EPA/ROD/R02-96/270
1996

EPA Superfund
Record of Decision:

NAVAL AIR ENGINEERING CENTER
EPA ID: NJ7170023744
OU 18
LAKEHURST, NJ
02/20/1996

NAVAL AIR ENGINEERING STATION, Lakehurst, NJ

RECORD OF DECISION

Area C Soil & Groundwater

10 January 1996

<IMG SRC 0296270 >

10 January 1996

RECORD OF DECISION
DECLARATION STATEMENT
AREA C
NAVAL AIR ENGINEERING STATION

FACILITY NAME AND LOCATION

Naval Air Engineering Station
Lakehurst, New Jersey 08733

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected alternative to address Area C soil and groundwater at the Naval Air Engineering Station in Lakehurst, New Jersey. The selected alternative was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Oil and Hazardous Substance Pollution contingency Plan.

This decision is based on information contained in the Remedial Investigation (RI) Report (October 1992), the Endangerment Assessment (EA) Report (October 1992), the Focused Feasibility Study for Area C Groundwater and Soil (March 1995), the Proposed Plan for Area C Groundwater and Soil (August 1995), and sampling data obtained from the Area C interim pump and treat facility (July 1991 - May 1995). These reports and other information used in the remedy selection process are part of the Administrative Record file for Area C, which is available for public review at the Ocean County Library in Toms River, New Jersey.

This document provides background information on the Area, presents the selected alternative, reviews the public's response to the Proposed Plan and provides answers to comments raised during the public comment period.

Both the United States Environmental Protection Agency (USEPA), Region II Regional Administrator and the Commissioner of the New Jersey Department of Environmental Protection (NJDEP) concur with the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

The selected alternative to address groundwater at Area C is continued operation of the existing groundwater treatment facility with modifications to enhance system performance. For soil, the selected alternative for Site 10 is no further action. For Site 16 soil, the selected alternative is continued operation of the bioventing system with potential modifications to enhance system performance. For Site 17 soil, the selected alternative is continued operation of the soil vapor extraction and bioventing system with potential modifications to enhance system performance.

The objectives of the proposed actions are to: 1) remediate Area C soil and groundwater to meet applicable or relevant and appropriate requirements (ARARs); 2) control contaminant plume migration and treat higher levels of groundwater contamination via the existing groundwater treatment facility.

Extensive monitoring will be performed to show the effectiveness of this alternative and monitor the extent and migration of groundwater contamination (if any).

STATUTORY DETERMINATIONS

This final action for Area C is protective of human health and the environment. The results of this action will attain Federal and State applicable or relevant and appropriate requirements (ARARs).

<IMG SRC 0296270A>

Captain Leroy Farr (Date)
Commanding Officer
Naval Air Engineering Station
Lakehurst, New Jersey

With the concurrence of:

<IMG SRC 0296270B>

Jeanne Fox (Date)
Regional Administrator
U.S. Environmental Protection Agency, Region II

DECISION SUMMARY
RECORD OF DECISION
AREA C
NAVAL AIR ENGINEERING STATION

SITE DESCRIPTION

The Naval Air Engineering Station (NAES) is located in Jackson and Manchester Townships, Ocean County, New Jersey, approximately 14 miles inland from the Atlantic Ocean (Figure 1). NAES is approximately 7,400 acres and is bordered by Route 547 to the east, the Fort Dix Military Reservation to the west, woodland to the north (portions of which are within Colliers Mill Wildlife Management Area), Lakehurst Borough and woodland, including the Manchester Wildlife Management Area, to the south. NAES and the surrounding area are located within the Pinelands National Reserve, the most extensive undeveloped land tract of the Middle Atlantic Seaboard. The groundwater at NAES is currently classified by NJDEP as Class I-PL (Pinelands).

NAES lies within the Outer Coastal Plain physiographic province, which is characterized by gently rolling terrain with minimal relief. Surface elevations within NAES range from a low of approximately 60 feet above mean sea level in the east central part of the base, to a high of approximately 190 feet above mean sea level in the southwestern part of the base. Maximum relief occurs in the southwestern part of the base because of its proximity to the more rolling terrain of the Inner Coastal Plain. Surface slopes are generally less than five percent.

NAES lies within the Toms River Drainage Basin. The basin is relatively small (191 square miles) and the residence time for surface drainage waters is short. Drainage from NAES discharges to the Ridgeway Branch to the north and to the Black and Union Branches to the south. All three streams discharge into the Toms River. Several headwater tributaries to these branches originate at NAES. Northern tributaries to the Ridgeway Branch include the Elisha, Success, Harris and Obhanan Ridgeway Branches. The southern tributaries to the Black and Union Branches include the North Ruckles and Middle Ruckles Branches and Manapaqua Brook. The Ridgeway and Union Branches then feed Pine Lake; located approximately 2.5 miles east of NAES before joining Toms River. Storm drainage from NAES is divided between the north and south, discharging into the Ridgeway Branch and Union Branch, respectively. The Paint Branch, located in the east-central part of the base, is a relatively small stream which feeds the Manapaqua Brook.

Three small water bodies are located in the western portion of NAES: Bass Lake, Clubhouse Lake, and Pickerel Pond. NAES also contains over 1,300 acres of flood-prone areas, occurring primarily in the south-central part of the base, and approximately 1,300 acres of prime agricultural land in the western portion of the base.

There are 913 acres on the eastern portion of NAES that lie within Manchester Township and the remaining acreage is in Jackson Township. The combined population of Lakehurst Borough, Manchester and Jackson Townships, is approximately 65,400, for an area of approximately 185 square miles. The average population density of Manchester and Jackson Townships is 169 persons per square mile.

The areas surrounding NAES are, in general, not heavily developed. The closest commercial area is located near the southeastern section of the facility in the borough of Lakehurst. This is primarily a residential area with some shops but no industry. To the north and south are State wildlife management areas which are essentially undeveloped. Adjacent to and south of NAES are commercial cranberry bogs, the drainage from which crosses the southeast section of NAES property.

For the combined area of Manchester and Jackson Townships, approximately 41 percent of the land is vacant (undeveloped), 57 percent is residential, one percent is commercial and the remaining one percent is industrial or farmed. For Lakehurst Borough, 83 percent of the land is residential, 11 percent is vacant, and the remaining 6 percent commercially developed.

In the vicinity of NAES, water is generally supplied to the populace by municipal supply wells. Some private wells exist, but these are used primarily for irrigation and not as a source of drinking water. In Lakehurst Borough there is a well field consisting of seven 50-foot deep wells, located approximately two-thirds of a mile south of the eastern portion of NAES. Three of the seven wells (four of the wells are rarely operated) are pumped at an average rate of 70 to 90 gallons per minute and supply drinking water for a population of approximately 3,000. Jackson Township operates one supply well in the Legler area, approximately one-quarter mile north of NAES, which supplies water to a very small population (probably less than 1,000) in the immediate vicinity of NAES.

The history of the site dates back to 1916, when the Eddystone Chemical Company leased from the Manchester Land Development Company property to develop an experimental firing range for the testing of chemical artillery shells. In 1919, the U.S. Army assumed control of the site and named it Camp Kendrick. Camp Kendrick was turned over to the Navy and formally commissioned Naval Air Station (NAS) Lakehurst, New Jersey on June 28,1921. The Naval Air Engineering Center (NAEC) was moved from the Naval Base, Philadelphia to Lakehurst in December 1974. At the time, NAEC became the host activity, thus, the new name NAEC. In January 1992, NAEC was renamed the Naval Air Warfare Center Aircraft Division Lakehurst (NAWCADLKE), due to a reorganization within the Department of the Navy. In January 1994, the NAWCADLKE was renamed the Naval Air Engineering Station (NAES), due to continued reorganization within the Department of the Navy.

Currently, NAES's mission is to support programs of technology development, engineering, developmental evaluation and verification, systems integration, limited manufacturing, procurement, integrated logistic support management, and fleet engineering support for Aircraft-Platform Interface (API) systems. This includes terminal guidance, recovery, handling, propulsion support, avionics support, servicing and maintenance, aircraft/weapons/ship compatibility, and takeoff. The Station provides, operates, and maintains product evaluation and verification sites, aviation and other facilities, and support services (including development of equipment and instrumentation) for API systems and other Department of Defense programs. The Station also provides facilities and support services for tenant activities and units as designed by appropriate authority.

NAES and its tenant activities now occupy more than 300 buildings, built between 1919 and 1989, totaling over 2,845,00 square feet. The command also operates and maintains: Two 5,000-foot long runways, a 12,000-foot long test runway, one-mile long jet car test track, four one and one-quarter mile long jet car test tracks, a parachute jump circle, a 79-acre golf course, and a 3,500-acre conservation area.

In the past, the various operations and activities at the Center required the use, handling, storage and occasionally the on-site disposal of hazardous substances. During the operational period of the facility, there have been documented, reported or suspected releases of these substances into the environment.

SITE HISTORY

Area C is located along the southern boundary of the NAES in the eastern portion of the Base (Figure 2). Area C includes Sites 10, 11, 16 and 17. Area C is partially developed and includes various facility buildings, including Hangars 5 and 6, the base MOGAS station and fuel farm 196 (Figure 3). The Paint Branch traverses the northern portion of Area C and the Manapaqua Brook flows past Area C to the south, outside the NAES property line. Groundwater flow in Area C is in a generally east to northeast direction toward the downgradient Paint Branch (Figure 4).

A Remedial Investigation in Area C revealed the existence of soil, sediment and groundwater contamination. Potential sources of soil, sediment and groundwater contamination are:

SITE 10: Figure 3 indicates the location of Site 10. Site 10 consists of: (a) an area located about 40 feet to the west and behind building 306 which was used as a barrel storage area from about 1960 to 1970, (b) Rockwell Road, a wide sand and gravel area between McCord Road and Taxiway No. 5, which acts as a parking lot for fuel trucks and provides access to the 424 gas station and the back side of Fuel Farm 196; and (c) the 424 MOGAS Station. Site 10 potential sources of contamination at Site 10 include:

1. A barrel storage area west and behind Building 306. It was reported that the barrels would often leak fluids (probably containing Petroleum Hydrocarbons) onto the ground. No estimate of the quantities of spilled fluids is available.

2. The sand and gravel area comprising Rockwell Road. During a 17-year period from 1960 to 1977, approximately 2,000 gallons per year of waste oils were sprayed on Rockwell Road for dust control purposes for an estimated total of approximately 34,000 gallons.

3. The 424 MOGAS Station. Two 5,000-gallon underground gasoline tanks and one 1,000-gallon underground diesel tank were located here. These tanks which were about 25-30 years old, were removed in 1988 and replaced with above-ground tanks. Stains around the fill pipes and fuel dispensing area suggested surficial releases from tank overfilling and poor maintenance practices.

Site 10 is located approximately 600 feet from the nearest NAES boundary which is adjacent to the cranberry bogs. There is a shallow groundwater table at Site 10 at a depth of approximately 7 to 9 feet. The groundwater flow at the site is in a northeasterly direction toward the Paint Branch. The Paint Branch is located approximately 2,000 feet east (downgradient) of the site.

SITE 11: Figure 3 indicates the location of Site 11. Site 11 consisted of a former drum storage area approximately 200 feet by 100 feet located about 50 yards north of Hangar 5. The drum storage area may have been a source of contamination although no information is available regarding its history or past usage. Adjacent to the site was an area about 1,000 by 300 feet from which approximately 350 cubic yards of surficial petroleum hydrocarbon contaminated soil was removed between 1981 and 1984. The visual discoloration was found to a depth of five inches. The site was subsequently expanded to include this area.

Further delineation sampling of soil at Site 11 was undertaken in the Spring of 1991 based on high level petroleum hydrocarbons found in test pit TP1-1 during the RI Phase II. Delineation sampling was conducted for the whole site because of the limited petroleum hydrocarbon data. Approximately 76 cubic yards of contaminated soil was delineated and excavated in the Summer of 1992. Post-excavation confirmation samples met NJDEP soil cleanup criteria and USEPA risk range. A No Further Action Record of Decision was signed by the Navy and EPA in June 1993 for Site 11.

Site 11 is located approximately 830 feet upgradient from the Paint Branch, a relatively small stream which feed the Manapaqua Brook. There is a shallow groundwater table depth of approximately 8 feet at Site 11.

Site 16: Figure 3 indicates the location of Site 16. The former Naval Air Technical Training Center (NATTC) fire fighting training area was located east of Hangar 6 (Building 195), adjacent to the NAES civilian fire fighting training area. The two fire fighting pits in the area were supplied from nearby fuel tanks. The fuel burned during training was collected from defueling aircraft.

In preparation of fire fighting training, a pit was flooded with about six inches of water, after which several inches of fuel were pumped onto the surface of the water. The water and fuel control valves were underground and controlled by a NATTC instructor during the training. The fuel was ignited by a torch, and the students practiced fire fighting techniques, generally by applying Aqueous Film-Forming Foam (AFFF) from crash trucks to put out the fire.

The water, AFFF, and waste fuel flowed to a 10 foot by 10 foot cinder block oil/water separator located to the east of the fire fighting pits. Effluent from the oil/water separator then discharged into an unlined lagoon.

Potential sources of contamination at the site include:

1. Leaching of unburned fuel into soils and groundwater from the bottoms of the fire training pits during, and following fire training activities.

2. The operation of the cinder block oil/water separator and the unlined lagoon located adjacent to it. The oil/water separator was inadequate to contain the oil mixed with AFFF and carbon residue from fuel burning at the training area. The area was in use from 1970 to 1986. No estimates of quantities of oil spilled or soaked into the soil during these fire training activities are available.

3. The operation of an oil/water separator and the unlined lagoon mentioned above that received

discharge from the former civilian fire fighting area. This area is located about 200 to 300 feet to the southwest of NATTC fire fighting area. The lagoon also received fuel condensate overflow from a dry well located in nearby Fuel Farm 196 (Site 17).

4. Various documented and unreported spills, including one that occurred on March 15, 1986, when approximately 250 gallons of JP-5 were spilled as a result of a frozen tank valve.

Site 16 is located approximately 500 feet (sidegradient) from the nearest NAES boundary. There is a shallow groundwater table at Site 16 at a depth of approximately 6 feet. The groundwater flow direction is to the northeast. The Paint Branch is located approximately 1,000 feet downgradient of the site. Wetlands are located outside the facility boundary, approximately 500 feet southeast (sidegradient) of the site.

SITE 17: Figure 3 indicates the location of Site 17. Fuel Farm No. 196 is located to the south of Hangar 6. There are four 50,00-gallon underground tanks at this location. The tank farm was constructed in the mid-1940s. The tanks originally contained AVGAS until about 1974.

Since 1974, they have been used to hold JP-5. Each tank had a pumping station and a dry well. As part of standard operating procedures, from about the mid-1940s to 1980, when this practice was discontinued, condensate from the fuel tanks was drained into the dry wells. The old fuel transfer area also had a dry well to contain fuel spills. Overflows from this dry well went to a drainage ditch that discharged to an unlined lagoon located about 600-700 feet southeast of the site. This fuel transfer area has been replaced with a new one.

To prevent the occurrence of spills, all piping in the fuel farm was subsequently placed above ground and cross-connection between tanks were eliminated. All filters/separators, meters, strainers, relaxation chambers, fuel overfill controls and associated hardware were installed in a new centralized fuel transfer area which is within a spill containment structure. In addition, the use of all dry wells was discontinued. The dry wells were removed in 1982. The four 50,000 gallon underground JP-5 tanks are scheduled to be abandoned, upon State approval of the closure plan, and will be replaced by two above ground storage tanks.

Potential sources of contamination at this site include:

1. Minor fuel spills associated with filling fuel trucks. No estimate of the amount of spillage is available.

2. Draining of the condensate from the fuel tanks into a dry well, a common practice until about 1980. About 50 gallons of water and fuel were drained from each tank every week into a dry well. Approximately 200 gallons of water and fuel were drained weekly from the four tanks for a yearly estimate of 10,400 gallons. Since this practice had been ongoing for 40 years (about 1940-1980) approximately 400,000 gallons of water and fuel may have been discharged to the four dry wells.

3. Three fuel spills were reported by NAES personnel: a spill of about 2,000 gallons in 1974, a spill of about 3,000 gallons in 1978, and a third spill in 1981 of 3,000 gallons. During a subsequent fuel recovery operation, a drawdown pump was installed in a recovery well to create a cone of depression on the groundwater table to facilitate the fuel recovery. Fuel spills associated with past practices were also recovered during the cleanup operation. A total of 11,000 gallons of fuel were recovered during this cleanup.

Site 17 is located approximately 1,000 feet from the nearest NAES boundary. The groundwater table at the site varies from 4.5 to 6.5 feet below ground surface. The groundwater flow direction is to the northeast toward the Paint Branch. The Paint Branch of the Manapaqua Brook is located approximately 1,650 from the site. The Manapaqua Brook is located approximately 1,500 feet southeast (sidegradient) of the site. The cranberry bogs are located Approximately 1,000 feet southeast (sidegradient) from Site 17.

INITIAL INVESTIGATIONS

As part of the DOD Installation Restoration Program and the Navy Assessment and Control of Installation

Pollutants (NACIP) program, an initial Assessment Study was conducted in 1983 to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous materials operations.

Based on information from historical records, aerial photographs, field inspections, and personnel interviews, the study identified a total of 44 potentially contaminated sites. An additional site, Bomarc, was also investigated by NAES. The Bomarc Site is the responsibility of the U S. Air Force and is located on Fort Dix adjacent to the western portion of NAES. A Remedial Investigation (RI) was recommended to confirm or deny the existence of the suspected contamination and to quantify the extent of any problems which may exist. Following further review of available data by Navy personnel, it was decided that 42 of the 44 sites should be included in the Remedial Investigation. Two potentially contaminated sites, an ordnance site (Site 41) and an Advanced Underground Storage Facility (Site 43), were deleted from the Remedial Investigation because they had already been addressed through previous investigations or standard removal procedures. In 1987 NAES was designated as a National Priorities List (NPL) or Superfund site under the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

ENVIRONMENTAL INVESTIGATIONS

Investigations at these sites were initiated from 1981 to 1984 by NAES, with the installation of a series of groundwater monitoring wells, which were monitored on a regular basis for the presence of free product. Figure 5 indicates the locations of all monitoring wells within Area C. At Site 16, several monitoring wells were installed to monitor the thickness of floating fuel product. In June 1983, a maximum of approximately seven inches of free-phase product was reported in well BJ. At Site 17, approximately 20 monitoring wells were installed following a fuel spill of approximately 3,000 gallons in September 1981. In November 1982, a product recovery cleanup began from a recovery well (RW) installed at the site. The recovered fuel, which was virtually 100 percent water-free, was pumped into a tank and was later used at the adjacent fire fighting school (Site 16) for training. Recovery operations were discontinued in July 1983, after no fuel was recovery operations were discontinued in July 1983, time, 10,223 gallons of fuel had been recovered, suggesting that older spills and past practices, such as the draining of condensate into dry wells, had contributed to the discharge of fuel. As part of the remedial actions and groundwater monitoring conducted at Fuel Farm 196 (Site 17), several shallow groundwater monitoring wells were installed in the vicinity of Site 10. A trace amount of floating product was reported in monitoring well BB in January 1983, June 1984 and August 1984. Additional actions conducted at these sites include:

Phase I Remedial Investigation (1985-1986)

Additional monitoring wells were installed and groundwater samples were collected from all new and existing wells for comprehensive chemical analyses. At Site 10, analysis of groundwater samples revealed contamination with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals. At Site 16, analysis of groundwater samples revealed the presence of lead, petroleum hydrocarbons (PHC), phenolics and organic halogens. Site investigations indicated that the unlined lagoons wee saturated with oil. At Site 17, analysis of groundwater revealed high levels of toluene, lead and PHCs. Based on the findings of the Phase I investigation, additional investigations were recommended at the sites in Area C. Table 1 provides a summary of Phase I groundwater results for volatile organic compounds which exceeded ARARs.

Soil Gas and Groundwater Screening Survey (May - June 1988)

A soil gas and groundwater screening survey was conducted at and downgradient from several sites in Area C to determine possible source areas. The survey indicated the presence of chlorinated organic compounds and petroleum hydrocarbons in soil gas and groundwater. On the basis of the data, additional investigations were recommended.

Phase II Remedial Investigation (1988)

At Site 10, analysis of groundwater samples confirmed the presence of high levels of VOCs in the vicinity of the 424 MOGAS Station. Analysis of soil samples collected at the site revealed elevated levels of PHC in localized areas. In 1988, the dispensing pumps and underground fuel tanks at the 424 MOGAS station were removed, and a new facility with above-ground tanks was constructed nearby. At Site 16, analysis of groundwater, soil, sediment and surface water samples revealed VOC, SVOC, metals and PHC contamination. A VOC groundwater contaminant plume was identified extending downgradient of the site. In October 1989, six observation wells were installed in the area of the lagoon to monitor floating product levels. Floating product was detected in two observation wells during monitoring. At Site 17, analysis of groundwater samples revealed contamination with VOCs, PAH compounds, lead and PHC. Floating product was detected in two monitoring wells. Data indicated the presence of a VOC plume in the vicinity of Fuel Farm 196 and upgradient to Site 10. Table 1 provides a summary of Phase II groundwater results for volatile organic compounds which exceeded ARARs.

Aquifer Characterization Study (1990)

Short-term pump tests were conducted on monitoring wells BA at Site 10, HG at Site 16, and recovery well RW at Site 17 to estimate hydraulic properties of the aquifer. Soil samples were collected from each site to further characterize the nature of soil contamination and assess the feasibility of a soil vapor venting remedial system.

Interim Remedial Action - Area C Pump & Treat (1990)

The Navy determined in the spring of 1990, that it had sufficient data to perform an interim remedial action at Area C. Although an indepth risk assessment and comprehensive feasibility study had not been completed, a decision to halt groundwater plume migration and treat groundwater contamination from Area C was made.

A proposed plan, highlighting an interim remedial action to be conducted for Area C groundwater,was issued on September 4, 1990. A public meeting to present the proposed interim action to the public for their approval and comments was held on October 2, 1990. The Record of Decision (ROD) which indicates the selected interim remedial action for Area C groundwater was issued on December 14, 1990 and signed by the USEPA, Regional Administrator on February 4, 1991.

The interim alternative implemented includes groundwater pumping, treatment and recharge of treated water back to the aquifer. Groundwater is extracted via three wells at a combined rate of 200 GPM. An existing 24 inch recovery well located in fuel farm 196 is pumped at 80 gallons per minute (gpm). A new six inch recovery well which was installed adjacent to the old gas station (Building 424) is pumped at 40 gpm. A new six inch recovery well which was installed adjacent to the Paint Branch is pumped at 80 gpm. Figure 6 shows the existing recovery wells and treatment system locations.

The extracted groundwater is pretreated to remove metals, free product and solids. To treat the VOCs in the extracted goundwater, the water is passed through air stripping columns. Granular activated carbon polishing filters are used for residual VOC and SVOC removal. The effluent exiting the air stripper is treated by granular activated air filters before being discharged to the atmosphere. The treated water is recharged to the aquifer at two irrigation/infiltration areas located upgradient of contaminated groundwater to form a "closed loop" treatment system.

The treatment system was designed by the Navy and awarded for construction in September 1990. Construction of the facility was completed and began operation in June 1991. This interim remedial action was implemented to halt the spread of contaminated groundwater from entering ecologically sensitive areas.

The interim action cost 1.6 million dollars to construct, approximately $375,000 per year to operate and maintain, approximately $90,000 per year for power and approximately $120,000 per year for project oversight.

Table 1 provides a summary of groundwater results which exceeded ARARs for volatile organic compounds during interim treatment.

Phase III Remedial Investigation (1991-1992)

At Site 10, a total of seven soil samples were collected from three soil borings drilled at the location of the three former underground storage tanks at the site. Analysis of these samples revealed contamination with VOCs, SVOCs and PHC. Groundwater samples collected downgradient of Sites 10 and 17 were contaminated with VOCs and lead. Groundwater samples collected at and downgradient of Site 16 confirmed that groundwater in the shallow aquifer is contaminated with VOCs. Lead was detected in one filtered groundwater sample at a level exceeding cleanup standards. Soil samples collected at the location of the four former fire-fighting pits at the site were highly contaminated with PHC and also contained high levels of PAH compounds. Low levels of PHC were detected in samples collected south of the NATTC fire-fighting pits and south and east of the oil/water separator. Sediment samples collected were highly contaminated with PHC and lead. At Site 17 groundwater samples confirmed the presence of PAH and lead in shallow groundwater at and downgradient from the site. Eight soil samples indicated that soil above the water table is contaminated with high levels of PHC. Low levels of alkylbenzenes, PAH compounds and lead were also detected in the samples. High levels of PHC were detected in s surficial sediment sample collected from the lagoon formerly used to collect discharges from Fuel Farm 196. Table 1 provides a summary of Phase III groundwater results for volatile organic compounds which exceeded ARARs.

Delineation Report, Area C soil and sediment (April 1993)

NAES conducted further sampling of soil and sediment in the area of the fuel farm, along the length of the Paint Branch, around and within the NATTC lagoon, and at the civilian fire fighting training pits. This sampling was to aid in determining the extent of soil and sediment contamination. Sampling was conducted between October 1992 through January 1993.

Paint Branch: On 2 October 1992, sediment samples were taken at 10 locations along the Paint Branch to determine whether the drains and outfalls into the river has caused contamination and to confirm the presence or absence of metals, SVOCs and petroleum contamination which was detected during the remedial investigation. Additional sampling was conducted on 16 December 1993 at several locations of concern. Based on the results of the additional sampling, it does not appear the contamination of sediment is widespread. At one location, levels of lead in sediment above National Oceanic and Atmospheric Administration (NOAA) effects range-low (ER-L) limits exists in a very limited area. It was determined that a removal action was not necessary and may have detrimental effects if conducted.

Civilian Fire Fighting Pits and West Lagoon: A total of twenty soil samples were taken in these areas. It was determined that the three fire pits and the lagoon bottom should be excavated. The volume calculated to be remediate was 1526 cu.yds.

NATTC Lagoon Area: Forty-four soil samples (from varying locations and depths) were taken in the area surrounding the lagoon and nine sediment samples were taken along the middle axis of the lagoon. Soil samples indicated that the petroleum contamination is widespread. The calculated areal extent of the contamination was calculated as 1.12 acres or 48,800 sq.yds. Sediment samples did not confirm previous investigation results which found elevated lead and cadmium levels.

Fuel Far 196: Sixteen soil samples were taken from eight locations. On each side of the fence, two locations were chosen. Samples were taken at depths of 2 and 5 feet from each location. None of the samples exceeded the NJ Soil Cleanup Criteria of 10,000 mg/kg for petroleum hydrocarbons. The extent of contamination was estimated to be 75,000 square feet with a volume of 450,000 cubic feet.

EE/CA for Area C soils (May 1993)

An Engineering Evaluation/Cost Analysis (EE/CA) report, which is similar to a feasibility study, was performed by NAES for Sites 16 and 17 on May 17, 1993. The purpose of the EE/CA was to develop, evaluate and select alternatives for conducting a non-time critical removal action. The recommended actions were as follows:

Site 16 Civilian Fire Fighting Pits and West Lagoon: Excavation and on-site recycling.

Site 16 NATTC lagoon: Excavation and on-site recycling of lagoon sediments (source area) and subsequent

In-situ bioremediation of contaminated area.

Site 17 Fuel Farm 196: Vapor extraction/bioventing.

Site 16 & 17 Workplan (December 1993), Removal Actions of "Hot Spots" (August 1993)

A workplan outlining the soil removal actions taken in the Summer of 1993 and discussing future in-situ soil treatment was finalized in December 1993. Excavation of the civilian fire fighting pits and lagoon and the NATTC lagoon (all located within Site 16) was conducted between August 19, 1993 and September 2, 1993. Approximately 2000 cubic yards of contaminated soil was removed from Site 16 and was later processed on-site to become road-base for station roads.

Between January 1994 to July 1994, the treatment systems for vapor extraction/bioventing at Site 17 and the bioventing system at Site 16 were designed and a construction specification was written. To determine design parameters, a bioventing study was performed at Sites 16 and 17 in May 1994.

Confirmation Sampling Report for Site 16 (18 April 1994)

Post-excavation sampling was performed by the Navy CLEAN contract at the tree Civilian fire fighting training pits and west lagoon at Site 16. Four sidewall samples were taken from each pit and three samples were taken from the embankment surrounding the lagoon. These results indicate that no further action is required in the civilian training areas of Site 16.

Bioventing Study at Sites 16 & 17

A bioventing treatability test was performed at Sites 16 and 17 by Aguilar Associates and Consultants in May 1994 to provide data necessary to design bioventing systems. The study was performed in accordance with the U.S. Air Force Center for Environmental Excellence "Test Plan and Technical Protocol for A Field Treatability Test for Bioventing", May 1992. Tests included soil gas permeability and in-situ respiration tests. The tests revealed that a 40 foot radius of influence could be obtained from the injected air. It also showed that with time, oxygen utilization increased, indicating the presence of microorganisms capable of digesting the petroleum contamination.

Interim Remedial Action/Bioventing at Site 16, Vapor Extraction & Bioventing at Site 17

System Layout at Site 16: The delineated area of contamination (>10,000 ppm PHC) was used as a template for the bioventing pipe layout. The pipe was placed in parallel rows 60 to 70 feet apart. The perpendicular distance was designed to provide adequate overlap of the radium of influence of each row. Nine rows of varying length schedule 40 slotted PVC piping were required to cover the entire area. The total length of the slotted pipe is approximately 2100 linear feet. Shutoff valves are incorporated at the beginning of each leg of the system as a way to fix potential damage without shutting off the entire system.

As a modification to the contract, the contractor suggested installing sparging points in a 10 foot grid under the lagoon bottom. The depth of the points is approximately 10 feet deep in order to maximize the bubbling effect.

System Layout at Site 17: The soil and groundwater conditions at Site 17 are very similar to those at Site 16, which is located 1000 feet to the west. However, the presence of four 50,000 gallon concrete fuel tanks and associated fuel lines, electric cables andpavement, were major influences in piping layout. The system utilizes vapor extracting in addition to bioventing piping. The designed system has 435 feet of slotted air injection piping (25%) and more than 1300 feet of vapor extraction piping. The extracted air will pass through carbon filters and will be reinjected through the air injection piping to provide a "closed loop" system.

General: The contract included construction and a six month operations and maintenance testing (prove-out) period of the two systems. System performance is monitored through biweekly soil gas sampling for oxygen and carbon dioxide and by monthly grid soil sampling. Start-up of these systems began on August 5, 1995.

Removal of Fuel Farm 196 - Contract Award

A contract to upgrade fuel farm 196 was awarded in the last quarter of Fiscal Year (FY) 94. This upgrade includes the abandonment of the present underground storage tanks. This abandonment includes removal of the tank appurtenances, the tank tops and the tank fill stand. The tanks themselves will be clean sand. To replace the storage that is being lost two new 25,000 gallon above ground tanks are being constructed. These new tanks will have all the required overfill protection devices, and secondary containment. There will also be a new fill stand constructed as part of the upgrade.

Investigation Summary

Based on the results of the interim remedial action, for groundwater, the existing groundwater treatment system is capable of preventing the migration of groundwater contamination. A groundwater flow and contaminant transport model was established to optimize the recovery system in Area C. Modifications to the groundwater recovery system will allow the highest levels ("source areas") of contamination to be captured for remediation.

Soil at Site 11 has already been addressed through removal actions and a No Further Action Record of Decision was signed in June 1993.

Due to low levels of contamination identified during the Remedial Investigation at Site 10, confirmation sampling was conducted in July 1995 which refuted the one RI sample which showed levels of contamination (Total Petroleum Hydrocarbons) above the NJ Soil Cleanup Criteria (found in the Area C Focused Feasibility Study Addendum dated July 31, 1995). Therefore no further action will be taken for soil at Site 10. Residual low levels of groundwater contamination at Site 10 will be addressed by the Area C groundwater treatment facility.

The vapor extraction and/or bioventing systems installed at Sites 16 and 17 will be capable of reducing soil contamination to acceptable levels. The soil treatment systems and additional pumping wells will complement each other and promote complete restoration of the Area. The drawdown created by the additional recovery wells within the vapor extraction area will allow the vapor extraction system to treat a larger soil area. The air injection systems will introduce oxygen to the groundwater surface thus enhancing the natural attenuation of the groundwater contamination.

TABLE 1
Volatile Organic Compounds Which Exceeded EPA MCLs and/or NJDEP PQLs

AREA C Groundwater Phase I Results

CONTAMINANT	DETECTED CONCENTRATIONS (ug/1)	EPA MCL (ug/1)	NJDEP PQL (ug/1)
Benzene	ND-410	5.0	1.0
Ethylbenzene	ND-96.3	700.0	5.0

AREA C Groundwater Phase II Results

CONTAMINANT	DETECTED CONCENTRATIONS (ug/1)	EPA MCL (ug/1)	NJDEP PQL (ug/1)
Benzene	ND-380	5.0	1.0
Toluene	ND-990	1000.0	5.0
Ethylbenzene	ND-560	700.0	5.0
Xylenes	ND-4500	10,000.0	2.0
Chlorobenzene	ND-14	5.0	2.0
Trichloroethene	ND-12	5.0	1.0
1,2-Dichloroethene	ND-12	100.0	2.0

TABLE 1 (continued)

AREA C Groundwater
Aquifer Characterization/Treatability Study

CONTAMINANT	DETECTED CONCENTRATIONS (ug/1)	EPA MCL (ug/1)	NJDEP PQL (ug/1)
Benzene	ND-410	5.0	1.0
Toluene	ND-150	1000.0	5.0
Ethylbenzene	ND-99	700.0	5.0
Xylenes	ND-390	10000.0	2.0

AREA C Groundwater Phase III Results

CONTAMINANT	DETECTED CONCENTRATIONS (ug/1)	EPA MCL (ug/1)	NJDEP PQL (ug/1)
Benzene	ND-4.4	5.0	1.0
Toluene	ND-23.1	1000.0	5.0
Ethylbenzene	ND-24.1	700.0	5.0
Xylenes	ND-120.8	10,000.0	2.0

TABLE 1 (continued)

AREA C Groundwater Additional Sampling
Conducted During Operation of Interim Treatment
July 1991 - June 1994

CONTAMINANT	DETECTED CONCENTRATIONS (ug/1)	EPA MCL (ug/1)	NJDEP PQL (ug/l)
Benzene	ND-420	5.0	1.0
Toluene	ND-300	1000.0	5.0
Ethylbenzene	ND-99	700.0	5.0
Xylenes	ND-470	10,000.0	2.0
1,1,2,2-Trichloroethene	ND-4	-	1.0
Chloroform	ND-210	100.0	2.0
cis-1,2-Dichloroethene	ND-10	100.0	2.0
Bramodichloromethane	ND-9	-	1.0
1,1,1-Trichloroethane	ND-29	200.0	1.0
Chlorobenzene	ND-4	-	2.0
Trichloroethene	ND-4	5.0	1.0
Dibromochloromethane	ND-2	-	1.0
Vinyl Chloride	ND-13	2.0	2.0
1,2,4-Trichlorobenzene	ND-2.93	70.0	1.0
1,1-Dichloroethene	ND-1.66	7.0	2.0

ND-Nondetect

NOTE:

Primary Maximum Contaminant Levels (MCLs) are Federally enforceable contaminant Levels allowable in public drinking water supplies. They have been established from health-based data by EPA's Office of Drinking Water Regulations (40 CFR 141) established under the authority of the Safe Drinking Water Act. MCLs are periodically revised as more information becomes available. When MCLs are not available, proposed MCLs were used as the comparison criteria for some analytes.

On 13 January 1993, the revised N.J.A.C. 7:9-6 which include the Groundwater Quality Criteria was signed. The criteria establish the groundwater classifications for the Pinelands, including class I-PL (Preservation Area) and Class I-PL (Protection Area). The actual groundwater criteria are the natural quality and background quality, respectively (N.J.A.C. 7:9-6.7).

Practical Quantitation Levels (PQLs) are the lowest concentration of a constituent that can be reliably achieved among Laboratories within specified Limits of precision and accuracy during routine Laboratory operating conditions. The PQLs will be used to determine compliance with the Groundwater Quality Criteria for Class I-PL groundwater.

Table 2
Soil Contaminants in Area C

CONTAMINANT	DETECTED CONCENTRATIONS (mg/kg)	NJDEP SCC Impact to GW (mg/kg)	NJDEP SCC Non-Residential Direct Contact (mg/kg)	NJDEP SCC Residential Direct Contact (mg/kg)
Site 10				
PHC	ND-10,819	10,000	10,000	10,000
Toluene	ND-7.8	500	1000	1000
Ethylbenzene	ND-17.0	100	1000	1000
Xylene (total	ND-190	10	1000	410
Naphthalene	ND-4.3	100	4200	230
2-Methylnaphthalene	ND-8.4	NE	NE	NE
Pyrene	ND-0.27	100	10000	1700
Lead	ND-7.5	NE	600	400
Site 16				
Toluene	ND-.009	500	1000	1000
2-Methylnaphthalene	ND-220	NE	NE	NE
Phenanthrene	ND- 0.41	NE	NE	NE
PHC	ND- 29,000	10,000	10,000	10,000
Site 17				
PHC	ND-15,000	10,000	10,000	10,000
Toluene	ND-0.009	500	1000	1000
Ethylbenzene	ND-0.066	100	1000	1000
Xylenes (total)	ND-0.980	10	1000	410
Naphthalene	ND-30	100	4200	230
2-Methylnaphthalene	ND-52	NE	NE	NE
Lead	3.1-99	NE	600	400

ND - Not Detected
NE - Not Established

Table 3
Sediment Contaminants in Area C

CONTAMINANT	CONCENTRATION (ug/kg)	NOAA ER-L ug/kg	NOAA ER-M ug/kg
Volatile Organic Compounds			
Toluene	ND - 6,100	--	--
Ethylbenzene	ND - 3,600	--	--
Xylene (total)	ND - 27,000	--	--
Semi-Volatile Organic compounds (ug/kg)			
Naphthalene	ND - 27,000	340	2100
2-Methylnaphthalene	ND - 40,000	65	670
Phenanthrene	ND - 1,300	225	1380
Anthracene	ND - 260	85	960
Carbazole	ND - 130	--	--
Fluoranthene	ND - 1,900	600	3600
Pyrene	ND - 1,700	350	2200
Butylbenzyl Phthalate	ND - 6,600	--	--
Benzo(a)anthracene	ND - 990	230	1600
Chrysene	ND - 1,000	400	2800
Benzo(b)fluoranthene	ND - 1,300	--	--
Benzo(k)fluoranthene	ND - 630	--	--
Benzo(a)pyrene	ND - 1,100	400	2500
Indeno(1,2,3-c,d)pyrene	ND - 490	--	--
Dibenz(a,h)anthracene	ND - 160	60	60
Benzo(g,h,i)perylene	ND - 460	--	--

CONTAMINANT	CONCENTRATION	NOAA ER-L mg/kg	NOAA ER-M mg/kg
Metals (mg/kg)			
Lead	2.9 - 472	35	110
Miscellaneous (mg/kg)			
PHC	36 - 39,000		
Total Organic Carbon	517 - 10,897		

Source: National Oceanic and Atmospheric Administration (NOAA) 1990 criteria for sediments

ER-L Effects Range-Low   ER-M Effects Range-Median
-- Value not available

NOTES:

1. Sediment contaminant concentrations are based on data up to and including the Phase III Remedial Investigation. In August 1993, bottom sediments of both the civilian and NATTC fire fighting training Lagoons were removed through excavation (to a depth of approximately one foot). Current contamination Levels in the NATTC Lagoon may vary. Per section 2.1.11 of this study, the Civilian fire fighting Lagoon (west Lagoon) was sampled after excavation and found to Longer require action.

2. ER-L in a very qualitative sense can be taken as a concentration above which adverse effects may begin or are predicted among sensitive life stages and/or species. The ER-M value can be taken as a concentration above which effects were frequently or always observed or predicted among most species. These criteria are general values used for screening and have been biased towards saltwater systems due to the nature of the data set used in the analysis.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan for Area C was issued to interested parties on August 16, 1995. On August 24 and 25, 1995, a newspaper notification inviting public comment on the Proposed Plan appeared in The Ocean County Observer and The Asbury Park Press The Air Scoop, on September 1, 1995. The comment period was held from September 5, 1995 to October 5, 1995. The newspaper notification also identified the Ocean County Library as the location of the Information Repository.

A Public Meeting was held on September 6, 1995 at the Manchester Branch of the Ocean County Library at 7:00 p.m. At this meeting representatives from the Navy, USEPA and NJDEP were available to answer questions concerning Area C and the preferred alternative. The attendance list is provided in this Record of Decision as Appendix A. Comments received and responses provided during the public hearing are included in the Responsiveness Summary, which is part of this Record of Decision. A transcript of the meeting is available as part of the Administrative Record.

During the public comment period from September 5, 1995 through October 5, 1995, no written comments were received pertaining to Area C.

This decision document presents the selected alternative (i.e., soil remediation via bioventing and vapor extraction systems and continued groundwater treatment with modifications to the current recovery system) for Area C, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan (NCP). The decision for Area C is based on the information contained in the Administrative Record, which is available for public review at the Ocean County Library, 101 Washington Street, Toms River, New Jersey.

SCOPE AND ROLE OF RESPONSE ACTION

Studies conducted in Area C had shown that the groundwater, soil and sediment in this area had been contaminated with various petroleum products as a result of past operations dating back to the 1960s and 1970s. The Navy implemented interim remedial actions to address the contamination prior to the implementation of a final action which is described in this document.

Groundwater Remedial Actions

Based on the levels of contamination detected in Area C groundwater during Phase I and II of the Remedial Investigation, an interim Focused Feasibility Study (September 5, 1990) was prepared to evaluate alternatives for controlling contaminated groundwater migration.

The Proposed Interim Remedial Action Plan was issued on September 14, 1990. The Navy proposed and the regulatory agencies (U.S. Environmental Protection Agency and New Jersey Department of Environmental Protection) concurred that a groundwater extraction, treatment and recharge system was the preferred option to remediate the contaminated groundwater.

An interim Record of Decision was issued on 14 December 1990. This decision document presented the selected remedial action for Area C - Sites 10, 16 and 17. In 1991 an interim treatment system began operation to control the downgradient migration of groundwater contamination. Documentation supporting the interim action conducted at Area C can be found in the Administrative Record for the NAES, at the Ocean County Library in Toms River, NJ.

The decision to recover and treat groundwater in Area C was made to protect human health and the environment by preventing the further migration of groundwater contamination. This decision was made in accordance with CERCLA, as amended by SARA and, to the extent practicable, the NCP.

The selected interim remedy was not a final action for groundwater or soil. The interim action for groundwater was the first cleanup phase of Area C. Based on data obtained from monitoring throughout the interim treatment period, a groundwater model has been produced to design the optimum groundwater extraction scenario capable of controlling the downgradient migration of contamination and also removing the higher "hot spot" area of contamination for treatment.

This document outlines final remedial actions to remediate Area C soil and groundwater and meet Applicable or Relevant and Appropriate Requirements (ARARs) for all media.

Soil Remedial Actions

The Engineering Evaluation/Cost Analysis (EE/CA) report analyzed different soil remediation technologies and determined which actions would be cost effective and remove the contamination expeditiously. From the EE/CA it was determined that excavation and on-site recycling (asphalt batching and road construction) would be a low cost alternative for some of the "hot spots". Therefore, soil was excavated from the bottom of both lagoons in Site 16 and at the Civilian fire pits (which were not undergoing soil flushing).

Excavation of soil at the fuel farm (Site 17) was not feasible since it was unknown when the fuel farm would be decommissioned. Therefore, an in-situ treatment, vacuum extraction and bioventing, was chosen at this area.

In the large contamination area surrounding the NATTC lagoon, bioventing, a form of in-situ bioremediation, was the low cost choice.

Once the EE/CA was approved by the NJDEP and USEPA, a public notice was placed in the Ocean County Observer and the Asbury Park Press on 15 March 1993 informing the public of the chosen actions and that the EE/CA was available for review at the Ocean County Library, Toms River. A thirty day written comment period followed. No comments were received.

Excavation and road construction was completed in September 1994. Vapor extraction and/or bioventing systems at Sites 16 and 17 have been constructed and system start-up began on August 5, 1995.

SUMMARY OF SITE RISKS

In April 1992, a facility-wide endangerment assessment for NAES were conducted. The objective of this Endangerment Assessment (EA) was to assess the potential current and future human health risks and potential environmental impacts posed by contaminated soils, groundwater, sediment, and surface water at NAES.

SITE RISKS (GROUNDWATER)

This is a summary of the Endangerment Assessment (EA) addendum findings for groundwater in Area C. The assessment of this site was conducted using all available data generated during previous remedial investigations (RI). This summary will discuss (1) the chemicals identified by the EA addendum as contaminants of concern (COCs), (2) the land use assumptions upon which estimates of potential human exposure to site contaminants are based, (3) the quantitative estimates of carcinogenic risk and noncarcinogenic hazard, and (4) a summary interpretation of the EA findings with regard to need for site remediation.

CONTAMINANTS OF CONCERN

For Area C groundwater, contaminants of concern were determined to be the following: arsenic, benzene, ethylbenzene, toluene, xylenes, and naphthalene.

LAND USE AND EXPOSURE ASSUMPTIONS

Four different scenarios representing current and potential future land uses were evaluated to assess applicability to the site. Evaluated scenarios included military, light industrial, onstruction and residential land uses. For each of these scenarios, human exposure is effected by mechanisms that include direct contact, inhalation and ingestion.

Based on current land use conditions within Area C, a light industrial land use scenario was quantified for direct exposure to contaminated groundwater via incidental ingestion.

Although future residential land use conditions were not investigated as part of the risk characterization for Area C, groundwater cleanup levels are based on residential land use assumptions.

HUMAN HEALTH RISK AND HAZARD FINDINGS

Hazards for noncarcinogens are 2.01 which is above the EPA's hazard index criteria value of 1.0. The hazard index values ranged from a minimum value of 2.10 X 10 2 for naphthalene to a maximum of 1.86 for arsenic. Carcinogenic risk estimates for groundwater in Area C are above EPA's acceptable risk range of 10 4 to 10 6. The overall area groundwater risk represented by the sum of the chemical-specific risk estimates is 3.97 X 10 4. The risk estimates ranged from a minimum of 3.85 X 10 5 for benzene to a maximum of 3.58 X 10 r for arsenic.

The inorganic compound arsenic contributes greatly to both the overall Area hazard and risk. A review of groundwater samples taken from Phase I, Phase II, Phase III and during interim treatment indicates that arsenic was only detected in 6.5% of the samples. Arsenic was only detected above the NAES established background level in 1.5% of the samples. Arsenic is believed to be a constituent of the fuels which were disposed of in Area C. Levels of arsenic detected since 1991 range from 12 to 66 ppb. Treatment system data indicates that the arsenic is being effectively removed from groundwater during the treatment process.

If arsenic is removed as a contaminant of concern, hazards for noncarcinogens would be reduced to 1.47 X 10 1, which is below the EPA's hazard index criteria value of 1.0. Carcinogenic risk estimates for groundwater would be reduced to within EPA's acceptable risk range of 10 4 to 10 6. The overall area groundwater risk would be 3.85 X 10 5.

These risk numbers are based on non-residential assumptions. If residential assumptions are used, the risk numbers would be higher and would fall out of the EPA acceptable risk range.

ECOLOGICAL ASSESSMENT

As part of the Endangerment Assessment, a Baseline Ecological Evaluation (BEE) was conducted to obtain a description of the ecosystems at NAES. The objective of the BEE was:

- To identify contaminants at each site that are of ecological concern.
- To identify whether sensitive ecological receptors are present or may have been present at the contaminated site.
- To identify potential exposure pathways to sensitive ecological receptors that exist or may have existed
- To determine whether or not sensitive ecological receptors are being or potentially may be adversely impacted by contaminants.

Currently it does not appear that groundwater is having an impact on the ecology of the Area. However, groundwater is hydraulically connected to Area surface water which does have ecological receptors.

SITE RISKS (SOILS/SEDIMENTS)

CONTAMINANTS OF CONCERN

For soil, COCs were determined to be the following: lead, mercury, BTEX, 2-Methylnaphthalene, phenanthrene, pyrene and PHC.

For sediment, COCs were determined to be various PAH compounds, such as: anthracene, benzo (a)anthracene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, flouranthene, phenanthrene, and pyrene. These compounds were found in Site 16 sediment to exceed NOAA ER-L levels, but did not exceed ER-M levels.

LAND USE AND EXPOSURE ASSUMPTIONS

For Sites 10, 16 and 17 soil, a light industrial land use was assumed. Risk for sediment was only evaluated under ecological assessment conditions.

HUMAN HEALTH RISK AND HAZARD FINDINGS

The highest hazard quotient in Area C soil was determined to be 0.0105 at Site 17 to a minimum hazard of 0.00032 at Site 10. The highest cancer risk was 2.71x10 08 at Site 16 with a minimum of 8.33x10 10 at Site 10. All calculated risk and hazard values are below the USEPA acceptable cancer risk ranges and hazard quotient values.

The site risk is based upon all available data and based upon the EE/CA and Removal Actions completed at Site 16, the actual current risk is lower than indicated.

ECOLOGICAL ASSESSMENT

Currently, neither the USEPA or NJDEP specify a maximum PHC soil concentration that, when ingested, will be protective of animal biota. The mean site-specific maximum concentrations exceeded 10,000 mg/kg for Sites 10, 16 & 17 in Area C. A maximum sediment PHC concentration of 39,000 mg/kg was recorded at Site 16. This data indicates that PHC contamination is moderately widespread and could present a potential health risk to terrestrial wildlife and aquatic biota.

The area of the NATTC lagoon is a grassy field which is visited by deer on a regular basis. Deer tracks are often seen leading to and from the lagoon, and it is assumed that when the lagoon is filled, it is used as a drinking water source. A study conducted in 1985, "A Study of the Percolation Pond at NATTC Fire School-Biological Effects", states:

> "Insect species such as dragonfiles, damsel flies, back swimmers, water beetles, and mosquito larvae were observed in the pond water. Other animals frequenting the pond included several toads and frogs. No mammals were seen, but tracks of deer, rabbit, and dogs were visible at the perimeter of the pond. Flying birds such as barn swallows, crow, killdeer, nighthawk, and kingfishers, field sparrows, morning doves, and pigeons wee seen landing and drinking from the water surface."

No long term study has been performed in these areas to determine the adverse effects on aquatic or terrestrial species. Although gambusia were introduced into the pond for study during the 1985 research, the effects were only recorded for 5 days. A longer study during the summer months may show that aquatic organisms cannot thrive in the lagoon environment. However, it must be assumed that a longer range study probably could not be performed since many aquatic organisms could not survive a winter in the pond due to its shallow depth.

ENDANGERMENT ASSESSMENT SUMMARY

In summary, the results of the EA indicate that contaminants present in soil, sediment and groundwater at Area C pose a concern relative to potential future,exposed populations. Therefore, alternatives for the remediation of soil, sediment and groundwater contamination in these Areas may be warranted.

The results of the EA should not be considered a characterization of absolute risks posed to human health or the environment. Rather, risk and hazard index values estimated in the EA should be used to identify potential sources of risks at NAES, with resultant consideration of sites for remedial action. The nine criteria used inthe detailed analysis of alternatives alternative.

SUMMARY OF REMEDIAL ALTERNATIVES

Under CERCLA, the selected alternative must be protective of human health and the environment, cost effective, and in accordance with statutory requirements. Permanent solutions to contamination are to be achieved wherever possible. The remedial alternatives considered for the site are summarized below. Detailed descriptions of the remedial alternatives can be found in the FFS (May 1995), which is available in the Administrative Record for NAES.

GROUNDWATER TREATMENT

The alternatives 1G through 4G are the final remedial Alternatives for groundwater. The final remedial action conducted in Area C will involve the combination of a groundwater and soil remedial action.

ALTERNATIVE 1G: NO ACTION

Estimated Construction Cost: $ 52,700 (To Abandon Treatment)
Estimated Net O&M Cost: $ 0
Estimated Implementation Time Frame: immediately

The groundwater contamination present in Area C is believed to be a result of past activities conducted at various sites. The sources of the contamination are believed to no longer exist. However, soil and sediment which may be contaminated in Area C may still provide a source of contamination for groundwater. This alternative involves no action to control or remove contamination at Area C (Sites 10, 16 and 17). Under this alternative, the existing treatment of groundwater would be discontinued.

This alternative has been included to provide a baseline for the comparison of other alternatives.

ALTERNATIVE 2G: NATURAL RESTORATION/GROUNDWATER MONITORING - DISCONTINUE EXISTING GROUNDWATER TREATMENT

Estimated Construction cost: $ 210,000
Estimated Net O&M Cost: $ 280,000/yr
Estimated Implementation Time Frame: 1 year

This alternative involves no additional interim actions at Area C (Site 10, 16 and 17) other then groundwater monitoring of the aquifer and study of the natural restoration processes occurring within the Area. The existing groundwater treatment system would be discontinued. Extensive monitoring of the plume extent and migration would be monitored through the existing well network and additional monitoring wells if necessary. Contaminants would not be treated but would be allowed to reduce naturally. The natural reduction occurring at the site would be studied to determine if the microorganisms at the site have the potential to degrade the VOCs to harmless products.

Under this alternative, no further action to control the source would be taken.

Additional costs involve the installation of up to 10 additional monitoring wells and an initial restoration study to prove that this process will effectively remediate the Area. Yearly operation and maintenance costs include quarterly sampling and analysis and project oversight.

ALTERNATIVE 3G: CONTINUE EXISTING TREATMENT - GROUNDWATER PUMPING, REMOVAL OF FREE PRODUCT, TREATMENT, RECHARGE AND IN SITU SOIL FLUSHING

Construction Cost: $ 1.6 million (SUNK COST-
costs already incurred)
Estimated Additional Construction Cost: $ 0
Estimated Net O&M Cost: $ 475,000/yr
Estimated Implementation Time Frame: already implemented

This alternative involves groundwater pumping from the existing 24 inch recovery well located in fuel farm 196, this well is pumped at 80 gallons per minute (gpm). An existing six inch well adjacent to the old gas station (Building 424) is pumped at 40 gpm. An existing six inch recovery well adjacent to the Paint Branch is pumped at 80 gpm.

At the existing treatment facility, a tank serves as an initial flow equalizer. A pretreatment unit is used for metals, free products and solids removal. Air stripping columns and granular activated carbon polishing filters are used to treat the volatile organic contaminants in the extracted groundwater. The effluent exiting the air stripper is treated by granular activated carbon air filters and clean air is discharged to the atmosphere. The treated groundwater, which meets or exceeds Federal and State drinking water standards is recharged to the aquifer at two irrigation/infiltration locations. Treated groundwater is spray irrigated over soil in Area C during temperate months and is infiltrated during winter months.

This alternative has been effective at halting the continued migration of the contaminated plume.

The only modifications to the existing system included under this alternative would be modifications to the sampling frequency. Based on previous sampling results, it is appropriate to reduce the frequency of sampling. The sampling of monitoring wells will be reduced from quarterly to biannually for VOCs and annually for SVOCs and metals. The sampling of deep monitoring wells that have not detected any contamination may be discontinued. Treatment system VOCs will continue to be monitored on a monthly basis. However, the frequency of sampling for semi-volatile organic compounds in the treatment process will be reduced to annually for system influent and quarterly for system effluent.

ALTERNATIVE 4G: MODIFICATIONS TO TREATMENT

Estimated Construction Cost: $ 1.6 million (SUNK COST)
Estimated Additional Construction Cost: $ $ 186,600
Estimated Net O&M Cost: $ 576,000/yr
Estimated Implementation Time Frame: 1 year

This alternative would utilize the existing treatment system as indicated in alternative 3G, however changes in recovery well location and pumping intervals would be implemented. Modifications to the existing groundwater recovery system would be made based on the results of the interim treatment system performance and quarterly data and additional modeling conducted in February 1995.

The following modifications would be implemented to improve contaminant recovery and accelerate the remediation of groundwater:

- Pumping of recovery well BA will be discontinued. This well has generally shown low or non-detectable levels of contamination in treatment system influent. Any groundwater contamination remaining at Site 10 would eventually be captured by downgradient pumping wells at Site 17. Wells BA would continue to be monitored on a quarterly basis with the other monitoring wells in Area C. If levels of contamination increase in this Area, pumping could be resumed.

- An additional recovery well (RW-2) will be placed adjacent to existing recovery well RW at Site 17. These wells will be pumped at a combined rate of 100 GPM to capture the higher levels of contamination at Site 17. The proposed locations of additional recovery wells are indicated in Figure 5.

- An additional recovery well will be placed within the area of highest contamination at Site 16. This well will be used to remove the source area of groundwater contamination at Site 16. This well will be constructed to remove free product from the groundwater surface and also pump contaminated groundwater into the existing treatment facility. The proposed locations of additional recovery wells are indicated in Figure 5.

- Up to four additional free-product recovery wells may be placed in the vicinity of Site 16. These wells would be used to remove free product which would be placed into a tank located at the site.

Under this alternative modifications would be made to the current sampling frequency. Based on previous sampling results, it is appropriate to reduce the frequency of sampling. The sampling of monitoring wells will be reduced from quarterly to biannually for VOCs and annually for SVOCs and metals. The sampling of deep monitoring wells that have not detected any contamination may be discontinued. Treatment system VOCs will continue to be monitored on a monthly basis. However, the frequency of sampling for semi-volatile organic compounds in the treatment process will be reduced to annually for system influent and quarterly for system effluent.

Under this general alternative, three potential modifications to the existing treatment system will be developed individually. Costs associated with each should be considered additional to those shown in Alternative 4G.

The individual development presented here is conducted to aid any future decision making processes which center on treatment system optimization. However, in the consideration of alternatives, modification will be treated as a single alternative.

The influent data from the recovery system proposed as alternative 4G will be reviewed to determine if modifications to the current treatment system are possible. These modifications could include one or several of the following alternatives.

Alternative 4GT1 Elimination of pH Adjustment for Treatment.

Sodium hydroxide is currently used in the Area C treatment process for pH adjustment. The pH of the plant influent is raised to allow metal hydroxides to precipitate out of solution. The use of this chemical is currently increasing the sodium content in the Area groundwater. Under this alternative the reduction and possible elimination of pH adjustment would be investigated. The effects of this change on treatment system performance would be investigated to determine implementability.

Alternative 4GT2 Elimination of Pretreatment.

If the levels of metals entering the treatment facility do not increase above the existing levels, once the new recovery scenario is implemented, the use of open aeration will be investigated. The use of this type of treatment would allow the elimination of oxidation/floculation/precipitation. This process is currently used in Area C to remove metals and solids from the system influent. The elimination of this process may cause excessive iron to build in air strippers and carbon units. The precipitated iron may also block subsurface infiltration piping.

Alternative 4GT3 Open Aeration to Treat Groundwater.

Based on the existing levels of VOCs in the treatment system influent, controls on air emissions are not required. If the influent levels from the new recovery system to be installed under alternative 4G continue to meet these requirements, the use of alternate open aeration treatment would be investigated. The use of this technology would require no pretreatment of groundwater. However, the level of contaminants entering the system would have to meet the NJDEP air pollution control requirements. The discharge requirements would have to meet applicable Federal and State requirements.

If the use of open aeration is implemented, the use of surface infiltration basins may be required to return treated water back to the aquifer. This type of discharge system would be more capable of handling precipitated iron than subsurface infiltration since the basins are more easily maintained.

SOIL TREATMENT

ALTERNATIVE 1S: NO ACTION/DISCONTINUE SOIL ACTION

Estimated Construction Cost: $ 0
Estimated Net O&M Cost: $ 0
Estimated Implementation Time Frame: N/A

This alternative involves no action to control or remove contamination at Area C (Sites 10, 16 and 17). The existing treatment of soil would be discontinued.

This alternative has been included to provide a baseline for the comparison of other alternatives.

ALTERNATIVE 28: SITE RESTORATION

Estimated Construction Cost: $ 75K
Estimated Net O&M Cost: $ 0
Estimated Implementation Time Frame: 6 months

Although not a treatment alternative, site restoration is an important step in the remediation process. At the location of spray irrigation, the site restoration process will include removal of remaining broken asphalt to aid in the infiltration process. Site restoration also include backfilling excavated areas and grading. Seeding and planting in disturbed areas prevents erosion and restores habitats for terrestrial species. A construction contract was awarded on September 12, 1995 to remove asphalt, grade and seed Site 16.

At Site 17, site restoration is being conducted under the tank removal/fuel farm demolition contract. Therefore, the costs associated with Site 17 are not included. All above ground piping and structures will be removed and trees planted.

ALTERNATIVE 3S: PROVE-OUT OF EXISTING SOIL REMEDIATION SYSTEMS

Estimated Construction Cost: $ 177K (SUNK COSTS)
Estimated Net O&M Cost: $ 81K/yr.
Estimated Implementation Time Frame: 1 month

The venting systems at Site 16 and 17 were constructed and began start-up and subsequent 6 month prove-out on August 5, 1995. System layouts are shown in Figures 7 and 8. This alternative includes start-up, prove-out, and continued operations and monitoring of soil conditions. Under this alternative, the systems would be operated for three years and then re-evaluated to determine effectiveness. If major system deficiencies are found during the first 6 months of prove-out, the Navy, with the concurrence of the Technical Review Committee, will re-evaluate possible system modifications and treatment options at that time.

ALTERNATIVE 4S: PROVE-OUT, MODIFY (AS NEEDED) AND CONTINUE EXISTING SOIL REMEDIATION SYSTEM OPERATION

Under this general alternative, prove-out of the existing vapor extraction and bioventing systems would occur, as outlined in alternative 3S, with the added flexibility of altering the systems to provide optimal contaminant reduction rates. Four potential modification schemes have been developed individually. Cost associated with each should be considered additional to those shown in Alternative 3S. Layout of existing systems are shown in Figures 7 and 8.

The individual development presented here is conducted to aid any future decision making processes which center on system optimization. However, in the detailed analysis of alternatives (section 9.0), modification will be treated as a single alternative.

PROVE-OUT
Estimated Construction Cost: $ 177K (SUNK COSTS)
Estimated Net O&M Cost: $ 81K/yr.

Alternative 4S1: Conversion from Bioventing to Vapor Extraction at Site 16

Estimated Additional Construction Cost: $ 20K
Estimated Additional O&M Cost: $ 11K/yr.
Estimated Implementation Time Frame: N/A

At Site 16, the bioventing system can be converted to vapor extraction fairly easily. The system would require the addition of carbon units, water condensation removal tank, and an air permit equivalency. If vapor extraction proves to be the more actives means of remediating soils, the conversion of the Site 16 system to vapor extraction may expedite cleanup. The cost associated with this conversion is relatively low.

Alternative 4S2: Conversion from Vapor Extraction to Bioventing at Site 17

Estimated Additional Construction Cost: $ 7,300
Estimated Additional O&M Cost: ($ 11K/yr)
Estimated Implementation Time Frame: N/A

The vapor extraction system could easily be modified to blow air through all the piping. This may be cost effective if bioventing proves to be a more active method of remediation. This conversion would eliminate the use of carbon and its regeneration costs, and the condensate water disposal costs.

Alternative 4S3: Increase of Air Flow at Sites 16 and 17

Estimated Additional Construction Cost: $ 18K
Estimated Additional O&M Cost: $ 3,800
Estimated Implementation Time Frame: N/A

If it becomes apparent through soil monitoring that increased air flow would expedite the cleanup process, then additional air flow capacity will be provided via increased blower motor size or the addition of extra blower motors. The change to a larger blower in either system is easily accomplished at minimal cost. The large diameter air piping (4: PVC) and extent of run of piping at either site could accommodate a much larger flow rate.

Alternative 4S4: Addition of Nutrients to the Soil at Sites 16 and 17

Estimated Additional Construction Cost: $ 0
Estimated Additional O&M Cost: $ 13.5K/yr.
Estimated Implementation Time Frame: N/A

Bioventing of contaminated soil is often accomplished utilizing indigenous microbes which are acclimated to the existing soil conditions. However, if necessary, nitrogen and phosphorus rich amendments could be added to the soil through the use of routine fertilizer applications. Watering or rainfall would provide transport mechanisms for the nutrients to reach subsurface (>2 feet in depth) contamination. Levels of nutrients in the soil would need to be monitored through soil sampling throughout the area.

ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against the nine evaluation criteria which are summarized below.

1. Overall Protection of Human Health and The Environment draws on the assessments conducted under other evaluation criteria and considers how the alternative addresses site risks through treatment, engineering, or institutional controls.

2. Compliance With ARARs evaluates the ability of an alternative to meet Applicable or Relevant and Appropriate Requirements (ARARs) established through Federal and State statutes and/or provides the basis for invoking a waiver.

3. Long-Term Effectiveness and Permanence evaluates the ability of an alternative to provide long term protection of human health and the environment and the magnitude of residual risk posed by untreated wastes or treatment residuals.

4. Reduction of Toxicity, Mobility or Volume Through Treatment evaluates an alternative's ability to reduce risks through treatment technology.

5. Short-Term Effectiveness addresses the cleanup time frame and any adverse impacts posed by the alternative during the construction and implementation phase, until cleanup goals are achieved.

6. Implementability is an evaluation of the technical feasibility, administrative feasibility, and availability of services and material required to implement the alternative.

7. Cost includes an evaluation of capital costs, annual operation and maintenance (O&M) costs, and net present worth costs.

8. Agency Acceptance evaluates the issues and concerns the response to the alternatives in terms of technical and administrative issues and concerns.

9. Community Acceptance evaluates the issues and concerns the public may have regarding the alternatives.

The first two criteria, protection of human health and the environment and compliance with Applicable or Relevant and Appropriate Requirements (ARARs) are considered by the EPA to be threshold criteria which each alternative must meet. The next five are balancing criteria, and the final two are considered modifying criteria.

ANALYSIS OF ALTERNATIVES (GROUNDWATER)

Overall Protection of Human Health and Environment -

Alternative 4G provides the greatest overall protection of human health and the environment through treatment of both higher concentration and downgradient groundwater contaminant areas and extensive monitoring. Based on the results of the interim action (Alternative 3G) modifications will be made to the current system to optimize the recovery of contaminated groundwater. Therefore, alternative 4G provides advantages over Alternative 3G through more extensive removal and treatment.

Alternative 3G provides overall protection of human health and the environment through hydraulic control and treatment of groundwater and extensive monitoring. However, pH adjustment and chemical addition under this alternative may have an adverse effect on the aquifer. Removal of these treatment steps may be implemented under Alternative 4G.

Alternative No. 2G, which offers no groundwater treatment, is the next protective alternative. This alternative may provide protection of human health through extensive monitoring of groundwater migration and natural reduction.

Alternative No. 1G, which offers no groundwater treatment or monitoring, is the least protective alternative.

Long-Term Effectiveness and Permanence -

Alternative 4G provides the overall most effective and permanent options for protection of human health and the environment through removal and treatment of both higher and downgradient levels of contamination. Long term permanence is ensured since monitoring well throughout and downgradient of the plume are monitored until all levels within the plume have been reduced below ARARs. The estimated time for this alternative to restoration is less than 10 years.

Alternative 3G would provide long-term protection of human health through the removal and treatment of all contamination migrating from the sites in Area C. The estimated time for this alternatives to capture and treat all contamination above ARARs is 10 years.

Alternative No. 2G provides no active treatment and is not considered to be effective at remediating the aquifer. The current levels of contamination appear to be too high for natural restoration to effectively control contaminant migration. This alternative would be effective toward the closing stages of remediation when pumping is no longer an effective option.

Alternative No. 1G provides no treatment and is not considered effective.

Reduction of Toxicity, Mobility or Volume -

Alternative 4G recovers and treats the largest area of contamination. The toxicity, mobility and volume are reduced through capture and treatment of the plume.

Alternative 3G recovers and treats contamination as it migrates to the recovery wells.

Alternative Nos. 1G and 2G offer no reduction of toxicity, mobility or volume through treatment of the contaminated media.

Short-Term Effectiveness -

Remedial action Alternatives 3G and 4G in the short-term, would halt the continued migration of contaminated groundwater downgradient of residual source areas. The estimated cleanup duration for alternative 4G is less than 10 years to reach ARARs. The estimated time to reduce all contamination below ARARs for Alternative 3G is 10 years.

Alternative No. 2G is effective at monitoring the movement of contamination but would not prevent the short term migration of contamination.

Alternative No. 1G provides no treatment of groundwater and is not considered to be effective in the short-term because residual risks are not reduced.

Implementability -

Alternative No. 1G offers the greatest implementability. This alternative involves the shutdown of the existing treatment facility and no further action.

Alternative No. 3G has already been implemented. This alternative requires continued operation and maintenance of the existing treatment facility.

Alternative No. 2G involves the shut down of treatment and continued monitoring of the aquifer. This alternative can be implemented in several months with the initiation of a study to determine the natural restoration within the aquifer. Alternative No. 4G would be more difficult to implement due to the additional construction required.

Cost -

Alternative No. 1G, the no action\long term monitoring alternative, has the lowest associated cost. Alternative No. 2G the limited action alternative has the second lowest cost. The cost for Alternative No. 3G involves operation and maintenance costs only and is therefore the lowest cost treatment option. Alternative No. 4G involves the construction of additional groundwater and free product recovery systems.

Compliance with ARARS -

EPA considers drinking water Maximum Contaminant Levels (MCLs) or State Practical Quantitation Levels (PQLs), whichever is more stringent for each contaminant of concern, to be ARARs.

Alternative No.1G does not comply with ARARs because no remedial action takes place. Alterative No. 2G will not reduce contamination to meet ARARs in a reasonable time frame before the contamination migrates to areas that could potentially harm human health and the environment. Alternatives 3G and 4G are designed to meet ARARs.

Agency Acceptance -

The NJDEP and Pinelands Commission concur with the Proposed Groundwater Alternative as detailed in Section 8.

Community Acceptance -

Community Acceptance will be addressed in the responsiveness summary to the Record of Decision.

ANALYSIS OF ALTERNATIVES (SOIL)

Overall Protection of Human Health and Environment -

Alternatives 3S and 4S provide the greatest overall protection of human health and the environment through treatment of the most highly contaminated areas and soil monitoring. Based on the results of the prove-out and 3 year evaluation period modifications (alternative 4S) may be made to the current system to optimize the rate of remediation. Therefore, alternative 4S may provide advantages over Alternative 3S in the future.

Alternative No. 2S, which offers no added protection of human health ant the environment in terms of contaminant reduction, is necessary to restore wildlife habitats and provide protection of the environment.

Alternative No. 1S offers no contaminant treatment or monitoring, is the least protective alternative.

Long-Term Effectiveness and Permanence -

Alternatives 3S and 4S provide the overall most effective and permanent options for protection of human health and the environment through removal and treatment of higher levels of contamination. Long term permanence is ensured since soil gas monitoring points throughout the area of concern are monitored until contaminant levels within the area have been reduced to below cleanup objectives. Soil samples will be conducted periodically to confirm results. The estimated time for this alternative to meet cleanup objectives through treatment is 5 years.

Alternatives 4S would provide long-term protection of human health through the possible optimization of existing systems if required.

Alternative No. 2S is not a remedial alternative but may provide long-term permanence in ecological restoration of the sites. This alternative would provide long-term erosion control and the establishment of Site 16 as a wildlife area would inhibit future human intrusion at the site.

Reduction of Toxicity, Mobility or Volume -

Alternatives 3S and 4S recover and/or treat a large volume of contaminated soil. The toxicity, mobility and volume are reduced through capture and/or treatment of the contaminants.

Alternative 4S may aid the rate of reduction of toxicity, mobility and volume of the contaminants if modifications are required in the future. This alternative may provide a greater contaminant reduction rate than alternative 3S.

Alternative Nos. 1 and 2 offer no reduction of toxicity, mobility or volume through treatment of the contaminated media.

Short-Term Effectiveness -

Remedial action Alternatives 3S and 4S in the short-term, would halt the continued migration of contaminated groundwater downgradient of residual source areas. The estimated cleanup duration for these alternatives is 5 years to meet the state cleanup criteria for soil.

Alternative No. 2S is effective in the short term for restoring the site to prevent erosion and enriching the wildlife habitats present at Site 16.

Alternative No. 1S provides no treatment of soil and is not considered to be effective in the short-term because the threat of further groundwater contamination would not be reduced.

Implementability -

Alternative No. 1S offers the greatest implementability. This alternative involves the shutdown of the existing treatment facilities and no further action.

The treatment facilities outlined in Alternative No. 3S have been constructed and began operation on August 5, 1995. This alternative requires continued operation and maintenance of the existing treatment facilities.

Alternative No. 4S involves possible future modifications of the systems outlined in Alternative 3S. These modifications, which include systems conversions, blower size increases, and nutrient additions, are easily implementable.

Alternative No. 1S consists of no action and is easily implementable.

Cost -

Alternative No. 1S, the no action alternative, has the owest associated cost. Alternative No. 2S, the restoration alternative, has a one-time associated cost. Alternative 3S has sunk costs of $177,000 from the construction, start-up and 6 month prove-out of the VE and bioventing systems of Sites 17 and 16. It also has expected long-term operations and maintenance costs of $81,000/year. Alternative 4S incurs costs in addition to those associated with 3S. Modifications under alternative 4S have additional construction costs up to $20,000 and $3,800 - $11,000 in additional operations and maintenance costs.

Compliance with ARARs -

Alternative No. 1S does not comply with ARARs because no remedial action takes place. Alternative No. 2S does not address contamination but complies with federal National Environmental Protection Act (NEPA) requirements. Alternative Nos. 3S and 4S are designed to meet cleanup levels and aid in groundwater remediation through active treatment of residual soil source areas.

Agency Acceptance - The NJDEP and the Pine lands Commission concur with the Proposed Soil Alternative as detailed in the Selected Alternative section below.

Community Acceptance - Community Acceptance is addressed in the responsiveness summary included in these Record of Decision.

THE SELECTED ALTERNATIVE

The Selected Alternative for Groundwater

The selected alternative to address groundwater at Area C is Alternative 4G: Modifications to Existing Treatment.

Based on quarterly groundwater data collected throughout Area C during interim treatment system operation since June 1991 and contaminant transport modeling, Alternative 4G has been selected as the preferred alternative to address groundwater contamination in Area C.

The existing groundwater treatment system will be modified to improve the capture of contaminated groundwater. Modifications to recovery well locations and pumping rates will be implemented as part of the selected action. Also, modifications to improve the effectiveness of the system by adding additional recovery wells to capture the most highly contaminated groundwater and adding free product recovery to enhance recovery of the minor amounts of product which continue to act as a source will be implemented. Additional modifications (4GT1-4GT3) to treatment are also included as part of the selected alternative and could be implemented based on system influent concentrations after recovery system modifications are implemented.

The objectives of the selected action for groundwater are to: 1) protect human health and the environment by reducing the downgradient migration of contaminated groundwater; 2) remediate source areas with the highest concentration of contaminants through the location of additional recovery wells within the plume; and 3) reduce groundwater contamination to ARARs.

The Selected Alternative for Soil

The selected alternative to address the remaining soil contamination at Sites 16 and 17 in Area C is Alternative 4S, Prove-out of Existing Soil Remediation Systems with Modifications Implemented as Needed. In addition, Alternative 2S, Site Restoration, is currently being implemented to eliminate ponding problems in the spray irrigation area and reduce soil erosion.

Based on additional soil sampling at Site 10, the no further action alternative has been selected for this Site.

Through prove-out of the existing treatment facilities for soil vapor extraction at Site 17 and bioventing at Site 10, the Navy can determine the effectiveness of the systems and gather data which can be used to optimize the systems as necessary to accelerate soil remediation.

Optional modifications to these systems are low cost, do not alter the remediation method substantially, and can be implemented quickly.

The objectives of the selected action for soil are to: 1) protect human health and the environment by reducing the levels of contaminants in the soil; 2) remove residual contamination in the soil that was not addressed in the 1993 removal action; and 3) reduce soil contamination to acceptable levels.

STATUTORY DETERMINATIONS

Under CERCLA, the alternative selected must protect both human health and the environment, be cost effective and comply with statutory requirements. Permanent solutions to contamination problems are to be achieved whenever possible.

Based on the consideration of alternatives, Alternatives 4G and 4S have been selected as the preferred alternatives to address the groundwater and soil in Area C for the following reasons:

- The selected alternatives will provide protection of human health and the environment through active treatment of both soil and groundwater. The remedial systems will be designed to meet ARARs. A combination of extensive monitoring and institutional controls will be used to ensure protection of human health.

- The treatment systems described in the selected alternative have already been implemented and will continue to be operated with modifications made to enhance system performance.

- The selected alternatives are cost effective.

RECORD OF DECISION
RESPONSIVENESS SUMMARY
AREA C
NAVAL AIR ENGINEERING STATION

The purpose of this responsiveness summary is to review public response to the Proposed Plan for Area C. It also documents the Navy's consideration of comments during the decision making process and provides answers to any comments raised during the public comment period.

The responsiveness summary for Area C is divided into the following sections:

OVERVIEW - This section briefly describes the remedial alternative recommended in the proposed plan and any impacts on the proposed plan due to public comment.

BACKGROUND ON COMMUNITY INVOLVEMENT - This section describes community relations activities conducted with respect the area of concern.

SUMMARY OF MAJOR QUESTIONS AND COMMENTS - This section summarizes verbal and written comments received during the public meeting and public comment period.

OVERVIEW

Area C is located at the NAES in Ocean County, Lakehurst, New Jersey. This responsiveness summary addresses public response to the Proposed Plan, proposing continued operation of the existing groundwater treatment system with modifications to the recovery system to enhance system performance and prove-out of vapor extraction/bioventing systems to treat soil contamination.

The Proposed Plan and other supporting information are available for public review at the information repository located at the Ocean County Library, 101 Washington Street, Toms River, New Jersey.

BACKGROUND ON COMMUNITY INVOLVEMENT

This section provides a brief history of community participation in the investigation and interim remedial planning activities conducted for Area C. Throughout the investigation period, the USEPA and NJDEP have been reviewing work plans and reports and have been providing comments and recommendations which are incorporated into the appropriate documents. A Technical Review Committee (TRC), consisting of representatives of the Navy, the USEPA, the NJDEP, the Ocean County Board of Health, the New Jersey Pinelands Commission, other agencies and communities surrounding NAES was formed and has been holding periodic meetings to maintain open lines of communication and to inform all parties of current activities.

Prior to public release of site-specific documents, NAES's public relations staff compiled a list of local public officials who demonstrated or were expected to have an interest in the investigation. Local environmental interest groups were also identified and included on this list. The list is attached as Appendix B to this Record of Decision.

On August 24 and 25, 1995, a newspaper notification inviting public comment on the Proposed Plan appeared in The Ocean County Observer and The Asbury Park Press. The public notice summarized the Proposed Plan and the preferred alternative. The announcement also identified the time and location of a Public Meeting and specified a public comment period, and the address to which written comments could be sent. Public comments were accepted from September 5, 1995 through October 5, 1995.

A Public Meeting was held on September 6, 1995, at 7:00 p.m. at the Manchester Branch of the Ocean County Library, Colonial Drive, Manchester, New Jersey. The Area investigations, Area evaluation process and the proposed remedial alternative were discussed. NAES representatives present included: CAPT Leroy

Farr, Commanding Officer; CDR Michael Murtha, Public Works Officer; Lucy Bottomley, Supervisory Environmental Engineer; Dorothy Peterson, Environmental Engineer; Michael Figura, Environmental Engineer; and Carole Ancelin, Public Affairs Officer. Mr. Bob Wing, represented the USEPA's Federal Facility Section; Ms. Donna Gaffigan represented the NJDEP's Bureau of Federal Case Management and Mr. Kevin Schick represented the NJDEP's Bureau of Environmental Evaluation and Risk Assessment. The complete attendance list is provided in Appendix A to this Record of Decision.

SUMMARY OF MAJOR QUESTIONS AND COMMENTS

Written Comments

During the public comment period from September 5, 1995 through October 5, 1995, no written comments were received pertaining to Area C.

Public Meeting Comments

The following is a summary of major questions and comments received at the Public Meeting held on September 6, 1995. A complete transcript of the Public Meeting is provided in the Information Repository at the Ocean County Library, Toms River NJ.

Question No. 1

Has any contamination from Area C gotten into the downgradient stream?

Response

The Paint Branch is located downgradient of Site 16 in Area C. Sampling of this stream during Phase II of the Remedial Investigation (1988) indicated elevated levels of volatile organic compounds (VOCs) in sediment and surface water. Sampling of sediment and surface water during Phase III of the Remedial Investigation (1991) showed no detection of VOC in either sediment or surface water. Additional surface water and sediment samples were taken from the Paint Branch in 1992. The samples indicated that surface water was not being impacted. The results of this additional sampling can be found in the Delineation Report for Area C soil and sediment (April 1993) located in the Administrative Record.

Monitoring wells were placed on the downgradient side of the stream to determine if contamination was migrating past the stream. No contamination was detected in these wells during the remedial investigation. The objective of the interim pump and treat facility started in 1991 in Area C was to prevent the further migration of contaminated groundwater in Area C and to prevent migration into downgradient surface water.

Question No. 2

Mr. Dinkin, a resident of Nicoletti and Johnson Avenues (located approximately 1 1/2 miles east of the base) and his neighbors have identified mercury in their wells. Could the contamination from Area C be the source of this mercury?

Response

The primary contaminants present in Area C are Petroleum Hydrocarbons (PHC) in soil and sediment and VOCs in groundwater. There has not been a source of mercury contamination identified on the base. Mercury is the type of contaminant that is very immobile. It is very difficult to get it to move from one location to another based on the way it is normally found. Mercury is not likely to have migrated over the distance from the base to this residential area.

The new Jersey Department of Environmental Protection (NJDEP) Bureau of Site Management is currently investigating this mercury problem. The NJDEP and U.S. Geological Survey have documented numerous reports of similar types of areas in the Cohansey aquifer and other parts of NEW Jersey where there are low levels of mercury in potable wells with no identifiable source.

Question No. 3

It was mentioned that a large amount of soil was excavated and reused in roads on the base. Is there any chance in the future as those roads disintegrate that any of the contamination will reenter the soil?

Response

The use of this technology has been used extensively in New York State and other states, but NAES is the first in New Jersey to use this technology with petroleum contaminated soils. Asphalt is basically sand mixed with a petroleum emulsion. What NAES has done is taken soil that already had a petroleum aspect to it and actually added more of an asphalt-based emlsion to it.

Laboratory testing performed on the asphalt produced indicated that the emulsion binds the contaminants so that none can leach out. The excavated material was used as road base material, mixed to meet DOT standards. A wearing course or a hot asphalt layer was added above the emulsion base. This layer is a very good wearing layer and acts as a cap to cover the base material. The materials used to produce the roads meet all the same DOT specifications as the roads you see normally.

Question No. 3

Mr. Blackwell Albertson, a resident of Beckerville Road, expressed concern about Area I&J.

Response

Since this public meeting was held to present the final actions for Area C and Area H, Mr. Albertson was requested to hold his question concerning Area I&J until the Restoration Advisory Board (RAB) meeting to be held on 13 September 1995. The minutes from this meeting are included in the Administrative Record as an attachment to the NPL minutes.

Appendix A

Attendance List for Public Meeting Held
September 6, 1995

<IMG SRC 0296270C>
<IMG SRC 0296270C>

updated 9-13-95

APPENDIX B
LIST OF CONCERNED PARTIES

Naval Air Engineering Station - Lakehurst

Captain L. Farr (908) 323-2380
Commanding Officer
Naval Air Engineering Station
Lakehurst, NJ 08733-5000

Ms. Carole Ancelin, Public Affairs (215) 595-0555
Naval Air Engineering Station
Lakehurst, NJ 08733-5000

Commander Mike Murtha (908) 323-2601
Public Works Officer
Naval Air Engineering Station
Lakehurst, NJ 08733-5000

Northern Division, Naval Facilities Engineering Command

Mr. Lonnie Monaco (215) 595-0555
Northern Division
Naval Facilities Engineering Command
Code 182
10 Industrial Highway
Mail Stop 82
Lester, Pa 19113-2090

Federal Elected Officials

Senator William Bradley (908) 688-0960
1705 Vauxhall Road
P.O. Box 1720
Union, NJ 07083

Senator Frank R. Lautenberg (609) 757-5353
208 White Horse Pike
Suite 18-19
Barrington, NJ 08007

Congressman Christopher H. Smith (908) 350-2300
100 Lacey Road
Suite 38A
Whiting, NJ 08759

Congressman Frank Pallone, Jr. (201) 571-1140
540 Broadway
Room 118
Long Branch, NJ 07740

State Elected Officials

Senator Leonard T. Connors, Jr. (609) 693-6700
620 West Lacey Road
Forked River, NJ 08731

Assemblyman Jefferey Moran (609) 696-6700
620 West Lacey Road
Forked River, NJ 08731

Assemblyman Christopher J. Connors (609) 693-6700
620 West Lacey Road
Forked River, NJ 08731

Assemblywoman Marlene L. Ford (908) 899-1208
2611 Spruce Street
Point Pleasant, NJ 08742

U.S. Environmental Protection Agency Officials

Ms. Laura Livingston (212) 264-6723
Federal Facilities Coordinator
Room 1104
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, NY 10278

Mr. Steven Katz (212) 264-2515
Superfund Community Relations Coordinator
U.S. Environmental Protection Agency
Region II
External Programs Division, Room 905
26 Federal Plaza
New York, NY 10278

Other Federal Agencies

Mr. Steve Aoyama (404) 639-6070
Agency for Toxic Substances and
Disease Registry
1600 Clifton Road
Mail Stop E-56
Atlanta, GA 30333

Commanding Officer
Attn: Joyce Patterson
NEESA Code 112E2
1001 Lyons St. Suite 1
Port Hueneme, CA 93043-4340

New Jersey Pinelands Commission

Mr. Todd DeJesus (609) 894-9342
The Pinelands Commission
P. O. Box 7
New Lisbon, NJ 08064

Ocean County Officials

Mr. Alan W. Avery, Jr., Commissioner (908) 929-2054
Ocean County Planning Board
P. O. Box 2191
Toms River, NJ 08754

Mr. Joseph H. Vicari, Director (908) 244-2121
Ocean County Board of Freeholders
P. O. Box 2191
Toms River, NJ 08754

Mr. Joseph Przywara, Coordinator (908) 341-9700
Ocean County Health Department
Environmental Health
2191 Sunset Avenue
Toms River, NJ 08753

Mr. A. Jerome Walnut, Chairman (908) 505-3671
Ocean County Environmental Agency
1623 Whitesville Road
Toms River, NJ 08754

Manchester Township Officials

Hon. Jane Cardo Cameron (908) 657-8121
Mayor of Manchester Township
One Colonial Drive
Lakehurst, NJ 08733

Mr. Wynn A. Mauer, Chairman
Manchester Township Municipal Utilities Authority
One Colonial Drive
Lakehurst, NJ 08733

Mr. William Jamieson, Jr., Chairman
Manchester Township Environmental Commission
One Colonial Drive
Lakehurst, NJ 08733

Jackson Township Officials

Mr. Richard Bizub, Chairman (908) 928-0900
Jackson Township Environmental Commission
128 Willow Drive
Jackson, NJ 08527

Borough of Lakehurst Officials

Hon. Alton Tilton (908) 657-4141
Mayor of Lakehurst Borough
5 Union Avenue
Lakehurst, NJ 08733

Mr. Robert J. Morris (908) 758-2241
Municipal Clerk, Borough of Lakehurst
5 Union Avenue
Lakehurst, NJ 08733

Pumsted Township Officials

Hon. Ronald S. Dancer (609) 758-2241
Mayor of Plumsted Township
P.O. Box 398
New Egypt, NJ 08533-0398

Community Groups and Interested Citizens

Pine Lake Park Association (908) 341-3653
1616 Seventh Avenue
Toms River, NJ 08757

Mr. Holmes Ertley (908) 657-4690
699C Friar Court
Lakehurst, NJ 08733

Mr. John Lewis (908) 657-1890
315 Beckerville Road
Lakehurst, NJ 08733

Ms. Candy Vesce
733 Sixth Ave.
Pine Lake Park
Toms River, NJ 08733

Ms. Theresa Lettman (609) 893-4747
Pinelands Preservation Alliance
120-34B White Bogs Road
Browns Mills, NJ 08015

Ms Susan Marshall
1716 Ninth Ave.
Toms River, NJ 08757

Ms Gisela Tsambikou
1162 Beacon St.
Pine Lake Park
Toms River, NJ 08757

Mr. Dieter Rand
3288 Johnson Ave.
Lakehurst, NJ 08733

Mr. & Mrs. Blackwell Albertson
135 Beckerville Rd.
Lakehurst, NJ 08733

Heritage Minerals, Inc.
Attn: Ms. Adele Hovnanian
One Hovchild Plaza
4000 Route 66
Tinton Falls, NJ 08527

Chuck Lindstrom
526-D Crescent Ave.
Jackson, NJ 08527

Ben Epstein
Ocean County Citizens for Clean Water
2230 Agin Court Road
Toms River, NJ 08733

Media Organizations

Advance News (908) 657-8936
2048 Route 37 West
Lakehurst, NJ 08733

Alyn Ackerman 1-800-822-9770
Asbury Park Press
3601 Highway 66
P.O. Box 1550
Neptune, NJ 07754-1550

Ms. Debra Coombe (908) 244-7171
Neward Star Ledger
44 Washington Street
Toms River, NJ 08753

New Egypt Press (609) 758-2112
37 Main Street
P.O. Box 288
New Egypt, NJ 08533

Ocean County Leader (908) 899-1000
P.O. Box 1771
Point Pleasant Beach, NJ 08742

Ms. Lisa Peterson (908) 793-0147
Ocean County Review
P.O. Box 8
Seaside Heights, NJ 08751

Ocean County Reporter (908 349-1501
8 Robbins Street
P.O. Box 908
Toms River, NJ 08753

Mr. Sam Christopher (908) 349-3000
Ocean County Observer
8 Robbins Street
CN 2449
Toms River, NJ 08753

RADIO

Mr. Shawn Marsh (908) 774-7700
WJLK Radio
Press Plaza
Asbury Park, NJ 07712

Ms. Joan Jones (908) 270-5757
WJRZ Radio
22 West Water Street
P.O. Box 100
Toms River, NJ 08754

Mr. Doug Doyle (908) 269-0927
WOBM Radio
U.S. Highway 9
Bayville, NJ 08721

Mr. Gary Myervich (908) 341-8818
Adelphia Cable
830 Highway 37 West
Toms River, NJ 08753

Mr. Abi Montefiore (908) 681-8222
Monmouth Cable
P.O. Box 58
Belmar, NJ 07719

Federal and State Case Managers

Mr. Jeffrey Gratz, Project Manager (212) 264-6667
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, Room 2930
New York, NY 10278

Ms. Donna Gaffigan, Case Manager (609) 633-1455
Bureau of Federal Case Management, CN 028
New Jersey Department of Environmental
Protection and Energy
401 East State Street
Trenton, NJ 08625-0028

Ms. Linda Welkom, Geologist (609) 292-8427
Bureau of Environmental Evaluation
and Risk Assessment
New Jersey Department of Environmental
Protection and Energy
401 East State Street
Trenton, NJ 08625

<IMG SRC 0296270 E>
<IMG SRC 0296270 F>
<IMG SRC 029670 G>
<IMG SRC 029670 H>
<IMG SRC 029670 I>
<IMG SRC 029670 J>
<IMG SRC 029670 K>
<IMG SRC 029670 L>
<IMG SRC 029670 M>