resampling and analysis of all Site 3 monitoring wells (including the new upgradient wells) and additional sampling and analysis of soil near the Army Reserve Hangar. The Navy and EPA agreed on a methodology for preparation of a new HHRA to help determine the eventual disposition of Site 3.

The preliminary (Navy internal) draft Site 3 RI report, reviewed by the Navy in January 2007, concluded that Site 3 soils do not pose a threat to public health or the environment. However, the Navy considered that the soil analytical data generated during the RI up to that time may not have been representative of actual site conditions. In order to confirm that the conclusion of the preliminary draft RI report regarding

site soils was correct, the Navy prepared a work plan for additional test pits and soil sampling in April 2007. Site 3 test pits and soil sampling were carried out according to the approved work plan in April/May 2007. Significant quantities of buried waste material at several Site 3 locations were encountered during this investigation, and soil samples associated with some of the buried waste contained elevated levels of semivolatile organic compounds (SVOCs), pesticides, PCBs, dioxin, and metals. In January 2008, a draft Test Pit and Soil Sampling Letter Report for Site 3 Landfill was submitted to regulators for review (Tetra Tech, January 2008). The Navy responded to EPA comments on the draft Letter Report in May 2008. This Test Pit and Soil Sampling Letter Report was finalized in September 2008.

To further delineate the extent of the buried waste and soil contamination discovered during the test pit investigation and to further characterize the soil contamination, the Navy initiated a landfill delineation investigation including brush clearing, EM geophysical surveys, additional test pits and soil samples, as well as surface soil and surface water/sediment sampling for ecological screening.

In April 2008, the draft SAP for the landfill delineation study at Site 3 was submitted to the regulators for review. The SAP for the Site 3 landfill delineation was finalized in November 2008 (Tetra Tech, November 2008). The EM geophysical survey of Site 3 was completed in April 2008 and an EM geophysical survey report was submitted in July 2008. Surface soil, surface water and sediment samples were collected in December 2008. Additional test pit investigation and soil samples collection were conducted in January 2009. The Site 3 Landfill Delineation Report was submitted on June 10, 2009. In August 2009, an additional twelve surface soil samples were collected to provide additional data for the ecological risk evaluation.

To update the RI groundwater data while the Navy and EPA attempted to delineate the extent of landfill cells discovered at Site 3 in 2007, a draft SAP for Site 3 IGWM was submitted to regulators for review in December 2007. The SAP for Site 3 IGWM was finalized in March 2008 (Tetra Tech, March 2008). Tetra Tech performed the round 1 of IGWM at Site 3 in March 2008. The Site 3 IGWM Report Round 1 was submitted in August 2008. Round 2 of IGWM at Site 3 was conducted in October 2008, and the Site 3 IGWM Report Round 2 was submitted in December 2008. Round 3 of IGWM at Site 3 was conducted in April 2009, and the Site 3 IGWM Report Round 3 was submitted in August 2009.

In order to further investigate the VOC plume at Site 3, additional monitoring wells 03MW09O and 03MW09S were installed at east of the perimeter fence road down gradient of the Site in January/February 2010. In February 2010, the two new monitoring wells 03MW09O and 03MW09S were sampled for TCL VOCs, with the results in a consistent range similar to other nearby monitoring wells.

Based on results from the draft Phase II RI and all subsequent activities including test pit investigation, landfill delineation investigation and interim groundwater monitoring investigations, Tetra Tech prepared a draft RI report that includes a new human health risk assessment and ecological risk assessment for Site 3. In May 2010, the draft Site 3 RI report was submitted to the regulatory agencies for review (Tetra Tech, May 2010).

The internal draft Site 3 FS is being prepared to be submitted in FY 2010.

3.1.4 Site 4 - North End Landfill

Limited information exists on the operations at the North End Landfill; however, the landfill reportedly was used from approximately 1967 to 1969 to accept overflow wastes from the Privet Road Compound. The site is approximately 3.5 acres in size and is located between the northern end of Runway 15/33 and the Perimeter Road. Disposed waste materials are believed to be items not collected during routine trash pickup such as bulk items, sewage sludge, and oils and lubricants. During the site's operation, it is reported that wastes were covered; however, observations from the IAS showed waste materials, including oil, at the surface (NEESA, 1986).

Based on the SI (EA, May 1990), combined with the results of the site screening process, the Navy recommended NFA for this Site. PADEP concurred with the Navy recommendation for NFA at this site (PADEP, October 31, 2005). The Navy prepared a summary discussion of review and presented a status update at the December 19, 2006 Navy Willow Grove IRP partnering team meeting. All available past investigation results, correspondence and notes were summarized and recommendations for future actions were presented for discussion among the team. EPA's BTAG visited Site 4 on March 28, 2007 to review conditions. BTAG did not recommend further investigation or action at this site.

The IAS (NEESA, 1986) and the SI (EA Engineering, 1990) described a pool of tarry waste that covered about 50 square feet and was underlain by very soft tarry earth at Site 4 - North End Landfill. The Navy contracted Tetra Tech to conduct site screening investigation at Site 4 to further identify the nature of this tarry waste. Site screening investigation field work was carried out, and the location of historical soil boring NELB-1 that reportedly was obtained from the tarry waste area was located in March 2008. The Status of Investigation Site Screening Area 4 was submitted to Navy in April 2008. To obtain information about the nature and extent of contamination, a soil sampling investigation at Site 4 tarry waste area was conducted in May 2008. A test pit investigation for the Site 4 tarry waste was conducted in September 2008. The tarry waste and related soil were excavated for off-Base disposal. In January 2009, the Test

Pit Investigation Report for Site Screening Area (SSA) 4 was submitted to the regulators (Tetra Tech, January 2009).

Based on discussion at the NAS JRB Willow Grove partnering team meeting held at EPA Region 3 in June 2007 between the Navy, EPA and PADEP, the Navy agreed to prepare an individual site screening process consensus agreement for No Action at Site 4. An Internal draft Record of Consensus Agreement was prepared in July 2007. Based on the results of the Site Screening Process performed in accordance with the FFA, the Record of Consensus Agreement No Action Decision for Site 4 was signed by the Navy BRAC Environmental Coordinator, EPA RPM and PADEP Case Manager on January 21, 2009.

3.1.5 Site 5 - Fire Training Area

The Fire Training Area is located in the south-central portion of NAS JRB, approximately midway between Runway 10/28 and State Route 463 (Figure 3-1). The site is located immediately south of Taxiway Juliet and covers an irregularly shaped area of approximately 1.25 acres. The training area was used from 1942 to 1975 for large-scale firefighting exercises, which included the disposal and burning of flammable liquid wastes generated by the Naval Air Station. Wastes, including solvents, paint chemicals, xylenes, toluene, and various petroleum compounds, were consumed at the rate of up to 4,000 or more gallons per year in these firefighting exercises. The area was also reportedly used for the drum storage of these flammable materials during the periods between burning exercises.

The Fire Training Area is primarily covered by grasses, with some woody and brushy vegetation present within the southern portion of the area. The burn area, consisting of the "burning ring" that has actually been found to have been a section of a partially buried steel tank, wide open at the top with an intact bottom below surrounding grade, was located in the south-central portion of the site (Tetra Tech, 2002).

B&R Environmental conducted RI field activities at Site 5 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The Phase I RI report recommended a Phase II RI and a FS (Halliburton NUS, 1993).

In 1997 Phase II RI fieldwork was conducted and in 1998, a draft Phase II RI report was submitted to regulators for review (Brown & Root, 1998). In 1999, the Navy decided to de-link the reporting process for IR sites (1, 2, 3, and 5) and submit four separate Phase II RI documents.

In 2000 additional field work was completed at Site 5 to verify that site groundwater contamination was not moving off-Base toward the Horsham Township Municipal water supply well number 26 (HTMW 26).

Sentinel monitoring wells installed on Navy property to monitor water quality between Site 5 and HTMW 26 are now sampled annually by the Base to verify contamination is not migrating closer toward the municipal water supply well.

The final RI report for Site 5, completed in February 2002, documented halogenated VOC contaminants in groundwater and a range of organic compounds [mainly polynuclear aromatic hydrocarbons (PAHs)] in limited site surface soils (Tetra Tech, February 2002). The final RI Report for Site 5 combined the results from the draft Phase II RI Report and previous findings for Site 5, with the results of activities performed from April 1998 through October 2000 (Tetra Tech, 2002).

In 2002, Tetra Tech prepared the draft FS report for Site 5 groundwater and submitted it to regulators and the RAB (Tetra Tech, February 2002). Based on RAB member comments, the Navy decided to reconsider emerging (biological and chemical treatment in-situ) technologies and resubmit a revised draft Site 5 groundwater FS for regulatory and public review. In response to requests from the RAB to include additional remedial alternatives for Site 5 groundwater, the 2002 draft Site 5 groundwater FS was revised and reissued as revised draft in 2004 (Tetra Tech, September 2004).

After submission of the RI Report (Tetra Tech, 2002), the Navy contracted for installation of an additional airport runway perimeter security fence. Part of the new security fencing was installed in or near the area of known PAH soil contamination. Because of this potential change to Site 5 surface soil conditions in the area of the identified PAH "hot spots," surface and shallow subsurface soil samples were collected in June 2004 for a side-by-side comparison with the 1997 data. The Navy submitted the Site 5 RI Addendum 1, PAH Confirmation Sampling and Analysis Report (Tetra Tech, October 2004) to confirm status of petroleum compounds in Site 5 soil.

Based on the Action Memorandum for Site 5 - Fire Training Area Soil Removal (Tetra Tech, August 2005), a soil removal action for PAH-contaminated soil at Site 5 began in December 2005. Initial excavation confirmation samples indicated PAHs remained at some spots at concentrations above cleanup levels. A second round of excavation and confirmation samples (including sampling and analysis for dioxins as requested by EPA) was followed by soil backfill in October 2006. The Navy's Site 5 RI Addendum 6 for Soil (Tetra Tech, June 2007), including the Navy's residual risk calculation approved by EPA, the RMC final closeout report, and an analysis of the potential impact from dioxins, as requested by EPA, was submitted in July 2007.

The revised draft FS for Site 5 groundwater (submitted in September 2004) generated a list of comments and questions from the EPA that were received in January 2005. The Navy responded with a series of RI work plans and reports of findings to address EPA concerns about past RI field sample

collection practices, past HHRA practices, and the site conceptual model. In February 2007, EPA issued a letter of concurrence with the Navy Response to Comments (RTC) document laying out the Navy response to each of the EPA comments on the Site 5 groundwater FS. In November 2008, the Navy submitted the final FS for Site 5 groundwater (Tetra Tech, November 2008).

Site 5 RI Addendum 2, Soil Investigation for Volatile Organic Compound (VOC) Soil to Groundwater Impact (Tetra Tech, March 2006) was submitted to validate the Navy's RI samples for VOCs in soil obtained in 1997. 1997 RI sample and analysis results were very comparable to the results obtained from the same sample locations using the (2006 current) EPA-preferred method of sample collection and preservation.

Site 5 RI Addendum 3, Technical Memorandum of Risk Assessment Evaluation for Site 5 Groundwater (Tetra Tech, February 2007), and Site 5 RI Addendum 4, Technical Memorandum of Risk Assessment Evaluation for Site 5 Soil (Tetra Tech, July 2006), applied current EPA HHRA guidance, toxicity factors and other current assumptions used for calculating estimated risk, and presented evaluation of variances from the HHRA performed in 1997. The HHRA Tech Memo for Site 5 soil concluded that the risk drivers and potential chemicals of concern (COCs) remained the same and highlighted any differences from the 1997 HHRA.

Site 5 RI Addendum 5, Remedial Investigation Addendum Report for Site 5 - Fire Training Area Groundwater (OU 2) (Tetra Tech September 2006) presented results and conclusions from RI activities performed by the Navy in response to EPA comments on the revised draft FS for Site 5 groundwater (Tetra Tech, September 2004). The Navy installed five new boreholes and eight new monitoring wells, performed geophysical logging, packer studies, and analysis of groundwater samples to respond to EPA hydrochemistry, hydrogeology and health risk concerns noted in these comments.

The final Proposed Plan for Site 5 Soil (OU 4) (Tetra Tech, June 2006), proposing no further action for soil at Site 5, was presented for public comment at a public meeting held for that purpose on July 11, 2007. Several comments were received from the public during the public meeting, but no additional comments were received during the balance of the public comment period that ran from June 15, 2007 through July 30, 2007. The ROD for Site 5 Soil (OU 4) (Tetra Tech, September 2006) addressed all comments from regulatory agency reviewers, as well as including comments from the public in the Responsiveness Summary Section. The Site 5 Soil (OU 4) ROD was signed by the Navy and forwarded to EPA for signature on September 13, 2007. EPA signed the OU 4 ROD on September 21, 2007.

Preliminary soil sampling and monitoring well installation for the Site 5 groundwater pilot study commenced in May 2008. The Pilot Study SAP for Site 5 Groundwater (OU 2) was finalized in October

2008 (Tetra Tech, October 2008). Field demonstration testing for bioremediation was conducted by the Navy to evaluate the effectiveness of several different electron donors. In April 2009, Tetra Tech began implementation of a bioremediation pilot study to remediate groundwater of Site 5. The first injection and groundwater recirculation segment of the biostimulation phase of the bioremediation pilot test was initiated on April 7, 2009 and concluded on June 26, 2009. The primary objective of biostimulation was to promote population growth of native bacterial populations by creating more favorable environmental conditions. Two post-biostimulation sampling events indicated that environmental conditions conducive to bioremediation were being created, but were not fully achieved, and that the transformation towards these conditions was not sustained. The Navy proposed to conduct a second biostimulation injection event.

The Navy, EPA and PADEP agreed to proceed with a further testing step consisting of injection of additional sodium bicarbonate and sodium lactate into the aquifer with groundwater recirculation. The second injection and recirculation segment at Site 5, consisting of approximately two times the quantity of sodium bicarbonate and six times the quantity of sodium lactate added in the first injection segment, commenced on February 17, 2010 and finished on April 26, 2010. Analytical sampling associated with the second biostimulation injection segment included two sampling events. The first sampling event was performed between March 15 and March 22, 2010, and the second sampling event was performed between May 5 and May 10, 2010. The analytical results indicated success with most of the parameters being monitored, except for the lack of a convincing bacterial population capable of degrading vinyl chloride.

In June 2010, the Navy, in consultation with EPA and PADEP, decided to continue pilot testing at Site 5 with the addition of appropriate biological stocks (bioaugmentation phase).

3.1.6 Site 6 - Abandoned Rifle Range No. 1

Abandoned Rifle Range No. 1 is located adjacent to Horsham Road near the southwestern corner of the Marine Reserve Compound. The Marine Reserve Training Center building and parking area that was constructed in the mid 1990s now covers virtually all of what is estimated as Site 6.

The range was built in 1942 and consisted of a firing mat and an earthen rampart. The rampart was approximately 1 acre in size. It is not known when the range was closed; however, the second range was not built until 1965, so it is assumed that this site was active until that time. After the site was closed, the rampart was regraded. There are no records indicating whether or not the lead from the fired rounds was removed; therefore, it is assumed that the lead was mixed with the earth from the rampart during the regrading (NEESA, 1986).

EA Engineering performed ESI fieldwork at Site 6 in 1991. Results indicated no apparent threat to health or the environment, and no further action was recommended (EA Engineering, 1992).

PADEP concurred with the Navy recommendation for NFA at this site (PADEP, October 31, 2005). The Navy prepared a summary review and presented a status update at the scheduled December 19, 2006 Navy Willow Grove IRP Partnering Team Meeting. All available past investigation results, correspondence and notes were summarized and recommendations for future actions were presented for discussion among the team.

Based on the results of the Site Screening Process performed in accordance with the FFA, the Record of Consensus Agreement No Action Decision for Site 6 was signed by the Navy BRAC Environmental Coordinator and the EPA RPM on December 12, 2007. PADEP agreement with the decision was documented in a letter from PADEP that was included as an attachment to the Record of Consensus Agreement document. Copies of the fully-executed Site 6 Record of Consensus Agreement document were distributed in January 2008.

3.1.7 Site 7 - Abandoned Rifle Range No. 2

The site is located in the northwestern corner of the facility, west of the north end of Runway 15/33. Construction and operation of the range were similar to Site 6 and consisted of a 1-acre earthen rampart to collect fired rounds of ammunition. The range operated from 1965 until 1977, when the current range located in Building 176 at the Army Reserve Compound was constructed. The rampart, along with the spent ammunition, was regraded in 1977. This area was subsequently used as a landfill for inert materials including clean fill, broken concrete, asphalt, and cinderblocks. In addition, dry wastewater treatment sludge and emulsified oil and grease from on-site oil/water separators were reported to have been buried at the site (NEESA, 1986).

Based on the ESI (EA, January 1992) combined with the results of the site screening process, the Navy recommended NFA for this Site. PADEP concurred with the Navy recommendation for NFA at this site (PADEP, October 31, 2005). The Navy prepared a summary review and presented a status update at the scheduled December 19, 2006 Navy Willow Grove IRP partnering team meeting. All available past investigation results, correspondence and notes were summarized and recommendations for future actions were presented for discussion among the team. EPA's BTAG visited Site 7 on March 28, 2007 to review conditions. BTAG did not recommend further investigation or action at this site.

In January 2008, the Navy prepared a technical memorandum presenting a human health risk screening evaluation (HHRSE) of soil and groundwater at Site 7. The HHRSE compared existing data to USEPA

Region III RBCs to conservatively estimate the potential for adverse carcinogenic and non-carcinogenic health effects for exposures to soil and groundwater. Concentrations of all chemicals detected in soil were less than their respective RBCs for residential exposures to soil with the exception of arsenic. Concentrations of arsenic exceeded the RBC at most sampling locations but concentrations of arsenic were within background levels for soil. Manganese was the only chemical detected in groundwater at concentrations exceeding the full RBCs for tap water. Manganese slightly exceeded its full RBC in one sample.

Based on discussion at the NAS JRB Willow Grove partnering team meeting held at EPA Region 3 in June 2007 between the Navy, EPA and PADEP, the Navy agreed to prepare a site screening process consensus agreement for No Action at Site 7. The Record of Consensus Agreement No Action Decision for Site 7 was signed by the Navy BRAC Environmental Coordinator, EPA RPM and PADEP Case Manager on August 20, 2008.

3.1.8 Site 8 - Building 118 - Abandoned Fuel Tank

The site consists of a former underground 500-gallon heating fuel tank located approximately 50 feet north of Building 118. The tank was placed in service in 1959 and was abandoned in place in 1980 when it was replaced with a 290-gallon above ground tank. The tank contained only No. 2 heating fuel and serviced Building 118. In 1980, oil was observed seeping into the basement of Building 118. This occurred on an intermittent basis and the oil was removed after each occurrence. The tank was investigated as a result of the seepage; the tank was empty and soils in the excavation around the tank did not indicate the presence of released materials; however, the fill and riser pipes were removed and the tank was buried in place (NEESA, 1986).

PADEP issued a notice of agreement (PADEP, October 31, 2005) with the Navy recommendation for NFA at Site 8 (Building 118 Abandoned Fuel Tank) under Pennsylvania storage tank regulations (Act No. 32; P.L. 169 and PA Code Title 25, Chapter 245). EPA sent a letter agreeing that the site had non-CERCLA issues and can be closed out from a CERCLA perspective (EPA, October 4, 2006).

3.1.9 Site 9 - Steam Plant Building 6 Tank Overfill

When the main steam plant (Building 6) was converted from coal to oil in 1969-70, spill containment for fuel oil was not constructed. In 1978, a fuel oil supplier delivered No. 2 fuel oil to a filled tank while leaving the delivery truck unattended. The fuel backed up through the vent pipe, and approximately 3,000 to 5,000 gallons of fuel oil were released. The spill was located in the area between Building 6 and Building 114. This area is now bermed to contain spills resulting from fuel delivery.

The NAS JRB Willow Grove fire department responded to the spill event and flushed the fuel with water. Runoff was directed to drainage swales downstream of the steam plant. The spill was directed toward the Air Reserve Facility's detention basin on the northern side of the facility. The basin was equipped with oil spill containment devices. The total affected area was less than 1 acre (NEESA, 1986).

PADEP issued a notice of agreement (PADEP, October 31, 2005) with the Navy recommendation for NFA at Site 9 (Steam Plant Building 6 Tank Overfill) under Pennsylvania storage tank regulations (Act No. 32; P.L. 169 and PA Code Title 25, Chapter 245). EPA sent a letter agreeing that the site had non-CERCLA issues and can be closed out from a CERCLA perspective (EPA, October 4, 2006).

3.1.10 Site 10 - Navy Fuel Farm

Site 10 is located south of the Air Reserve facility along the north side of Privet Road. The site formerly had two partially buried, 210,000-gallon fuel tanks (Tank No. 115 and Tank No. 116) containing aviation fuel. Two smaller underground storage tanks (USTs) were located in the southeastern corner of the site. One tank contained diesel fuel and the other was used for storage of waste oil. The waste oil tank was formerly used for fuel storage. In 1986, Tank No. 115 was overfilled and fuel was released to the ground. The same year during excavation for utility work on the southern side of the site, non-aqueous phase liquid (NAPL) was observed floating on top of the water in the trench. The NAPL was observed in the area of a dry well located near the northeastern corner of Building 81, which is located south of the 210,000 gallon tanks. The dry well was used to discharge effluent water siphoned from the bottom of the fuel tanks (EA Engineering, 1990). In March 1989, aviation fuel was detected emanating from two patches of dead grass on the west side of Tank No. 115. In 1991 the two main fuel tanks and the waste oil and diesel fuel USTs were removed. Inspection of the waste oil tank during removal revealed that the tank was not intact as holes up to 1 inch in diameter were reported.

In 1995, groundwater remediation pilot systems were investigated to address the petroleum (aviation fuel) contamination at Site 10 (Navy Fuel Farm) under the PADEP UST program. The Final Study Report for Product Recovery Pilot System was completed in 1996 (EA, 1996).

In 1998, a light non-aqueous phase liquid (LNAPL) recovery system designed to remediate the fuel spill was installed.

In 2001, the Navy discontinued active operation of the LNAPL recovery system for the jet fuel spill. Quarterly floating product recovery by bailing, or capture by absorption onto recovery "socks" placed in the well, continued until January 2003.

PADEP approved the final Work Plan for various fieldwork efforts at Site 10 (EA, 2003). Field work included installation and sampling of monitoring wells and soil borings to evaluate current site conditions. A final RI for Site 10 soil was submitted in December 2003 to support no further investigation at this time (EA, 2003).

In September 2004, the Navy submitted the Request for No Further Action for IR Program Site 10 Groundwater (EA, September 2004). PADEP agreed with the Navy that no further remedial action or investigation at this time is appropriate for Site 10 soils or groundwater. However, PADEP noted in their letter (PADEP, April 2004) that groundwater and soil at Site 10 do not meet criteria for unrestricted use and that it may be appropriate to seek full closure under Act 2 if land use changes.

Under provisions of BRAC 2005, the land associated with Site 1 and Site 10 will be conveyed to the Army to construct an "Armed Forces Reserve Center" to consolidate regional Army Reserve training activities into a central location at a military enclave to be established at NAS JRB Willow Grove. Construction planning for the Armed Forces Reserve Center was underway in 2008/2009. Preliminary planning included a concept design for placement of structures and utility facilities needed for the Army Reserve. Issues such as proper building construction and planning to take into account the existing environmental restrictions at Site 1 and Site 10 were included in the preliminary design effort by the Army. In September 2009, the Navy transferred 18.25 acres to the Air Force as part of the BRAC 2005 requirement to construct a consolidated Armed Forces Reserve Center.

3.1.11 Site Screening Area 11 - Aircraft Parking Apron (SSA 11)

In 1992, during construction of footers for an Air Force building, organic odors were detected by the construction crew. This area is located at the north end of the main runway, between the Navy and Air Force parking aprons. It is suspected that fuel was spilled in this area in the past. Although soil samples were analyzed and the suspected contaminated soil was excavated, confirmation sampling was not conducted in 1992. Also, the analytical method was not stipulated and the laboratory reporting units were questionable (the samples consisted of soil; however, the reporting units indicated aqueous samples). Therefore, PADEP requested that confirmation soil samples be collected and evaluated to determine if attainment for Act 2 liability protection for closure could be demonstrated for the former excavated area (SSA 11). In addition, PADEP requested that groundwater be sampled downgradient of the site to determine if the petroleum-contaminated soil had affected the groundwater in the area. PADEP approved the final Work Plan for various fieldwork efforts at suspected "site" 11 (SSA 11) dated March 2003 (EA, 2003). Field work included installation and sampling of monitoring wells and soil borings to evaluate current site conditions to determine if any of the previously reported petroleum contamination remained.

In March 2004 the Navy submitted the final report of PADEP Act 2 soil sampling and analysis (EA, March, 2004) at suspected Navy "site" 11 (SSA 11 - Aircraft Parking Apron). PADEP agreed with the Navy conclusion that this "site" did not meet the criteria necessary to be considered under any program for potential remediation. This "site" has never formally entered either the IR or UST program. It was agreed by PADEP and the Navy that no further action of any kind is required for SSA 11, the suspected "site" 11, former aircraft parking apron (PADEP, April 5, 2004). The Navy received a letter from EPA dated February 12, 2007 indicating concurrence that no further remedial actions are needed for SSA 11.

3.1.12 Site 12- South Landfill

The Navy contractor RMC removed drums and debris and sampled soil at the EPIC drum and debris site, SSA 12, (the site screening area between Site 2 and Site 5) in 2003. Information from the drum removal and soil sampling report (RMC, July 2003) at SSA 12 was sent to the Navy's contractor Tetra Tech for tabulation, evaluation, and incorporation into a final report of cleanup. However, due to unacceptably high analytical detection limits, comparisons to typical health-based benchmarks (e.g., EPA RBCs or PADEP MSCs) did not lead to a clear resolution of the status of the SSA 12 drum removal area.

Based on the inconclusive nature of the soil report for the SSA 12, the Navy contracted Tetra Tech to obtain confirmation samples from this area. SSA 12 was defined at that time as the portion of Site 2 northeast of the usually dry drainage ditch running through Site 2, roughly cutting Site 2 in half. The draft Work Plan for Soil Investigation at Site Screening Area 12 (Tetra Tech, May 2007) was submitted for regulatory agency review and comment in May 2007. In November 2007, the Navy submitted the final Work Plan for Soil Investigation at SSA 12 (Tetra Tech, November 2007). A confirmation soil investigation for the SSA12 was conducted in December 2007 and EM geophysical surveys were performed in March 2008. An EM geophysical survey report was submitted in July 2008 and the SSA 12 Confirmation Soil Investigation Report was submitted in September 2008.

In December 2008, after review of conditions at SSA 12 including visual observations of a "hummocky" appearance, followed by extensive brush clearing and the EM survey of subsurface conditions that implicated presence of subsurface burial of waste on the northeast side of the drainage ditch, the Navy in agreement with EPA and PADEP initiated a separate Remedial Investigation and CERCLA decision process for what is now designated as Site 12, South Landfill.

To further delineate the nature and extent of any buried waste at the site and to further characterize the nature and extent of the soil contamination discovered during previous investigations, the Navy initiated Phase I Remedial Investigation at Site 12. The Phase I RI would include test pits and subsurface soil samples, as well as surface water, sediment, and surface soil samples for ecological screening. In August 2009, the draft SAP for the Phase I RI at Site 12 was submitted to the regulators for review.

Based on EPA comments, the Response to Comments (RTC) for Site 12 Phase I RI SAP was submitted in November 2009 .The SAP for the Phase I RI at Site 12 was finalized in December 2009 (Tetra Tech, December 2009).

In January 2010 the Navy initiated the Phase I Remedial Investigation at Site 12 which included test pits and soil samples, as well as surface water, sediment, and surface soil samples for ecological screening. In May 2010 an internal draft Site 12 Phase I RI Data report was submitted to the Navy for review. The draft Site 12 Phase I RI Data Report was distributed for regulatory agency review in June 2010.