



Public Health Assessment for

**NAVAL WEAPONS STATION EARLE (NWSE)
COLTS NECK, NEW JERSEY
EPA FACILITY ID: NJ0170022172
AUGUST 24, 2006**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE**

Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

In 1986, ATSDR was authorized by Superfund to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR may conduct public health assessments when petitioned by concerned individuals or requested by other local, state, or federal agencies. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment process allows ATSDR scientists and public health assessment cooperative agreement partners flexibility in document format when presenting findings about the public health impact of hazardous waste sites. The flexible format allows health assessors to convey to affected populations important public health messages in a clear and expeditious way.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to evaluate possible the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is distributed to the public for their comments. Comments received during the public comment period and that are related to the document are summarized and addressed in the final version of the report.

Conclusions: The report presents conclusions about the public health threat posed by a site. Ways to stop or reduce exposure will then be recommended in the public health action plan. ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA or other responsible parties. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also recommend health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

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List of Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CDC	Childhood Development Center
COCs	contaminants of concern
CV	comparison value
DOD	Department of Defense
DON	Department of Navy
EMEG	environmental media evaluation guide (ATSDR)
EPA	U.S. Environmental Protection Agency
FFA	federal facilities agreement
IAS	Initial Assessment Study
IRP	Installation Restoration Program
MCL	EPA's maximum contaminant level
MRL	ATSDR's minimal risk level
NACIP	Navy Assessment and Control of Installation Pollutants
NJDFW	New Jersey Department of Fish and Wildlife
NEESA	Navy Energy and Environmental Support Activity
NPL	National Priorities List
NWSE	Naval Weapons Station Earle
OU	operable unit
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
PHA	public health assessment
ppb	parts per billion
ppm	parts per million
RBC	EPAs Region III risk-based concentrations
RCRA	Resource Conservation and Recovery Act
RDX	royal demolition explosive (i.e., cyclotrimethylenetrinitramine)
RfD	reference dose (EPA)
RMEG	reference media evaluation guide (ATSDR)
ROD	record of decision
SSA	site screening assessment area
SVOC	semi-volatile organic compound
TCE	trichloroethylene
TNT	trinitrotoluene
TPH	total petroleum hydrocarbons
TRC	Technical Review Committee
VOC	volatile organic compound

Summary and Statement of Issues

The Agency for Toxic Substances and Disease Registry (ATSDR) prepared this public health assessment (PHA) to evaluate potential health hazards associated with past, current, and future exposures to contaminants originating from Naval Weapons Station Earle (NWSE). ATSDR evaluated potential exposures to contaminants from NWSE, primarily from off-site migration of sediments and surface water, and has not found any completed exposure pathways that would result in adverse health effects.

NWSE borders on the New Jersey townships of Colts Neck, Wall, Howell, Tinton Falls and Middletown. NWSE comprises two areas, the 10,248-acre Main Base (Mainside area), located approximately 10 miles inland and the 706-acre waterfront area. The two areas are connected by a Navy-controlled right-of-way. Since its commission in 1943 the primary mission of NWSE has been to supply ammunition to the naval fleet. A variety of munitions-related items (e.g., high explosives, small arms, and gun powder) are stored at NWSE. NWSE personnel transport weapons and ordnance to the waterfront piers by rail, but most of the materials entering the station are transported by truck or tractor-trailer. Most of the munitions at the station are stored at several secure locations throughout the Mainside area.

Operations at NWSE have generated a variety of waste products, largely from the burial of waste in unlined pits or landfills. These wastes include solvents, paints, and metals and explosives from unserviceable munitions, packing material, and wood products. Since 1982, site investigations have been conducted at NWSE to evaluate areas of potential environmental concern. During the 1992 Initial Assessment Study (IAS), a total of 29 potentially hazardous sites were identified at NWSE. In 1990, NWSE was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL). As part of the remediation process, on-site landfills have been or are being capped and groundwater underneath known contaminated sources is routinely monitored. In addition, there have been removal actions at several of the IRP sites since investigations began.

ATSDR's public health assessment process is designed to identify populations who may have been or are being exposed to hazardous substances and determine the public health implications of the exposure. As part of this process, a preliminary health assessment for NWSE was released in November 1988. At the time, ATSDR concluded that not enough data were available to adequately make a public health hazard determination for NWSE. ATSDR conducted an initial site scoping visit in 1991; activities included meeting with site personnel and touring the station. ATSDR conducted a second site visit to NWSE on March 21-22, 2005. During this visit ATSDR met with NWSE personnel, toured the station, and received updates on the progress of environmental investigations and remedial activities for the station.

Based on an evaluation of available data for NWSE, ATSDR has not identified any situations that pose a public health hazard. Many of the original source areas of contamination have been removed and any existing areas of contamination do not pose a significant hazard because they are not easily accessible and people would not be expected to come in frequent contact with them. ATSDR evaluated surface water and sediment on NWSE to determine the potential for human exposure. ATSDR concluded the following:

- ***Potential exposures from contaminated surface waters or sediments migrating off site.***

Past Exposure: *ATSDR concludes that surface water or sediments migrating off of NWSE property did not pose a public health hazard in the recent past (i.e., since the early 1990s). Sufficient information is not available to make a public health determination for exposures that may have occurred prior to the early 1990s. Sampling results from the 1990s have not identified high levels of persistent compounds such as heavy metals, PCBs, or chlorinated pesticides in locations where the potential for off-site migration is high. ATSDR's evaluation indicates that it is unlikely contamination at levels of health concern migrated off site in the recent past.*

Current and Future Exposure : *ATSDR concludes that surface water or sediments migrating off of NWSE property pose no current or future public health hazard. On the basis of ATSDR's review of the chemical data, hydrogeological conditions, and remedial actions conducted to remove source areas of contamination, ATSDR concludes that none of the 15 IRP sites closest to NWSE streams flowing off site are currently, or in the future, likely to significantly impact human health. The results of recent surface water sampling for metals, PCBs, and pesticides, conducted in 2003 and 2004, indicate that harmful levels of these contaminants are not migrating off site.*

Background

Site Description and History

Naval Weapons Station Earle (NWSE) is a primary East Coast Fleet Support Activity facility that provides ammunition to Navy, Marine Corps, and Coast Guard units in the northeastern United States. NWSE is located in Monmouth County, New Jersey, approximately 47 miles south of New York City (Figure 1). NWSE borders on the New Jersey townships of Colts Neck, Wall, Howell, Tinton Falls and Middletown (NWSE 1999). It comprises two areas, the 10,248-acre Main Base (Mainside area), located approximately 10 miles inland (Figure 2), and the 706-acre waterfront area (Figure 3). The two areas are connected by Navy-controlled right-of-way consisting of a 13.1-mile road and rail corridor (NWSE 1999; Tetra Tech 1998).

NWSE was originally commissioned in 1943. The station was most active during World War II when a large portion of the ammunition and explosives used in Europe were shipped from this facility. After World War II, activities at the station decreased in response to reduced demands for munitions (NWSE 1999).

The primary mission of NWSE is to supply ammunition to the naval fleet. Over 90 percent of the land at NWSE is dedicated to the storage, maintenance, renovation, and control of munitions and delivery of ordnance. The station also performs other services mostly related to the storage and transport of munitions (Tetra Tech 2004). In addition to ordnance operations, the station also hosts non-ordnance related tenant operations and various support functions (e.g., supply, fleet maintenance, and public works) (NWSE 1999). The Navy transports weapons and ordnance to the waterfront piers by rail, but most of the materials entering the station are transported by truck or tractor-trailer (Cultural Resource Group 1996).

Most of the munitions at the station are stored in magazines (i.e., bunker-like structures often designed for storing weapons and ammunitions) that are typically aligned in multiple rows at several locations throughout the Mainside area. The magazines were used to store a variety of munitions-related items such as high explosives, small arms, fuses and detonators, and black powder. In addition to these conventional munitions a limited number of missiles were stored in the north-central portion of the station for a short time during the mid-1950s (Cultural Resource Group 1996).

The Mainside administration and housing area and the waterfront administration area are the only areas on site that are not dedicated to ordnance activities or within the safety buffers that surround the ordnance areas. These two areas, not restricted by safety requirements, are used for offices, base support, housing, and recreational facilities (Brown & Root 1996).

Operations at NWSE have generated a variety of waste products, largely from ordnance activities and to a lesser extent from other support operations. These wastes include solvents, blasting grit or shot, paints, and metals and explosives from unserviceable munitions, packing material, and wood products. Other non-ordnance wastes include oils and small amounts of pesticides, degreasers, acids, metal scrap and dunnage (i.e., any material, such as boards, planks, or blocks, used in transportation and in storage to support and secure supplies) (NWSE 1999).

Remedial and Regulatory History

The Navy Assessment and Control of Installation Pollutants (NACIP) Program was developed by the Department of the Navy during the early 1980s to identify and control environmental contamination from past use and disposal of hazardous wastes at Navy installations. The NACIP Program is part of the Department of Defense (DOD) Installation Restoration Program (IRP). Environmental investigations and remedial activities at NWSE are being conducted through the DOD's IRP.

Past disposal methods at NWSE consisted mostly of burial of waste in unlined pits or landfills. This method of waste disposal resulted in contamination of the soil, surface water, sediments, and ground water. Since 1982, site investigations have been conducted at NWSE to evaluate areas of potential environmental concern (Brown & Root 1996).

In 1982, an Initial Assessment Study (IAS) was conducted. During the IAS a total of 29 potentially hazardous sites were identified at NWSE based on information from historical records, aerial photographs, field inspections, and personnel interviews (Hart Associates 1983). Numerous site investigations have been conducted since the IAS in order to characterize the nature and extent of contamination at NWSE (Tetra Tech 2003).

NWSE was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) in September 1990. In January 1991, EPA Region II entered into a Federal Facilities Agreement (FFA) with the Navy for NWSE. The primary purpose of the FFA is to ensure that environmental impacts associated with past and present activities at NWSE are addressed and that appropriate CERCLA Response/Resource Conservation and Recovery Act (RCRA) corrective actions are taken to protect public health and the environment (Weston 1993).

During the IRP process areas of contamination are designated as sites or site screening assessment (SSA) areas. Additionally, the multiple sites can be divided into a number of operable units (OUs). OUs may be grouped on the basis of geography, specific site-related issues, or initial phases of an action. OUs may also consist of any set of actions performed over time or any actions that are concurrent, but located in different parts of a site. IRP sites at NWSE have been grouped into nine OUs comprising sites with similar characteristics.

- OU 1: Includes Site 4 (Landfill West of "D" Group) and Site 5 (Landfill West of Army Barricades).
- OU 2: Site 19 (Paint Chip and Sludge Disposal Area Adjacent to Building S-34).
- OU 3: Site 26 (Explosive "D" Washout Area, Building GB-1).
- OU 4: Includes Site 14 (Defense Property Disposal Office Warehouse); Site 20 (Grit Blasting Disposal Area at Building 544); Site 22 (Paint Chip Disposal Area Adjacent to Building D-2); Site 23 (Paint Chip Disposal Area Adjacent to Building D-5); Sites 24/25 (Closed Pistol Ranges); Site 27 (Projectile Refurbishing Area); and Site 29 (PCB Spill Site, Building C-16).
- OU 5: Includes Site 13 (Defense Property Disposal Office yard).

- OU 6: Includes Site 3 (Landfill Southwest of “F” Group) and Site 10 (Scrap Metal Landfill near Building S-589).
- OU 7: Site 26 (tetrachloroethylene [PCE] groundwater plume).
- OU 8: Includes Site 1 (Ordnance Demilitarization Site) and Site 11 (Contract Ordnance Disposal Area).
- OU 9: Includes Site 17 (Disposal Area Behind Training Barge [Waterfront Area] (Brown & Root 1997a; 1998c; Tetra Tech 1998; 2004).

In addition to the sites listed within the OUs above, there are also other IRP sites that the Navy has not placed into OUs. Figures 2 and 3 show the location of IRP sites identified at NWSE. Appendix A provides a description of all the sites identified at NWSE along with significant findings associated with environmental investigations, corrective actions taken, and ATSDR’s evaluation of public health hazards.

As part of the remediation process, on-site landfills have been or are being capped and groundwater underneath known contaminated sources is routinely monitored. In addition, there have been removal actions at several of the IRP sites since investigations began (Appendix A).

ATSDR Involvement

A preliminary health assessment for NWSE was released in November 1988. At the time, ATSDR concluded that not enough data were available to adequately make a public health hazard determination for NWSE. No completed exposure pathways and no community health concerns were identified during the initial site visit (ATSDR 1988).

ATSDR conducted an initial site scoping visit in August 1991. During the initial visit ATSDR met with Navy personnel, toured the station, and attended a technical review committee (TRC) meeting on August 13, 1991. In addition, ATSDR also contacted the County Health Commissioner and Middleton Township Health Department regarding any community concerns associated with NWSE (ATSDR Site Files. Reviewed May 2005).

ATSDR conducted a second site visit to NWSE on March 21-22, 2005. During this visit ATSDR met with NWSE personnel and received updates on the progress of environmental investigations and remedial activities for the station, toured the station, and conducted record reviews at the Monmouth County Public Library.

Demographics

ATSDR examines demographic information to identify the presence of sensitive populations, such as young children and the elderly, in the vicinity of a site. Demographics also provide details on residential history in a particular area, information that helps ATSDR assess time frames of potential human exposure to contaminants. Demographic information for the site and residential areas surrounding NWSE is presented in this section.

NWSE borders on the Monmouth County townships of Colts Neck, Wall, Howell, Tinton Falls, and Middletown. The waterfront portion of the station is also within the town of Leonardo. The

population of Monmouth County has increased by about 11 percent between 1990 (553,124) and 2000 (615,301), with an estimated 2004 population of almost 636,300. According to the 2000 U.S. Census, the population of Colts Neck was 12,331. The township has experienced just over 44 percent population growth since 1990, which is considerably above the average growth of 11 percent for the County (U.S. Bureau of Census 2000).

According to the 2000 U.S. Census, the populations of Howell (48,903), Wall (25,261), and Tinton Falls (15,053) have all experienced population growth ranging from 22 percent to as high as 44 percent between 1990 and 2000. Middletown (66,237) was the only place that lost population since the 1990 census (Bureau of the Census 2000).

According to the 2000 U.S. Census, there are 29,398 people within a one-mile radius of NWSE (Figure 1). The 706-acre waterfront area is more densely populated with an estimate of 14,539 people within a one-mile radius compared to the 10,248-acre Mainside area with an estimated population of 14,894 (Figure 1) [NWSE 2005a].

NWSE has four on-base family housing areas with approximately 600 on-base residents in total. The housing areas were built between 1944 and 1990. There are also two old single dwellings used for military housing on Highway 34. These two dwellings were built before NWSE was commissioned in 1943. The largest housing area is the Stark Road (700) Area, which was built in 1989. It contains a total of 85 units and approximately one-half of all on-base residents with a population of over 300 (NWSE 2005b). During the March 2005 site visit, ATSDR observed many unoccupied units. According to NWSE personnel, reduced operations and subsequent redeployment of military personnel to other facilities have resulted in substantially reduced demand for on-base housing. There are currently 1,435 active duty, reservist, and civilian personnel stationed at NWSE with an average tour of duty of three or four years.

A Child Development Center (CDC) is located on site and was built in 1993. The center enrolls children between the ages of 6 weeks and 5 years. Most of the playgrounds and equipment have been recently updated and meet all current child safety standards. Most of the play areas are located near the family housing areas and are not near the industrial or other restricted portions of the station. There are many recreational facilities available to families stationed at NWSE, including tennis courts, baseball fields, a jogging track, and bowling alley. There are no schools on NWSE property.

Land Use, Topography, and Natural Resources

NWSE is located in the coastal lowlands of Monmouth County, New Jersey, within the Atlantic Coastal Plain Physiographic Province. The Mainside area lies in the outer Coastal Plain, approximately 10 miles inland from the Atlantic Ocean. The waterfront area lies on the southern coast of Sandy Hook Bay along the Atlantic shoreline (Brown & Root 1996).

Most of the immediate (i.e., within one-half mile) land area surrounding the Mainside portion of NWSE is comprised of industrial (e.g., Monmouth County Reclamation Center) and non-residential (e.g., golf courses and parks) uses. Some residential areas are located between Yellow Brook and Neck Road, immediately south of the station boundary, and near the main gate along

the north-central boundary of the station. There are also residential areas just to the east of the station in Tinton Falls (Brown & Root 1996).

The Mainside area comprises two primary land use areas: 1) the administrative, residential, and industrial area; and 2) the ordnance storage and operations area. A large number of buildings are located in the administrative, residential, and industrial area. The administrative buildings, on-site housing, and recreational facilities are generally situated on the western side of this area whereas most of the industrial facilities are to the east (Cultural Resource Group 1996). Most of the land at the Mainside area is undeveloped comprising a mix of vegetated grassy areas and medium and large growth forest (Brown & Root 1996). During the March 2005 site visit, ATSDR observed that many of the IRP sites were heavily vegetated with few signs of current activity. The majority of IRP sites are located at the Mainside area as shown on Figure 2.

The waterfront area occupies a long strip of land perpendicular to the shoreline (Figure 3). It contains the Ordnance Department that provides ammunition for ships operated by the Navy and Coast Guard and a pier that extends 2.2 miles into Sandy Hook Bay. Much of the area consists of swamp or tidal marsh and a small portion of property has also been filled in. IRP sites 6, 12, 15, and 17 are closest to the waterfront. Another parcel of land that connects to the waterfront area is often referred to, separately from the waterfront area, as Chapel Hill. Chapel Hill is a polygonal shaped area that is approximately one mile from the water and is connected to the narrow waterfront area by a private road and rail line. Three of the station's IRP sites (7, 8, 9) are located within this parcel of land (NWSE 2001; Weston 1994).

NWSE consists of gentle hills separated by meadows and low-lying wetlands. The Mainside and waterfront areas are relatively flat, with elevations ranging from approximately 100 to just over 300 feet above mean sea level (MSL) within the Mainside area and around 10 feet above MSL at the shoreline waterfront area. The Chapel Hill area has some steep slopes and elevations ranging from 100 to 200 feet above MSL (Tetra Tech 1998; NWSE 2001).

The only significant fishing activity at NWSE occurs along the pier complex at the waterfront facility. Saltwater fishing at the waterfront piers follows all pertinent New Jersey game and fish laws. A fishing pass must be obtained in order to fish from the NWSE piers. All authorized personnel (this includes active duty military assigned to NWSE; civilian or NWSE employees; station retirees, both civilian and military; and reservists during active duty periods at NWSE) who obtain a fishing pass must log in and out at the pier post at the beginning and end of each fishing day (NWSE 2001).

There are very few freshwater ponds that are suitable for fishing at NWSE. Most of the ponds are very shallow and do not support commonly-consumed fish species. Consequently, there is minimal freshwater fisheries management at the station (NWSE 2001).

Hunting is allowed on some portions of NWSE property. However, there are strict regulations that are enforced by site personnel. The current hunting program follows the New Jersey game laws and the recommendations of the New Jersey Division of Fish and Wildlife (NJDFW). Authorized hunters must attend an orientation session with NWS Earle security personnel and have a valid New Jersey hunting license before hunting season begins. Off site residents are not allowed to hunt at NWSE unless they work at the station. A hunting brochure was developed for

distribution to all current and potential hunters outlining specifically who is allowed to hunt at the station. The brochure outlines the policies, procedures, and hunting locations (NWSE 2001).

All facilities located in the Mainside portion of the station are connected to a municipal water supply (New Jersey American Water Company). Water for the municipal supply network comes from surface water intakes, reservoirs, and deep wells. No public water supply wells or surface water intakes are located on the NWSE property. In the past, two deep water supply wells were used as potable water sources for the Mainside area of NWSE. Both these wells were screened in the Raritan-Magothy aquifer at depths of approximately 800 feet below ground surface. These two wells are no longer in service. The recharge for this aquifer is located several miles north and west of the Mainside portion of NWSE (Weston 1994).

Potable water is supplied in areas surrounding the Mainside station by a combination of municipal water and private wells. There are a number of private wells located within a 1-mile radius of NWSE and several within the NWSE boundaries. The majority of the off-site wells are used for domestic purposes. A large concentration of private wells is located immediately west of the station (Brown & Root 1998c). The NWSE wells are primarily used for industrial purposes and are not a source of drinking water or used for domestic purposes (e.g., cooking or showering) (Alicia Hartman, Deputy Environmental Storefront Manager, NWSE. Personal Correspondence, June 2, 2005).

Hydrogeology

Groundwater: There are five principle coastal plain aquifers and three smaller “minor” aquifers in the region. The five principle regional aquifers include, 1) the Kirkwood-Cohansey aquifer system, 2) the Atlantic City 800-foot sand, 3) Wenonah-Mount Laurel aquifer system, 4) the Englishtown aquifer, and 5) the Potomac-Raritan-Magothy aquifer system. There are three minor Coastal Plain aquifers. These include, 1) Piney Point Aquifer, 2) Vincentown Aquifer, and 3) the Red Bank Sand Aquifer. With the exception of Kirkwood-Cohansey aquifer, all of these aquifers are either confined or semi-confined, with the confining layer typically consisting of clay and silt. The maximum thickness of these aquifers is 720 feet, with an average thickness of 340 feet. (Brown & Root 1998c; NWSE 2001).

The Mainside area is situated in the recharge area of the Kirkwood-Cohansey principle aquifer and the Vincentown aquifer. The waterfront area is situated in the recharge area of the Wenonah-Mount Laurel aquifer system (Brown & Root 1998c). Although these aquifers are not used for public water systems in the areas immediately surrounding the station, they are used for both private and public water supply in the New Jersey Coast area east of the Mainside area and for domestic use in areas without public water systems near the station. The recharge areas for the Raritan-Magothy aquifer, which lies under the Mainside area of NWSE, is located several miles north and west of the Mainside area and it is not expected that site-related contaminants would have a significant impact on this aquifer (Weston 1994).

Surface Water: The NWSE Mainside area is divided into three primary drainage basins (Swimming, Manasquan, and Shark Rivers) that have headwaters on NWSE. Marsh Bog and Mingamahone Brooks and tributaries of the Manasquan River drain the southern portion of the Mainside station. The Shark River drains the southeastern portion and the Mine, Yellow Brook North, Hockhockson, and Pine brooks drain the northern portion of the Mainside area (NWSE 2001). The Hockhockson Brook joins Pine Brooks north of NWSE; Pine Brook enters Swimming River downstream of Swimming River Reservoir and then to Navesink River. The rivers originating on the Mainside area are listed in Table 2. Basically, the streams in the northern portion of NWSE drain northward and the streams in the southern portion drain southward. The drainage pattern results from low hills trending northeast/southwest (referred to as Hominy Hills) in the central part of Mainside station which create a surface water divide (Figure 2). Rivers and brooks draining NWSE ultimately discharge to the Atlantic Ocean.

Three of the streams draining portions of the station are tributaries to rivers used for surface water reservoirs.

- The northwest corner of the station drains into Mine Brook and Yellow Brook North, which flow to the Swimming River Reservoir.
- The southeast portion of the station drains to the Shark River, water source for the Glendola Reservoir.
- The Manasquan River tributaries, draining south from the base, are a source of water for the Manasquan River reservoir in Howell Township.

There are approximately 32.25 acres of open water on NWS Earle. In addition to the freshwater streams/brooks within the Mainside station boundary, there are springs and small brooks feeding the 11 ponds that make up the area. All of these ponds are man-made and are fairly shallow. Surface water drainage from the waterfront area enters Sandy Hook Bay directly (Figure 3) and through Compton, Ware, and Wagner Creeks. None of these creeks are used for drinking or domestic water supply. There are also approximately 3,000 acres of wetlands on NWSE property. There are no current plans to develop any of these wetland areas (NWSE 2001).

Quality Assurance and Quality Control

In preparing this PHA, ATSDR reviewed and evaluated information provided in the referenced documents. Documents prepared for the CERCLA program must meet standards for quality assurance and control measures for chain-of-custody, laboratory procedures, and data reporting. The environmental data presented in this PHA come from site characterization, remedial investigation, and monitoring reports prepared by NWSE (and their contractors) under CERCLA and/or RCRA. Based on our evaluation, ATSDR determined that the quality of environmental data available for NWSE is adequate for making public health decisions.

ENVIRONMENTAL CONTAMINATION, HUMAN EXPOSURE PATHWAYS, AND PUBLIC HEALTH IMPLICATIONS

In this section, ATSDR evaluates whether community members have been (past), are (current), or will be (future) exposed to harmful levels of chemicals. Figure 4 describes the exposure evaluation process used by ATSDR. ATSDR screens the concentrations of contaminants in environmental media (e.g., groundwater or soil) against health-based comparison values (CVs). Because CVs are not thresholds of toxicity, environmental levels that exceed CVs would not necessarily produce adverse health effects. If a chemical is found in the environment at levels exceeding its corresponding CV, ATSDR estimates site-specific exposure and evaluates the likelihood of adverse health effects. *ATSDR emphasizes that a public health hazard exists only if exposure to a hazardous substance occurs at sufficient concentration, frequency, and duration for harmful effects to occur.*

What is meant by exposure?

ATSDR's PHAs evaluate the potential for human exposure or contact with environmental contaminants. Chemical contaminants released into the environment have the potential to cause adverse health effects. However, *a release does not always result in human exposure*. People can only be exposed to a contaminant if they come in contact with it—if they breathe, eat, drink, or come into skin contact with a substance containing the contaminant.

How does ATSDR determine which exposure situations to evaluate?

ATSDR scientists evaluate site conditions to determine if people could have been, are, or could be exposed (i.e., exposed in a past scenario, a current scenario, or a future scenario) to site-related contaminants. When evaluating exposure pathways, ATSDR identifies whether exposure to contaminated media (soil, sediment, water, air, or biota) has occurred, is occurring, or will occur through ingestion, dermal (skin) contact, or inhalation.

If exposure was, is, or could be possible, ATSDR scientists consider whether contamination is present at levels that might affect public health. ATSDR scientists select contaminants for further evaluation by comparing them against health-based comparison values (CVs). These are developed by ATSDR from available scientific literature related to exposure and health effects. CVs are derived for each of the different media and reflect an estimated contaminant concentration that is *not likely* to cause adverse health effects for a given chemical, assuming a standard daily contact rate (e.g., an amount of water or soil consumed or an amount of air breathed) and body weight. See text box on next page and Appendix B for a list of CVs Used by ATSDR.

If someone is exposed, will they get sick?

Exposure does not always result in harmful health effects. The type and severity of health effects a person can experience as a result of contact with a contaminant depend on the exposure concentration (how much), the frequency and/or duration of exposure (how long), the route or

pathway of exposure (breathing, eating, drinking, or skin contact), and the combined effects of exposure to multiple substances.

Once exposure occurs, characteristics such as age, sex, nutritional status, genetics, lifestyle, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. Together, these factors and characteristics determine the health effects that may occur.

In almost any situation, there is considerable uncertainty about the true level of exposure to environmental contamination. To account for this uncertainty and to be protective of public health, ATSDR scientists typically use worst-case exposure level estimates as the basis for determining whether adverse health effects are possible. These estimated exposure levels usually are much higher than the levels that people are really exposed to. If the exposure levels indicate that adverse health effects are possible, ATSDR performs a more detailed review of exposure, also consulting the toxicologic and epidemiologic literature for scientific information about the health effects from exposure to hazardous substances.

What potential exposure concerns were evaluated for NWSE?

Following the strategy outlined above, ATSDR reviewed the environmental data generated from environmental investigations conducted at NWSE to identify past, current, or future public health hazards. This included soil, sediment, groundwater, and surface water sampling data as well as assessing potential physical hazards associated with munitions or other explosive materials.

ATSDR identified one potential exposure concern associated with site-related contaminants at NWSE requiring further evaluation:

About ATSDR's Comparison Values (CVs)

CVs are not thresholds for adverse health effects. ATSDR CVs represent contaminant concentrations many times lower than levels at which no effects were observed in experimental animals or human epidemiologic studies. If contaminant concentrations are above CVs, ATSDR further analyzes exposure variables (for example, duration and frequency of exposure), the toxicology of the contaminant, other epidemiology studies, and the weight of evidence for health effects. Some of the CVs used by ATSDR scientists include:

EMEGs — environmental media evaluation guides
RMEGs — reference dose media evaluation guides,
CREGs — cancer risk evaluation guides, and
MCLs — EPA's maximum contaminant levels (MCLs).

EMEGs, RMEGs, and CREGs are non-enforceable, health-based CVs developed by ATSDR for screening environmental contamination for further evaluation. EPA's MCLs are enforceable drinking water regulations developed to protect public health.

You can find out more about the ATSDR evaluation process by reading ATSDR's Public Health Assessment Guidance Manual at:
<http://www.atsdr.cdc.gov/HAC/HAGM/>, or contacting ATSDR at 1-888-42ATSDR.

- *Potential exposures from contaminated surface waters or sediments migrating off site.*

The term “*exposure concerns*” is used to describe conditions and circumstances by which people could come into contact with contaminants. Table 1 provides a summary of this potential exposure concern evaluated in this PHA. Appendix C describes the methods ATSDR used in its evaluation of potential public health hazards. Appendix D contains a glossary of environmental health terms that are frequently used in ATSDR’s PHAs.

Table 1: Potential Exposure Pathways Evaluated at NWSE

<i>Exposure Concern</i>	<i>Time Frame</i>	<i>Exposure:</i>	<i>Public Health Hazard</i>	<i>Actions Taken or Recommended</i>	<i>Comments</i>
<i>1. Potential exposures from contaminated surface waters or sediments migrating off site</i>					
ATSDR evaluated the potential for off-site migration of contaminants in surface water and sediment to off-site streams and other surface water bodies.	Past (prior to the 1990s)	Possible	This potential exposure situation does not represent a public health hazard.	Actions taken include: <ul style="list-style-type: none"> ❑ In December 1997, the Navy announced a plan for remediation of groundwater underneath Site 26 using air sparging and soil vapor extraction. The Air/Sparging System began operating in 2000 and the system was shut down in 2004. Quarterly sampling has continued. ❑ NWSE personnel conducted two rounds of surface water sampling at locations where streams leave the station property. The results of the sampling did not indicate contaminants migrating off-site at levels that would be of human health concern. 	The sampling data that has been reviewed does not indicate that off-site surface water has been adversely impacted by site-related contamination. Although environmental monitoring at NWSE began in the early 1980s, data on most IRP sites were collected in the 1990s. There is some uncertainty, however, about the extent of contamination and potential for off-site migration prior to sampling. ATSDR does not have sufficient information to make definitive statements about off-site exposure pathways prior to data availability.
	Recent Past (since 1990s)	Unlikely			
	Current	Unlikely	ATSDR reviewed site sampling data as well as station wide surface water sampling conducted by the Navy. The sampling results do not indicate that site-related contaminants are migrating off site via surface water or sediment at levels that would pose a human health concern.		
	Future	Unlikely			

Discussion

1. Potential exposures from contaminated surface waters or sediments migrating off site

Characterization of the Issue

There are numerous rivers, streams, and brooks that cut across NWSE. All the rivers and streams draining the station eventually discharge to the Atlantic Ocean (Weston 1993). The watersheds and drainage basins that feed into many of the rivers and brooks that traverse NWSE contain a number of areas that were designated as IRP sites by the Navy. Many of these source areas are in remote locations that are vegetated with brush and a variety of trees and other plants. Access to these sites is restricted to station personnel and the potential for direct exposure to site-related contaminants is quite low.

What is a watershed and how does it differ from a drainage basin?

A watershed is the area of land that drains into a body of water such as a river, lake, stream, or bay.

Drainage basins generally refer to large watersheds that encompass the watersheds of many smaller river and streams.

During the site visit to NWSE, ATSDR observed that many of the rivers and brooks originated within the station boundaries and flowed off-site, both north and south of the station. In addition, both the Swimming and Shark Rivers supply water to reservoirs used for municipal drinking water supplies. Since many of the watersheds that feed into the rivers and streams on site are in close proximity to source areas of contamination, ATSDR decided it would be prudent to evaluate the nature and extent of off-site migration and potential for human exposure from contaminated surface water and sediments. ATSDR's evaluation consisted of two components: 1) an evaluation of the nature and extent of contamination at 15 of the IRP sites that have the greatest potential to impact the streams flowing off site at NWSE; and 2) a review of NWSE's "Clean Water" investigation that involved surface water sampling at streams that flow off site.

Nature and Extent of Contamination

Evaluation of 15 IRP Sites in close proximity to surface water flowing off site: ATSDR evaluated the likelihood that contaminants from on-site sources will impact off-site sediments or surface water (Figures 2 and 3). Sites were chosen based on geographic proximity to the station boundary and an evaluation of the nature, extent, and direction of contaminant migration at the site. We considered whether there were physical barriers to surface water flow such as roads or railroad tracks. Fifteen (15) IRP sites with the greatest potential to impact off-site surface water and sediment were identified and evaluated for their potential to contribute to off-site contamination. These included Sites 2 and 5 (potential to impact Pine Brook and possibly Hockhockson Brook); Sites 1, 13, and 16/F (potential to impact Hockhockson Brook; Site 48 (potential to impact Mine brook); Site 19 and 26 (potential to impact Mingamahone Brook- west or east branch); Sites 3 and 27 (potential to impact Mingamahone Brook- east branch/Browns

Brook; Site Q (potential to impact the Manasquan River/Yellow Brook {South}); Sites 6, 12, 15, and 17 (potential to impact Ware Creek located adjacent to the Waterfront portion of the station).

Table 2 presents information pertaining to the nature of contamination associated with each of the 15 sites and the extent to which site-related contaminants are likely to impact streams, creeks, and brooks flowing off site.

Table 2: Potential for source areas at NWSE to impact off-site surface water and/or sediments				
<i>Stream</i>	<i>Closest Site (s)</i>	<i>Chemical (s) of concern</i>	<i>Medium</i>	<i>Potential for impacting off-site surface water and/or sediments at levels of health concern</i>
Pine Brook	Site 2 Active Ordnance Demolition Range	Explosives Metals	Soil Groundwater	Past: Low/medium Potential Current: and Future: Low/medium potential Comments: Soils have not been significantly impacted outside the immediate range area. The occurrence of explosive compounds in groundwater, soils, and sediments were infrequent and metals were detected at very low concentrations. Perchlorate in groundwater appeared to be limited to the range area. Impact from this site appears to be low to medium.
	Site 5 Landfill West of Army barricades (A portion of the site was also used as a skeet range)	Metals Solvents	Soil (Primarily subsurface) Groundwater	Past: Low Potential Current and Future: Low Potential Comments: Solvents were only detected in shallow groundwater. A landfill cap was installed in 1998 and the skeet range was closed. Lead impacted soils from the lead shot were removed. Prior to the installation of the landfill, the topography was relatively flat limiting the potential for off-site surface water runoff.
Hockhockson Brook	Site 1 Former Ordnance Demolition Range	Explosives Metals Organics	Soil Groundwater	Past: Low/medium Potential Current and Future: Low Potential Comments: Arsenic has been detected in soil
	Site 13 Defense property Office Disposal Yard	Metals PCBs Organics	Soil Groundwater	Past: Medium Potential Current and Future: Low/Medium Potential Comments: Site 13 is just west of the Hockhockson Brook, about 0.5 miles from the station boundary. Given the groundwater and surface water flow and proximity to the station boundary, contaminants from this site have potential to migrate off site. No SVOCs, pesticides, or PCBs were detected in surface water samples. Lead (16.9 ppb) was detected above the EPA's drinking water action level of 15 ppb.
	Site 16/ Epic Site F	Petroleum PAHs	Soil Groundwater	Past: Medium Potential Current and Future: Low/Medium Potential Comments: Environmental investigations led to the discovery of a large concentration of diesel fuel on top of the shallow groundwater aquifer. The Hockhockson Brook is about 0.5 miles from the site and most of the contamination is associated with the shallow groundwater and not surface soil or sediments; thus there is potential for off-site migration through the shallow aquifer to the stream.

Table 2: Potential for source areas at NWSE to impact off-site surface water and/or sediments

<i>Stream</i>	<i>Closest Site (s)</i>	<i>Chemical (s) of concern</i>	<i>Medium</i>	<i>Potential for impacting off-site surface water and/or sediments at levels of health concern</i>
Mine Brook	Site 48 Mine Battery Disposal Area	Mine actuators (i.e., batteries) were disposed in the wetland areas and West Pond. Metals	Sediment Surface Water	Past: Low Potential Current and Future: Low Potential Comments: Site 48 is in close proximity (About 200 feet east) of Mine Brook. The mine actuators were generally in tact and no leaching of contamination from these actuators has been reported. A removal action was conducted in 2004.
Mingamahone Brook (West)	Site 19 Paint Sludge Disposal Site	Metals	Soil	Past: Low/medium Potential Current and Future: Low Potential Comments: Elevated levels of lead and chromium were detected mostly in surface and shallow sub-surface soils. Site investigations showed that contaminants had migrated from Site 19 to the drainage ditch that leads to a tributary of Mingamahone Brook and adjacent wetlands. Contaminated soil has been removed and potential for future contaminant migration off-site via surface water is very low.
	Site 26 Explosive "D" Washout Area (some groundwater/surface water may go to Mingamahone Brook (East)/ Browns Brook)	Explosives VOCs (Primarily TCE, it's breakdown products, and tetrachloroethylene [PCE])	Soil Groundwater	Past: Low Potential Current and Future: Low Potential Comments: Significant concentrations of TCE and PCE have been detected in groundwater approximately 25 feet below the ground surface. The TCE component of the solvent plume extends from the area surrounding Building GB-1 to the western bank of the Mingamahone Brook and is approximately 350 feet long and 130 feet wide. The PCE component of the plume originates near Building GB-2 and extends farther south than the TCE component. Sampling in temporary wells installed near Mingamahone Brook reported TCE concentrations detected in one sample at 8.3 ppb; and PCE concentrations as high as 29 ppb, with detections at multiple locations (Battelle 2004). Although TCE and PCE concentrations detected in groundwater are elevated, Site 26 is located near the center of NWSE and whatever infiltration of VOCs occurs from the shallow groundwater to the Mingamahone Brook would likely be greatly diluted downstream where surface water flows off site (approximately 2 miles from the site).
Mingamahone Brook (East)/ Browns Brook	Site 3 Landfill Southwest of "F" Group	Metals PAHs VOCs	Groundwater	Past: Low/Medium Potential Current and Future: Low Comment: In 2003, the Navy installed a landfill cap at Site 3 and this should minimize any potential off-site migration of contaminants.

Table 2: Potential for source areas at NWSE to impact off-site surface water and/or sediments

<i>Stream</i>	<i>Closest Site (s)</i>	<i>Chemical (s) of concern</i>	<i>Medium</i>	<i>Potential for impacting off-site surface water and/or sediments at levels of health concern</i>
	Site 26 Explosive "D" Washout Area	Explosives VOCs	Soil Groundwater	Past: Low Potential Current and Future: Low Potential Comments: Please refer to the comments for Site 26 under Mingamahone Brook (West).
	Site 27 Projectiles Refurbishing Area	Metals PCBs	Soil	Past: Low Potential Current and Future: Low Potential Comments: Contamination was detected in a small area that was remediated in 1996.
Manasquan River/Yellow Brook (South)	Site Q (Site 46) Military Sealift Command Firefighting School	None	No significant sources of contamination were identified at this site.	Past: Low Potential Current and Future: Low Potential Comments: Environmental sampling (soil, sediment, and groundwater) did not show elevated levels of contamination at this site.
Ware creek	Site 6 Landfill West of Normandy Road	Metals	Soil Groundwater	Past: Low Potential Current and Future: Low Potential Comments: Samples collected from the adjacent tidal marsh show little impact from Site 6.
	Site 12 Battery Acid Spill Site	Lead	Soil Sediment Surface water	Past: Medium Potential Current and Future: Low Potential Comments: Elevated lead levels were found in soil, sediment, and surface water samples from a nearby storm drain. Lead-contaminated soil was excavated in 1999.
	Site 15 Sludge Disposal Site Near Waterfront South Gate	Organic compounds	Soil Sediment	Past: Low Potential Current and Future: Low Potential Comments: Samples collected from the downgradient marsh showed minimal impact from Site 15.
	Site 17 Disposal Site Behind the Training Barge		Surface water	Past: Low Potential Current and Future: Low Potential Comments: Impact from this site appears to be very low with most of the contamination isolated to a small area of fill material. Lead was detected in one surface water sample (77 ppb) above EPA's action level of 15 ppb for drinking water.

Sources: Weston 1993; Weston 1994; Brown & Root 1998c; Tetra Tech 1998a; 2003

The headwaters of the Shark River originate on the southeastern portion of Mainside Station, however, no IRP sites are nearby.

¹ U.S. Environmental Protection Agency's Maximum Contaminant Levels for drinking water

The information in Table 2 is intended to provide a general overview of what contaminants have been identified at each of the 15 sites, what medium they have been identified in (e.g., soil, groundwater, surface water), and the potential for off-site migration of contaminants at levels of health concern. A more detailed description of these sites, site investigations, and corrective actions are provided in Appendix A.

The contaminants most frequently detected at the 15 IRP sites were metals (e.g., arsenic, chromium, and lead), organic compounds such as TCE and other solvents, PCBs, and explosive compounds. The highest concentrations were typically detected in groundwater or surface soil, and to a lesser extent in sediments. Surface water samples were often collected at these sites if permanent surface water features were identified near the source of contamination. However, metals in surface water samples were usually below ATSDR's health-based screening values and levels of most organic compounds (e.g., solvents, PCBs and pesticides) were very low or not detected. Perchlorate, exceeding an EPA preliminary remediation goal for cleanup at 24.5 ppb in water, was detected in groundwater at several Site 2 sampling locations. Site 2 has no potable groundwater usage.

Watershed Sampling of Surface Water and Sediments: During the 1996 RI, 19 surface water and 18 sediment samples were collected at 5 watersheds located within the Mainside portion of NWSE and 2 watersheds within the Waterfront portion of the station.

Sediment — Sediment samples collected from the Ware Creek Watershed, south of Site 15, contained a number of metals (e.g., arsenic, beryllium, and cadmium) above the ranges found in background samples. However, none of these metals exceeded ATSDR's health-based screening values. Several VOCs and pesticides were detected in low concentrations below levels of health concern in sediments across the watersheds at both the Mainside area and Waterfront portion of NWSE.

Surface Water —with the exceptions of arsenic and lead, which were both detected at maximum concentrations of 50 ppb, none of the more frequently detected metals exceeded their health-based screening values. Most organic compounds were either not detected or detected at very low concentrations in surface water (Brown & Root 1996).

NWSE Surface Water Sampling: In June 2003, NWSE personnel conducted surface water sampling at five locations where streams leave the station. Water samples were collected for analysis from the Mine, Hockhockson, Shark River, Marsh Bog, and Mingamahone Brooks (Figure 2). These streams were chosen because the water flows off site into the Swimming River Reservoir (about 2.5 miles north of the station), Manasquan Reservoir (about 3 miles southwest of the station), and Glendola reservoir (about 3 miles southeast of the station). In the spring of 2004, NWSE conducted additional surface water sampling of five more NWSE streams that flow off site. The sample collection sites included Ware Brook, Yellow Brook Southwest, the East Branch Mingamahone, the Northwest Branch Yellow Brook, and Pine Brook (Figure 2). Water samples were analyzed for total suspended solids (TSS), RCRA metals, 21 pesticide compounds, 7 PCB Arochlors, and total petroleum hydrocarbons (TPHs) (NWSE 2004).

Table 3 presents the results of both rounds of surface water sampling at NWSE. The metals of greatest health concern (i.e., arsenic, cadmium, chromium, and lead) were generally detected at levels below health concern. Lead (17.8 ppb) was detected in one surface water sample slightly above EPA’s action level of 15 ppb in drinking water. No other metal or organic contaminants exceeded their respective maximum contaminant level (MCL) established by EPA.

Table 3: Sampling of Streams at NWSE (those with surface waters exceeding background concentrations)*				
Name of stream	Location	Chemical (s)	Maximum Concentration (ppb)	EPA's MCL ¹ (ppb)
NWSE Surface Water Sampling (June 2003)				
Mine Brook	Northwest portion of Mainside	Chromium Lead	7.6 1.8	100 15 ²
Hockhockson Brook	North-central portion of Mainside	Cadmium Chromium	0.5 9.6	5 100
Marsh Bog Brook	Southwest portion of Mainside	Cadmium	0.8	5
NWSE Surface Water Sampling (March/April 2004)				
Ware Creek	Just east of Waterfront portion	Arsenic Chromium Lead	6.1 8 17.8	10 100 15 ²
Sources: NWSE 2003; 2004				
¹ U.S. Environmental Protection Agency's Maximum Contaminant Levels for drinking water ² EPA's Action Level for lead is 15 parts per billion (ppb)				
<p>*Only concentrations exceeding NWSE background concentrations for surface water are included in this table as described here: In the three background surface water samples taken for Mainside (BWSW01, BWSW02, BWSW04): arsenic was not detected; cadmium was detected in one sample at 0.18 ppb; chromium ranged from 0.72 to 2.6 ppb; and lead was detected in one sample at 4.4 ppb (Source: Brown & Root Environmental 1997a). Of the three Waterfront background samples, two samples were used (BGSW05 and BGSW06): arsenic, cadmium, chromium, and lead were not detected (results were below detection limits). Background sample BGSW07 was excluded for comparison because of inorganic metals results (arsenic at 9 ppb and lead estimated at 16 ppb) which exceeded other background levels and did not appear to represent background concentrations.</p> <p>The Navy sampled for a suite of pesticides and 7 PCB Arochlors at each sampling location and no pesticides were detected. The Navy analyzed for Resource Conservation and Recovery Act (RCRA) metals, which include the following compounds: Arsenic (MDL = 2.3 ppb), Barium (MDL = 0.50 ppb), Cadmium (MDL = 0.4 ppb), Chromium (MDL = 1.0 ppb), Lead (MDL = 0.80 ppb), mercury (MDL = 0.15 ppb), Selenium (MDL = 4.8 ppb), and Silver (MDL = 0.6 ppb).</p> <p>MDL = Method detection limit</p>				

Evaluation of Potential Public Health Hazards

ATSDR reviewed sampling data from 15 IRP sites in close proximity to adjacent streams and evaluated the potential for contaminants to migrate off site at levels that could be harmful if people came in contact with them, either through direct contact with skin (i.e., dermal exposure), swallowing or ingesting contaminated soil, sediments, or water, or consuming contaminated food items (e.g., people who catch fish from off-site streams or ponds or hunters).

The adjacent text box describes the principal criteria ATSDR uses for evaluating human exposure. Given what is known about the nature and extent of contamination at each of the sites most source areas were considered to have a low or in some cases low-to-medium potential to impact off-site surface water and sediment at levels of human health concern. Most off-site migration of contaminants would have occurred in the past since remedial actions have been conducted at the most contaminated sites. ATSDR did not identify any known completed exposure pathways during its evaluation.

Past Exposure

The sites with somewhat higher potential to impact off-site surface water and sediments included Site 1 (Former Ordnance Demolition Range), Site 3 (Landfill Southwest of “F” Group), Site 12 (Battery Acid Spill Site), Site 13 (Defense property Office Disposal Yard), Site 19 (paint Sludge Disposal Site), and Site 26 (Explosive “D” Washout Area). These sites were considered to have a low-to-moderate potential for impact primarily because of their close proximity to the station boundary and because sampling detected contamination in soil, surface water, or groundwater. The results of sampling conducted at most of these sites generally showed low levels of contamination in soil and groundwater, with the exceptions being at Site 12, where elevated lead levels were detected in soil, sediment, and surface water; Site 19 where elevated levels of lead and cadmium were detected in soil; and Site 26, where high concentrations of TCE were detected in monitoring wells surrounding a leach tank at Building GB-1. PCE from a source near Building GB-2 is a component of the solvent plume at Site 26.

The data used to evaluate the IRP sites in close proximity to streams flowing off site are based on environmental sampling beginning during the early 1990s. There is little environmental monitoring data prior to this time period and it is possible that off-site migration of contaminants may have occurred during the period of active unregulated releases, which occurred primarily during the late 1940s through the 1970s. Although the nature and extent of contamination in various media in the past at NWSE (i.e., prior to 1990) are not documented, the location of the

Evaluating Exposure

In assessing the potential for human exposure it is important to determine the following:

What are the source characteristics (e.g., media, contaminant concentration)?

How is the contamination distributed within the various media (e.g., location and extent of contamination)?

What are the transport pathways (physical and/or biological)?

What is the ultimate fate of the contaminants (i.e., where do the contaminants ultimately end up)?

If a completed exposure pathway is identified, what is the estimated individual exposure dose?

source areas and the current information available about the nature and extent of contamination across the site is sufficient to draw some general conclusions about past levels of contamination.

Our evaluation indicates that it is unlikely contamination at levels of health concern migrated off site in the past. Recent sampling has not identified extensive areas of contamination among persistent compounds such as heavy metals and PCBs in most of the source areas closest to the station boundary. Furthermore, on the basis of previous sampling there is no evidence to indicate that sediments along streambeds and/or wetlands near source areas have been significantly impacted by contamination. Occasional ‘hot spots’ or areas of higher contamination were identified at some sites during previous sampling efforts, but these were generally confined to small geographic areas.

A groundwater plume containing high concentrations of TCE, PCE and other organics was identified beneath Site 26. Site investigations identified the likely sources as a former leach tank near Building GB-1 and a 30-foot wide by 10-foot deep percolation pit in the center of the site near the former Building GB-2. Although TCE and some other organics were significantly elevated close to their sources, no off-site migration of groundwater or any other media is expected given local hydrogeological conditions and the distance (approximately 2 miles) from the site to the closest station boundary. A large number of groundwater samples were collected to characterize and help delineate the plume. The results of the groundwater sampling showed no detections of VOCs at the outlying sampling locations, which were all well within the station boundary. The plume boundary extends to the west-southwest approximately 1,000 feet away from the original sources. The westward most extent of the plume is very close to the Mingamahone Brook. Although surface water samples do not show the brook to be impacted by the plume, routine surface water monitoring of this brook should be considered.

Based on the sampling from the recent past (i.e., since 1990s), ATSDR concludes that off-site migration of contaminants did not occur at levels of health concern. However, there is not sufficient information to evaluate what site conditions were like prior to environmental monitoring.

Current and Future Exposure

On the basis of ATSDR’s review of the data, hydrogeological conditions, and remedial actions taken at IRP sites in close proximity to streams flowing off-site, ATSDR concludes that none of the 15 IRP sites are currently, or likely in the future, to significantly impact human health via off-site migration. The results of recent surface water sampling conducted in 2003 and 2004 have confirmed that harmful levels of site-related contamination do not appear to be migrating off site.

Community Health Concerns

There are several ways in which ATSDR may learn about specific concerns within the community. A resident may contact ATSDR directly and discuss specific issues that they are concerned about. Residents may also contact community leaders or state and/or local health agencies and they, in turn, may contact ATSDR and communicate these concerns. Another common way that ATSDR learns about community concerns at some sites is through public availability sessions coordinated by ATSDR, restoration advisory board (RAB) meetings, or other public meetings that are attended by ATSDR representatives.

ATSDR did not identify any community health concerns regarding NWSE. Community members and other interested parties had the opportunity to submit comments, questions, or concerns related to ATSDR's evaluation of NWSE during a public comment period, May through July 2006. ATSDR did not receive any comments from the public, therefore no comments and responses are recorded in this final PHA.

Child Health Considerations

ATSDR recognizes that infants and children may be more sensitive to exposures than adults in communities with contamination in water, soil, air, or food. In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health. ATSDR is committed to evaluating their special interests at sites such as NWSE as part of the ATSDR Child Health Initiative.

ATSDR has attempted to identify populations of children in the vicinity of NWSE. According to recent housing records, approximately 80 children age 5 and under and a total of 263 children under the age of 18 reside in military housing at NWSE (Stacey Gardner, Family Housing, NWSE. Personal Communication, March 22, 2005). The on-site housing areas are not next to known sources of contamination and children are not allowed unsupervised access to restricted portions of the station, where IRP sites are located and where industrial activities are occurring.

During the site visit, ATSDR health assessors paid close attention to where children living on site reside and spend most of their time. NWSE representatives provided access to housing areas, day care facilities, and recreational areas used by children and other residents. Most of the housing areas, recreational areas, and playground equipment were well maintained. The day care center contained new equipment and complied with safety standards. Restricted portions of the station were fenced off and ATSDR did not identify any hazards in areas that were accessible to children.

On the basis of ATSDR's exposure evaluation, *ATSDR concludes that exposure to site contamination at NWSE does not pose unique health hazards for children.*

Conclusions

After evaluating available environmental information, ATSDR has reached the following conclusions regarding the identified exposure situations at NWSE. On the basis of the most currently available information, there are no past, current or future public health hazards associated with contaminants at this site. ATSDR's pathway-specific conclusions regarding the potential exposure pathways evaluated at are described below:

1. *Potential exposures from contaminated surface waters or sediments migrating off site*

Past Exposure: *ATSDR concludes that surface water or sediments migrating off of NWSE property did not pose a public health hazard in the recent past (i.e., since the early 1990s). Sufficient information is not available to make a public health determination for exposures that may have occurred prior to the early 1990s.* Sampling results from the 1990s have not identified high levels of persistent compounds such as heavy metals, PCBs, or chlorinated pesticides in locations where the potential for off-site migration is high. ATSDR's evaluation indicates that it is unlikely contamination at levels of health concern migrated off site in the recent past.

Recent sampling has not identified extensive areas of contamination among the more persistent compounds such as heavy metals, PCBs, or chlorinated pesticides in most of the source areas closest to the station boundary. A groundwater plume containing high concentrations of TCE, PCE, and other VOCs was identified beneath Site 26. Although TCE and some other organics were significantly elevated close to their sources, little or no off-site migration of groundwater, or any other media, is expected given local hydrogeological conditions [such as the direction of groundwater flow and the distance (approximately 2 miles) away from the closest station boundary].

Furthermore, on the basis of previous sampling there is no evidence to suggest that sediments along streambeds and/or wetlands near the station boundary have been significantly impacted by contamination. Occasional 'hot spots' or areas of higher contamination were identified at some IRP sites during previous sampling efforts, but these were generally confined to small on-site areas. Overall, ATSDR concludes that off-site migration of contaminants in the past did not occur at levels of health concern. Therefore, any past exposure to site contaminants is considered as a No Apparent Public Health Hazard.

Current and Future Exposure: *ATSDR concludes that surface water or sediments migrating off of NWSE property pose no current or future public health hazard.* On the basis of ATSDR's review of the data, hydrogeological conditions, and remedial actions conducted to remove source areas of contamination, ATSDR concludes that none of the 15 IRP sites closest to NWSE streams flowing off site are currently or in the future likely to significantly impact human health. The results of recent surface water sampling for metals, PCBs, and pesticides, conducted in 2003 and 2004, indicate that harmful levels of these contaminants are not migrating off site. Therefore, any current or future exposures to site contaminants are considered as No Apparent Public Health Hazards.

Recommendations

Based on ATSDR's conclusions that surface water or sediments migrating off of NWSE property did not pose a public health hazard in the recent past (i.e., since the early 1990's) or currently, nor is a health hazard likely in the future, no site-specific recommendations are made. If future data become available which indicate the potential for adverse human health effects based on contamination coming from NWSE, ATSDR will consider conducting further evaluations.

Public Health Action Plan

The Public Health Action Plan (PHAP) for NWSE contains a description of actions taken and to be taken by ATSDR, NWSE, EPA, and other state or local agencies subsequent to the completion of this PHA. The purpose of the PHAP is to ensure that this PHA not only identifies potential and ongoing public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The public health actions that are completed, ongoing or planned, and recommended are listed below.

Completed Actions

Refer to Appendix A for specific investigations, remedial actions, and timelines associated with each IRP site.

1. The Navy has conducted numerous environmental investigations, including an initial assessment study (IAS) in 1983, an addendum to the IAS in 1992, several site and remedial investigations/feasibility studies (RI/FS) between 1990 and 1998, as well as conducted recent confirmatory sampling and long-term monitoring for sites that have undergone corrective actions.
2. The Navy has completed numerous corrective actions involving the removal of contaminated soil, sediment, solid waste removals (e.g., construction debris, empty drums, scrap metal, and mine batteries), transformers, liquid waste-filled drums, and fuel tanks. These actions were taken at specific sites (e.g., Sites 20, 22, 23, 24, 25, and 27) to reduce the potential for human exposures and to mitigate ecological impacts from contamination. Most of the corrective actions occurred subsequent to the RI Addendum Report released in January 1998.
3. The Navy along with federal and state regulators has determined that 16 IRP sites require no further action (Sites 8, 11, 14, 18, 20-25, 27-29, L or 41, 47, and 48).
4. The Navy has installed numerous vegetative and low permeability landfill caps at a number of IRP sites (e.g., Sites 3, 4, 5, and 10) where site-related contaminants had the potential to migrate either vertically through the underlying shallow aquifer or horizontally towards wetland and surface water bodies.
5. In September 1999, the Navy installed a full-scale air sparging system with soil vapor extraction at Site 26. At the end of 2004, the system was taken off-line.

Ongoing and Planned Actions

1. The Navy is continuing long-term groundwater monitoring at the following IRP sites which have been impacted by site-related contaminants (Sites 1, 2, 4, 5, 10, 17 and 26).
2. The Navy continues to investigate source areas across NWSE and is working with state and federal regulators to determine whether additional sampling and/or remedial actions are needed. Further investigation is planned for former landfills (Sites 7 and 9) and the active ordnance demolition range (Site 2).

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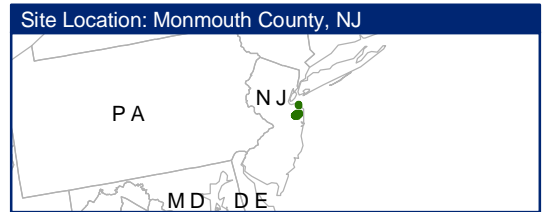
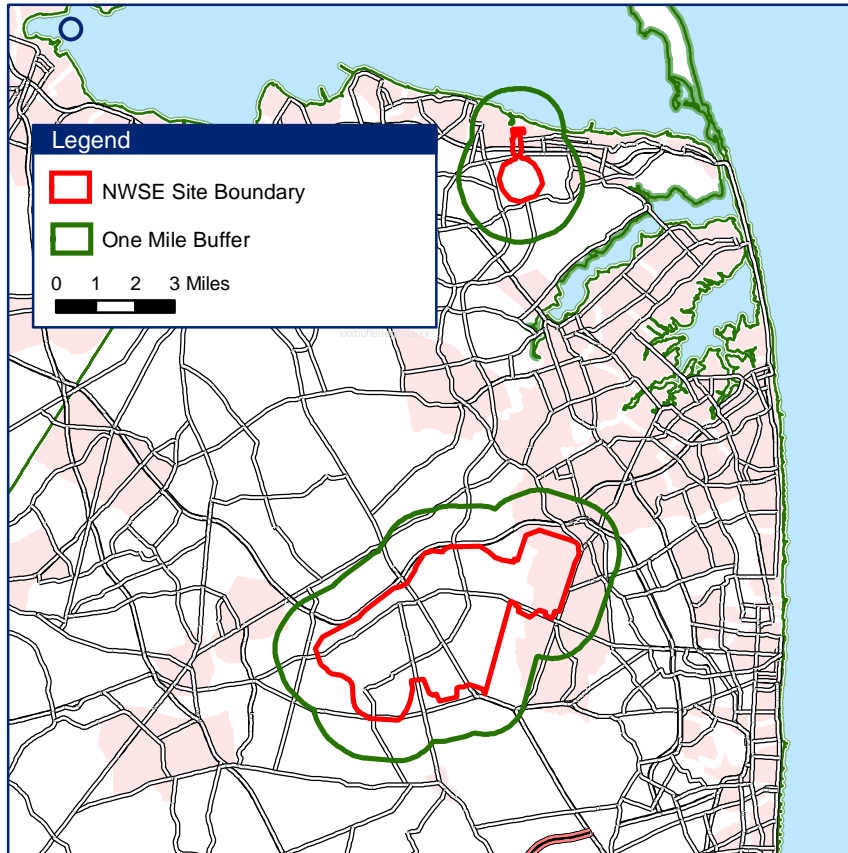
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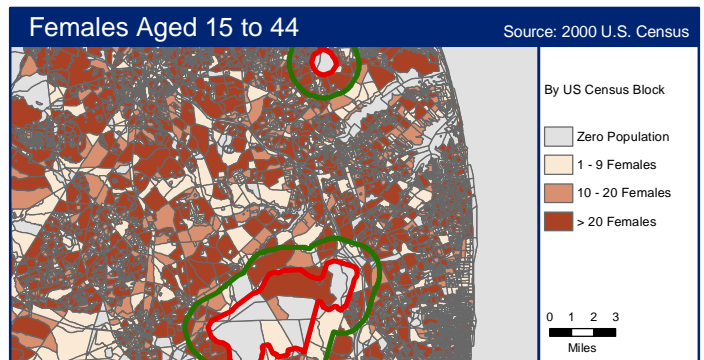
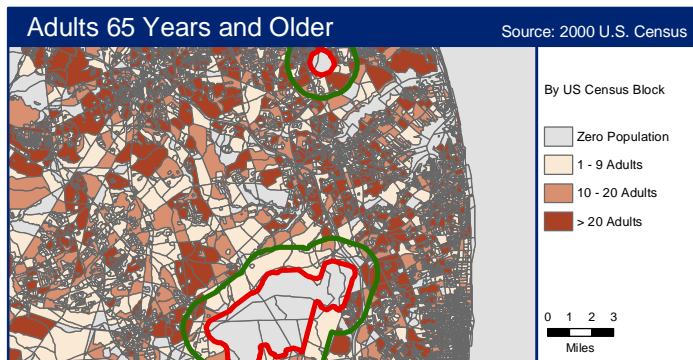
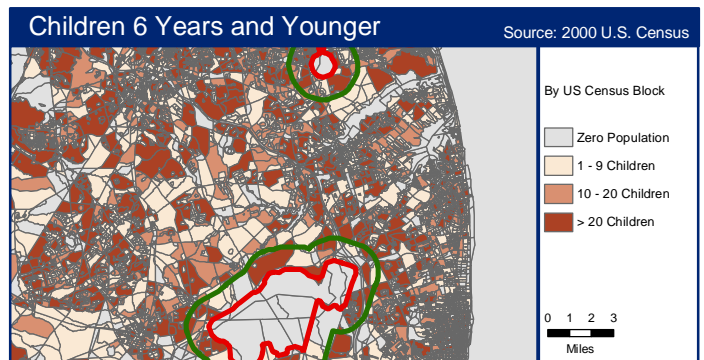
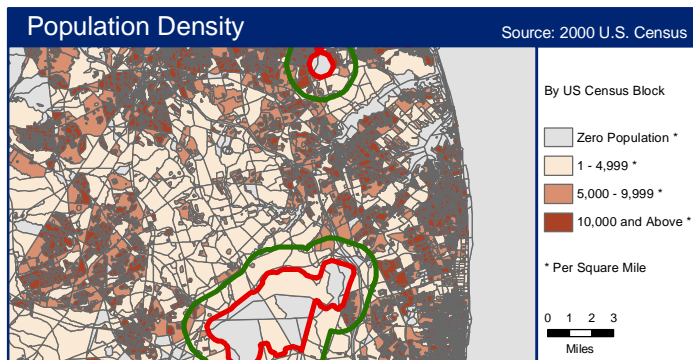


Demographic Statistics
 Within Area of Concern*

	Water Front	Mainside	1mi
Total Population	14,539	14,894	29,433
White Alone	13,761	12,047	25,808
Black Alone	127	1,532	1,659
Am. Ind./AK Native Alone	17	44	61
Asian Alone	400	753	1,153
Native Hawaiian & Other Pacific Islander Alone	5	1	6
Some Other Race Alone	76	237	313
Two or More Races	153	279	432
Hispanic or Latino**	515	878	1,393
Children Aged 6 & Younger	1,410	1,837	3,247
Adults Aged 65 & Older	1,380	906	2,286
Females Aged 15 to 44	3,135	3,616	6,751
Total Housing Units	5,214	5,210	10,424

Base Map Source: Geographic Data Technology (DYNAMAP 2000), August 2002
 Site Boundary Data Source: ATSDR Public Health GIS Program, August 2002
 Coordinate System (All Panels): NAD 1983 UTM Zone 18N

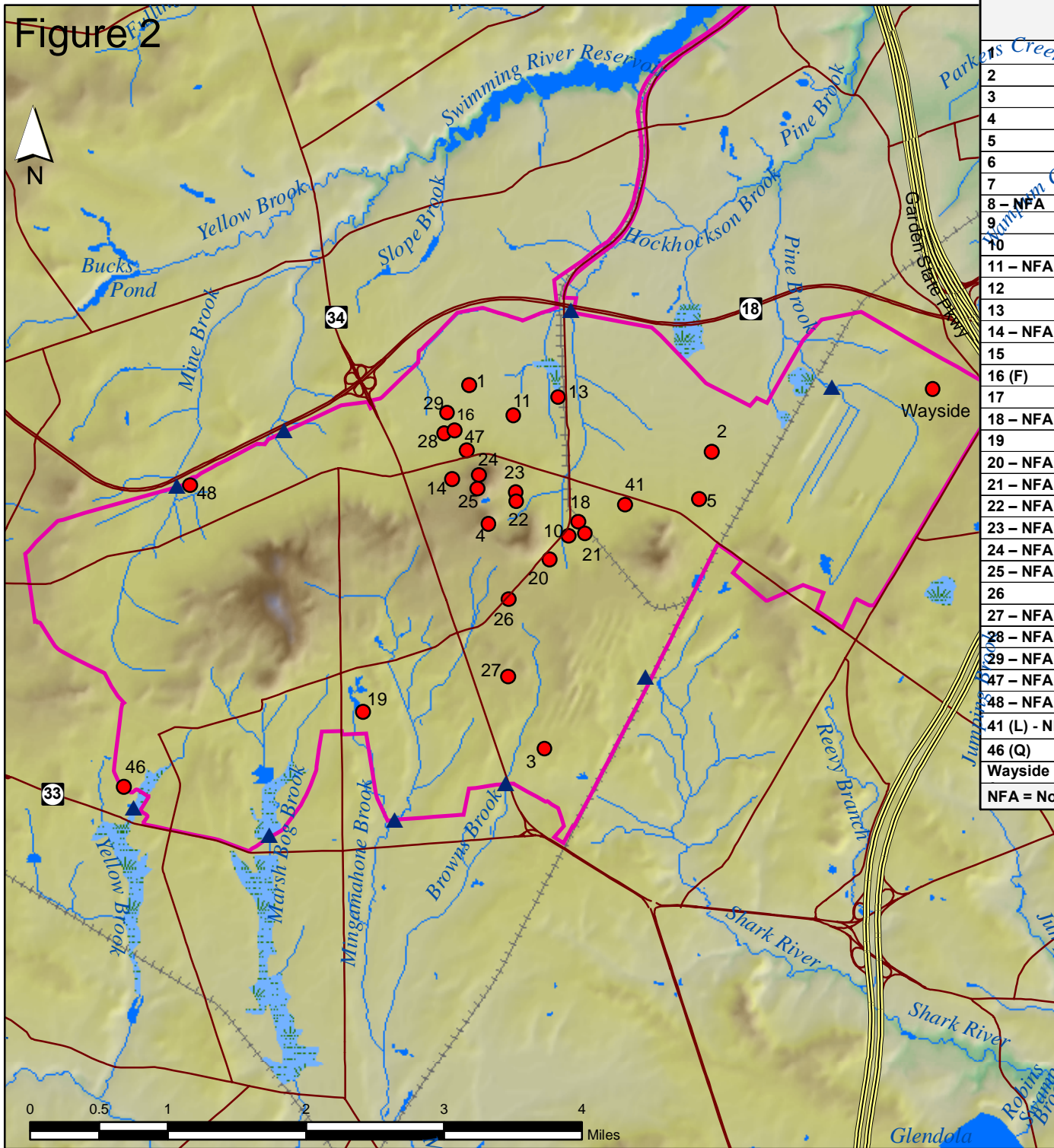
Demographics Statistics Source: 2000 U.S. Census
 * Calculated using an area-proportion spatial analysis technique
 ** People who identify their origin as Hispanic or Latino may be of any race.



GENERATED: 01-18-2005



Figure 2



NWSE Installation Restoration Program Sites (Key to Figures 2 and 3)	
1	Former Ordnance Demolition Range (MAIN)
2	Active Ordnance Demolition Range (MAIN)
3	Landfill Southwest of "F" Group (MAIN)
4	Landfill West of "D" Group (MAIN)
5	Landfill West of Army Barricades (MAIN)
6	Landfill West of Normandy Road (Waterfront)
7	Landfill South of "P" Barricades (Waterfront)
8 - NFA	Landfill East of Building S-186 (Waterfront)
9	Landfill Southeast of "P" Barricades (Waterfront)
10	Scrap Metal Landfill Near Building 589 (MAIN)
11 - NFA	Contract Ordnance Disposal Area (MAIN)
12	Battery Acid Spill Site (Water Front)
13	Defense Property Disposal Office Yard (MAIN)
14 - NFA	Defense Property Disposal Office Warehouse (MAIN)
15	Sludge Disposal Near Waterfront South Gate (Waterfront)
16 (F)	Diesel Fuel Line to Building C-50 (MAIN)
17	Disposal Site Behind Training Barge, Waterfront
18 - NFA	Demilitarization Furnace (MAIN)
19	Paint Sludge Disposal Site Adjacent to Building S-34
20 - NFA	Grit Blast Disposal Site Adjacent to Building 544 (MAIN)
21 - NFA	Baghouse & Cyclone Dust Storage Near Building S-589
22 - NFA	Paint Sludge Disposal Site Adjacent to Building D-2
23 - NFA	Paint Sludge Disposal Site Adjacent to Building D-5
24 - NFA	Closed Pistol Range (MAIN)
25 - NFA	Closed Pistol Range (MAIN)
26	Explosive "D" Washout Area Near Building GB-1 (MAIN)
27 - NFA	Projectiles Refurbishing Area (MAIN)
28 - NFA	Waste Oil Tank (MAIN)
29 - NFA	PCB Spill Site, North of Building C-16 (MAIN)
47 - NFA	Closed Pesticide Shop, Building S-86 (MAIN)
48 - NFA	Mine Battery Site at West Pond Area (MAIN)
41 (L) - NFA	MSC Van Parking Lot (MAIN)
46 (Q)	Military Sealift Command Fire Fighting School (MAIN)
Wayside	Training and Communications Area (MAIN)
NFA = No Further Action	

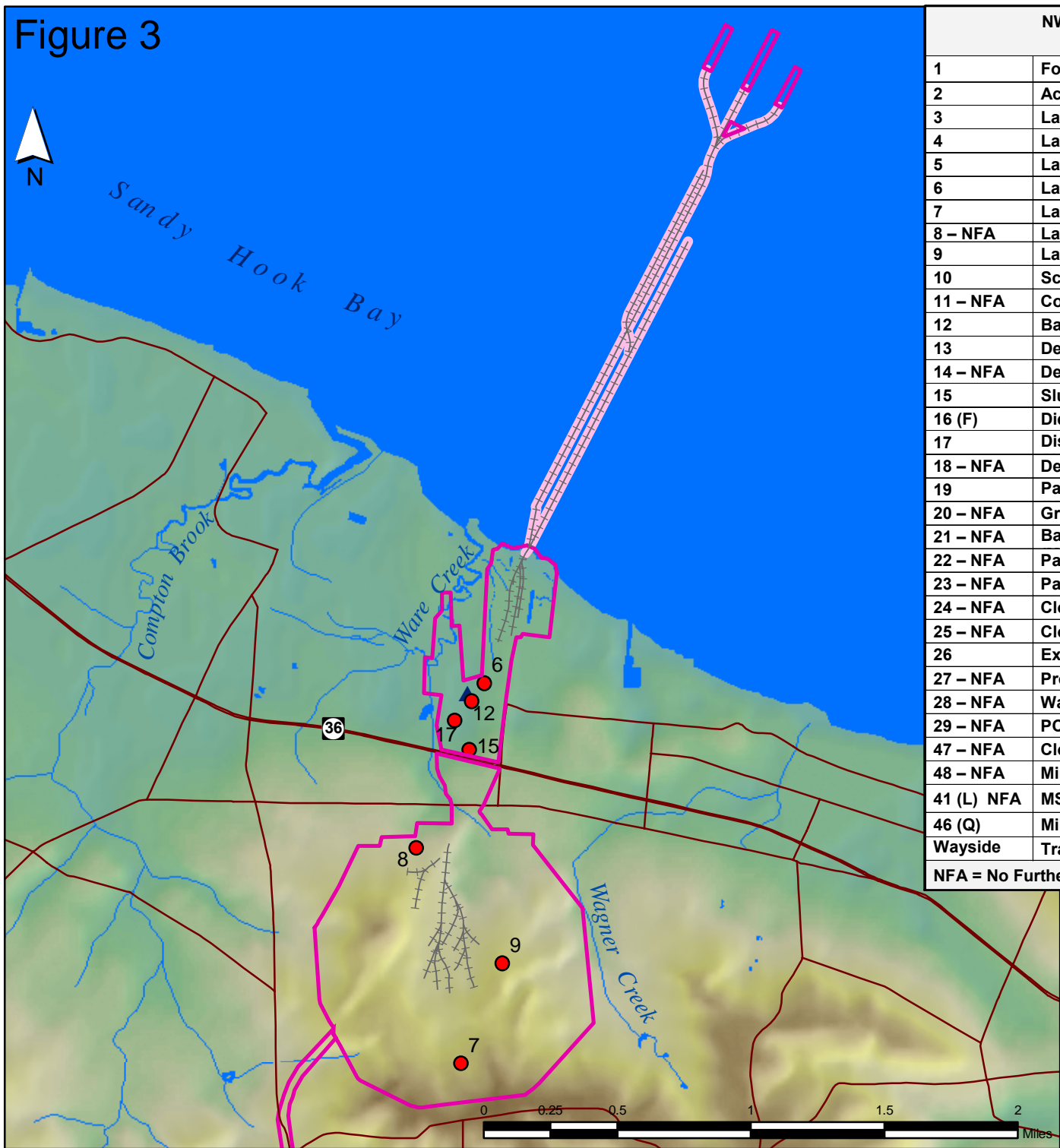
NWS Earle

Tinton Falls, New Jersey

● Site Locations

▲ Stream Sample Locations

Figure 3



NWSE Installation Restoration Program Sites (Key to Figures 2 and 3)	
1	Former Ordnance Demolition Range (MAIN)
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8 - NFA	Landfill East of Building S-186 (Waterfront)
9	Landfill Southeast of "P" Barricades (Waterfront)
10	Scrap Metal Landfill Near Building 589 (MAIN)
11 - NFA	Contract Ordnance Disposal Area (MAIN)
12	Battery Acid Spill Site (Water Front)
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14 - NFA	Defense Property Disposal Office Warehouse (MAIN)
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20 - NFA	Grit Blast Disposal Site Adjacent to Building 544 (MAIN)
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22 - NFA	Paint Sludge Disposal Site Adjacent to Building D-2 (MAIN)
23 - NFA	Paint Sludge Disposal Site Adjacent to Building D-5 (MAIN)
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25 - NFA	Closed Pistol Range (MAIN)
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27 - NFA	Projectiles Refurbishing Area (MAIN)
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29 - NFA	PCB Spill Site, North of Building C-16 (MAIN)
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48 - NFA	Mine Battery Site at West Pond Area (MAIN)
41 (L) NFA	MSC Van Parking Lot (MAIN)
46 (Q)	Military Sealift Command Fire Fighting School (MAIN)
Wayside	Training and Communications Area (MAIN)
NFA = No Further Action	

NWS Earle

Tinton Falls, New Jersey

- Site Locations
- ▲ Stream Sample Locations

Figure 4: ATSDR's Exposure Evaluation Process

REMEMBER: For a public health threat to exist, the following three conditions must all be met:

- Contaminants must exist in the environment
- People must come into contact with areas that have potential contamination
- The amount of contamination must be sufficient to affect people's health

Are the Environmental Media Contaminated?

ATSDR considers:

- Soil**
- Ground water**
- Surface water and sediment**
- Air**
- Food sources**



Are People Exposed To Areas With Potentially Contaminated Media?

For exposure to occur, contaminants must be in locations where people can contact them.

People may contact contaminants by any of the following three exposure routes:

- Inhalation**
- Ingestion**
- Dermal absorption**



For Each Completed Exposure Pathway, Will the Contamination Affect Public Health?

ATSDR will evaluate existing data on contaminant concentration and exposure duration and frequency.

ATSDR will also consider individual characteristics (such as age, gender, and lifestyle) of the exposed population that may influence the public health effects of contamination.

APPENDICES

Appendix A. IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 1 Ordnance Demilitarization Site</p> <p>[OU 8]</p>	<p>Site 1 is a 6-acre open field that is located in the north-central portion of the station just west of Macassar Road. It was used for burning ordnance materials between 1943 and 1975.</p>	<p>An Initial Assessment Study (IAS) was conducted in 1983 and the report did not recommend a follow-up confirmation study.</p> <p>Additional environmental sampling was conducted during the 1993 Site Inspection Study. Soil samples were analyzed for selected target analyte list (TAL) compounds including metals, explosive compounds, and total petroleum hydrocarbons (TPH). Groundwater samples were analyzed for target compound list (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and selected explosive compounds.</p> <p>Additional groundwater samples and sub-surface soil samples were also collected during the 1995 RI.</p> <p>Contaminants of concern (COCs) include: <i>Surface Soil:</i> Metals <i>Groundwater:</i> Metals (Chromium) and explosives (RDX).</p> <p>[Note: The type of chromium was not specified and for purposes of screening is assumed to be hexavalent (VI) Chromium].</p>	<p>During demilitarization activities, the site was plowed and a layer of diesel soaked hay was burned on-site to remove residual ordnance. The procedure was repeated three times.</p>	<p>Access to Site 1 is restricted and any human contact by site personnel or visitors is infrequent.</p> <p>There is some potential (primarily in the past) for contaminants to migrate off-site via surface water entering the Hockhockson Brook.</p> <p>Exposure Potential – Low/medium</p>



Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 2 Active Ordnance Demilitarization (RCRA) Site</p>	<p>Site 2 is an 11-acre active site located in the northeastern portion of the Mainside section of the Station. It was used for the disposal of ordnance from on- and off-base, including some disposal for the New Jersey Department of Environmental Protection. Disposal at this site began in 1973.</p> <p>It is estimated that between 1973 and 1983 approximately 80,000 pounds of explosives and propellants have been disposed at Site 2. Some of the specific explosives include composition 4 (a plastic explosive compound), ammonium picrate, trinitrotoluene (TNT), royal demolition explosives (RDX), black powder, and double-base propellants consisting of a mixture of nitrocellulose and nitroglycerine.</p>	<p>On the basis of the IAS, this site was recommended for a confirmation study based on the potential for nitrates to enter the groundwater.</p> <p>During site investigations groundwater, surface and sub-surface soil samples were collected. Soil samples were analyzed for explosive compounds and nitrates. Groundwater samples were analyzed for TCL organics, TAL metals, and explosive compounds.</p> <p>COCs include: <i>Groundwater:</i> Several explosive compounds were detected in groundwater samples including 2,4,6-TNT, 2,4-dinitrotoluene [DNT], 4-amino- 2,6-DNT, HMX, and RDX. VOCs including bis (2ethylhexyl) phthalate, chloroform, and perchlorate were also detected.</p>	<p>This is still an active site and no corrective actions have been conducted. The site, a RCRA regulated unit, is sampled and monitored in accordance with the NJDEP requirements.</p>	<p>Access to Site 2 is restricted and any human contact by site personnel or visitors is infrequent.</p> <p>Exposure Potential – Low/Medium</p>

Naval Weapons Station Earle (NWSE)

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 3 Landfill Southwest of "F" Group [OU 6]</p>	<p>Site 3 is a 5-acre inactive landfill located in the southeast corner of the Mainside section of the station. The landfill was used for the disposal of domestic refuse and industrial wastes from 1960 until 1968.</p> <p>Industrial wastes disposed at the landfill included paint, paint thinners, solvents, varnishes, pesticide containers and rinse water, and a small amount of asbestos. Only a small percentage of the estimated 4,800 tons of wastes were considered industrial.</p>	<p>During the IAS, Site 3 was recommended for a confirmation study based on potential for site contaminants to impact groundwater.</p> <p>Surface soil and groundwater samples were collected during site-related investigations (e.g., Phase I and II SI and 1986 Remedial Investigation [RI]). Samples were generally analyzed for VOCs and metals. One sediment sample was also collected from a drainage swale.</p> <p>As part of the Phase II RI, soil gas sampling was conducted in June 1995 at three locations (Sites 3, 16, and 26). Samples were collected at Site 3 and analyzed for BTEX (benzene, toluene, ethylbenzene, and xylene m-p and xylene-o), TCE (trichloroethylene), and PCE (tetrachloroethylene). The soil gas survey was conducted to identify the location and extent of a potential VOC source area near one of the monitoring wells.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI</p> <p>COCs include: <i>Groundwater:</i> Metals and VOCs <i>Sediments:</i> PAHs <i>Soil Gas:</i> Organics including TCE and PCE</p>	<p>As part of the agreed upon remedy for Site 3, the Navy installed a vegetative cap over the landfill in June 2003. Land-use restrictions define access limitations that could result in damage to the landfill cover.</p>	<p>Access to Site 3 is restricted and any human contact by site personnel or visitors is infrequent.</p> <p>There is some potential (primarily in the past) for contaminants to migrate off-site via surface water entering the Mingamahone Brook. The landfill cap at Site 3 should minimize any current and future potential off-site migration of contaminants.</p> <p>Exposure Potential – Low/Medium</p>

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 4 Landfill West of "D" Group</p> <p>[OU 1]</p>	<p>Site 4 is a 5-acre site located near the center of the Mainside section of the station between Route 34 and Midway Road. The landfill was used from 1943 to 1960 and during this time approximately 10,200 tons of waste were disposed. A thin layer of sandy soil was used to cover buried materials.</p> <p>During its operation, waste materials were burned in trenches and subsequently covered with fill. The bulk of the materials disposed at this site included domestic wastes; demolition wastes; pesticide containers and rinse waters; and industrial wastes such as paint, paint thinners, acids, alcohols, small amounts of asbestos, and scrap wood.</p> <p>During site investigations workers encountered concrete, brick, and other construction debris at the landfill.</p>	<p>According to the IAS, Site 4 was recommended for a confirmation study based on potential for site contaminants to impact groundwater.</p> <p>A Phase I Site Inspection/IRP Phase II Confirmation Study was conducted in 1986. A Phase II Site Inspection Study was conducted in 1993. An RI/FS was conducted in 1993 and an RI was conducted in 1995. Samples were analyzed for metals, selected pesticides, SVOCs, VOCs, PCBs and total petroleum hydrocarbons (TPH).</p> <p>COCs include: <i>Soil:</i> Pesticide (4'4'-DDT) and TPH – detected only in subsurface soil. <i>Surface Water:</i> Metals (Lead). <i>Sediments:</i> PCBs, SVOCs, and VOCs <i>Groundwater:</i> VOCs (TCE and breakdown products) and metals.</p>	<p>In February 1998, a remedial action was initiated that included the installation of a low permeability landfill cover. The remedial action was completed in September 1999.</p> <p>The selected remedy also included groundwater monitoring and institutional controls (e.g., fencing, restricting site access, and restricting use of groundwater).</p> <p>A site inspection was conducted in January 2003 to ensure that all selected remedies were in place and effective.</p>	<p>Access to Site 4 is restricted and any human contact by site personnel or visitors is infrequent.</p> <p>Exposure Potential – Low</p>

Naval Weapons Station Earle (NWSE)

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 5 Landfill West of Army Barricades</p> <p>[OU 1]</p>	<p>Site 5 covers 13-acres located in the northeastern portion of the Mainside section of the station, immediately southwest of Site 2. The landfill operated from 1968 until 1978 and was used for the disposal of approximately 6,600 tons of domestic and industrial wastes.</p> <p>Industrial wastes are reported to only comprise a small percentage of the total wastes deposited in the landfill.</p> <p>Site 5 was an open vegetated area surrounded by woodlands. Approximately one acre of the site was used as a skeet shooting range. The skeet range was closed in 1998.</p>	<p>According to the IAS, Site 4 was recommended for a confirmation study.</p> <p>Sampling was conducted during several investigations: A Confirmation Study in 1986, a Site Inspection Study in 1993, an RI/FS in 1993, and an RI in 1995. Samples were generally analyzed for VOCs and metals.</p> <p>COCs include: <i>Soil:</i> Metals and VOCs – primarily subsurface soil <i>Groundwater:</i> VOCs and metals</p>	<p>In 1995, an interim remedial action was taken to stabilize the site.</p> <p>In February 1998, a remedial action was initiated that included the installation of a low permeability landfill cover. The remedial action was completed in September 1999. Lead impacted soils from the lead shot used at the skeet range were removed.</p> <p>A site inspection was conducted in January 2003 to ensure that all selected remedies were in place and effective.</p>	<p>Access to Site 5 is restricted and any human contact by site personnel or visitors is infrequent.</p> <p>Exposure Potential – Low</p>



Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 6 Landfill West of Normandy Road (Waterfront)</p>	<p>Site 6 is a 4-acre landfill in the waterfront portion of NWSE where refuse from waterfront area operations were burned and covered. It received explosive and solvent contaminated waste- waters from the Explosive Reclamation Facilities at Building 109 and loading operations at Building 110. The site was used from 1942 to 1975.</p> <p>The wastewaters discharged to this site contained TNT, RDX, TCE, trichloroethane, and cyclohexanone.</p> <p>According to site reports, the landfill may have been part of a salt marsh before disposal operations began. Most of the site area is currently paved or covered by buildings.</p>	<p>According to the IAS, Site 6 was not recommended for a Confirmation Study.</p> <p>Sampling was conducted during several investigations: A Phase I Site Inspection/IRP Phase II Confirmation Study was conducted in 1986.</p> <p>A Phase II Site Inspection Study and RI/FS were conducted in 1993. An RI was conducted in 1995.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI. Samples were generally analyzed for VOCs and metals.</p> <p>COCs include: <i>Sediment: Metals (arsenic and lead), PAHs (Benzo(a)pyrene) and some pesticides.</i> <i>Groundwater: Metals (arsenic)</i></p>	<p>In 1999, the Navy contractor stabilized the landfill surface by removing brush, adding soil cover, and grading and seeding.</p>	<p>Access to Site 6 is restricted. However, the site is located in the Waterfront portion of the station along the narrow land that extends to the water.</p> <p>Site 6 is adjacent to wetlands and Felgates Creek, both of which are surface water receptors of contamination.</p> <p>Exposure Potential – Low/medium</p>

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<p>Site 7 Landfill South of "P" Barricades (Waterfront)</p>	<p>Site 7 is located southeast of Building 375 in the waterfront portion of NWSE. The landfill received explosive contaminated wastewater from Loading Plant 3.</p> <p>The site was used from 1945 to 1975. The wastewaters discharged to this site contained TNT and RDX generated in Plant 3, and TCE and cyclohexane.</p> <p>In addition to munitions-related waste from the loading plant, shop wastes from the Waterfront Public Works shop and the Munitions Handling Laboratory (e.g., glass, wood, and small quantities of paint thinner and solvents) were also disposed at Site 7.</p>	<p>Site 7 was not recommended for Confirmation Study.</p> <p>A Phase I Site Inspection/IRP Phase II Confirmation Study was conducted in 1986.</p> <p>A Phase II Site Inspection Study was conducted in 1993</p> <p>An RI/FS was conducted in 1993 and an RI was conducted in 1995.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI</p> <p>No COCs were identified during environmental sampling.</p>	<p>No corrective actions have been taken at this site.</p> <p>The Navy has prepared a draft Feasibility Study (FS) to determine what actions, if any, should be performed. The FS is under review.</p>	<p>Access to Site 7 is restricted.</p> <p>The site is an open grassy area with some brush surrounded by woodlands. Any potential exposures would be limited and remaining site contamination is not accessible due to thickly vegetated ground cover.</p> <p>Site 7 is adjacent to Felgates Creek, which is a surface water receptor of contamination.</p> <p>Exposure Potential – Low</p>



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Site 8 Landfill East of S-186 (Waterfront)	<p>Site 8 is a 1-acre site located at the northern most portion of the Waterfront portion of the station.</p> <p>The landfill was used from 1943 to 1965 for the disposal of dunnage (i.e., untreated wood used to protect and secure cargo on ships). Approximately 20,000 to 30,000 cubic yards of material were disposed at this site.</p>	<p>Site 8 was not recommended for Confirmation Study. No additional sampling has been conducted.</p> <p>No COCs have been identified at Site 8.</p>	<p>No corrective actions have been conducted at this site.</p> <p>Site 8 was recommended for no further action.</p>	<p>Access to Site 8 is restricted. Much of the site has been paved over and is currently used as a parking lot.</p> <p>Site 7 is adjacent to Felgates Creek, which is a surface water receptor of contamination.</p> <p>Exposure Potential – Low</p>
Site 9 Landfill South of "P" Barricades (Waterfront)	<p>Site 9 is a three-acre area located in the southern half of the Waterfront portion of the station. The landfill was used for the disposal of dunnage lumber from 1967 to 1972. It is estimated that 4,500 to 7,500 cubic yards of lumber were disposed of at this site.</p>	<p>Site 9 was not recommended for Confirmation Study.</p> <p>A Phase I Site Inspection/IRP Phase II Confirmation Study was conducted in 1986.</p> <p>Additional sampling was also conducted as part of the Phase II Site Inspection Study (1993), RI/FS (1993), and RI (1995).</p> <p>No COCs have been identified at Site 9.</p>	<p>No corrective actions have been taken at this site.</p> <p>The Navy plans on preparing a Feasibility Study in fiscal year 2005 to determine what actions, if any, should be performed.</p>	<p>Access to Site 9 is restricted and any potential exposures would be limited.</p> <p>Exposure Potential – Low</p>

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Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 10 Scrap Metal Landfill Near Building S-589</p> <p>Also referred to as the "Box Yard"</p> <p>[OU 6]</p>	<p>Site 10 is a two-acre area located within the Mainside portion of the station, approximately 2,500 feet south of the intersection between Asbury Avenue and Midway Road. The site is mostly surrounded by forested wetlands.</p> <p>This landfill was used from 1953 to 1965 for disposal of demilitarized munitions and spent munitions cases. Aluminum and steel containers as well as assorted ammunition were buried at this site.</p> <p>Approximately 65,000 cubic yards of material were disposed of at this site. Since site closure, a large number of 40 mm shell casings have been found at the surface due to the erosion of cover materials.</p>	<p>Site 10 was not recommended for Confirmation Study.</p> <p>A Phase I Site Inspection/IRP Phase II Confirmation Study was conducted in 1986.</p> <p>Additional sampling was conducted as part of the Phase II Site Inspection Study (1993), RI/FS (1993), and RI (1995).</p> <p>COCs include: Groundwater: metals (lead)</p> <p>No other COCs were identified at Site 10.</p>	<p>A Feasibility Study, Proposed Plan and Record of Decision have been completed for Site 10.</p> <p>According to the Navy, a landfill cap has been placed on Site 10 in accordance with the Presumptive Remedy for CERCLA Municipal Landfill Sites. Other limited actions, such as institutional controls, which limit erosion on the site and restrict groundwater use are in place. The Remedial Action was completed in June 2003. Long-term monitoring continues on an annual basis.</p>	<p>Access to Site 10 is restricted.</p> <p>Exposure Potential – Low</p>



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<p>Site 11 Contract Ordnance Disposal Area</p> <p>[OU 8]</p>	<p>Site 11 is a two-acre site located in the north-central portion of the Mainside station.</p> <p>According to site- reports, Navy contractors used the area for several years for the disposal of obsolete ordnance material. The specific amounts of materials and dates of disposal activity are not available.</p> <p>The site was also used from 1974 to 1977 for occasional fire-fighting training exercises.</p>	<p>Site 11 was not recommended for Confirmation Study.</p> <p>A Phase I Site Inspection/IRP and Phase II Confirmation Study were conducted in 1986.</p> <p>A Phase II Site Inspection Study was conducted in 1993. Six soil samples (6-18 inches below ground surface [bgs]) were collected during the 1993 RI/FS. An RI was conducted in 1995.</p> <p>No COCs have been identified at Site 11.</p>	<p>A Feasibility Study, Proposed Plan and Record of Decision were completed for this Site.</p> <p>No corrective actions are planned for Site 11.</p>	<p>Access to Site 11 is restricted.</p> <p>Exposure Potential – Low</p>

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<p>Site 12 Battery Storage Area/Battery Acid Spill Site (Waterfront)</p>	<p>Site 12 is a paved area comprising approximately no more than 10,000 square feet located in the northwest portion of the Waterfront Area, behind the recreation building (Building R-14).</p> <p>It was apparently used for disposal of acid electrolyte from forklift batteries being sent offsite for reclamation. However, the period of disposal and quantity disposed of are not known and actual releases into the environment have not been confirmed.</p> <p>According to recent site documents, batteries have not been stored at this site for over ten years and there are no visible signs of contamination or stressed vegetation.</p> <p>An underground storage tank (UST) was located adjacent to the battery storage area and was removed in 1994.</p>	<p>Site 12 was not recommended for Confirmation Study.</p> <p>One surface water and one sediment sample was collected from the storm water culvert outflow during the 1993 SI. The samples were analyzed for metals, VOCs, SVOCs, pesticides, PCBs, and cyanide.</p> <p>Surface soil (0-6 inches bgs) and sediment samples were collected during the 1995 RI. Soil samples were collected near the site and the Site 6 marsh investigation included samples near the storm drain discharge point. Sampling indicated a small source area with relatively high lead levels near the surface. Subsurface concentrations were much lower.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI.</p> <p>COCs include: <i>Surface Soil:</i> Metals (Lead) and PAHs (Benzo(a) pyrene).</p> <p><i>Surface Water:</i> Metals (lead)</p>	<p>The Navy conducted soil excavation activities in 1999. The excavation of contaminated soils achieved the remediation goal established for protection of human health and to ensure minimal migration of contaminants to the adjacent marsh.</p> <p>The Draft Record of Decision is under review and is recommending no further action be performed at this Site.</p>	<p>Access to Site 12 is restricted. However, the site is located in the Waterfront portion of the station along the narrow land that extends to the water, which is industrialized and not as remote as the Mainside portion of NWSE.</p> <p>Exposure Potential – Low/medium</p>



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<p>Site 13 Defense Property Disposal Office Yard</p> <p>[OU 5]</p>	<p>Site 13 is located in the Mainside area near the rail classification yards in the north-central portion of the station. Most of the Defense Property Disposal Office yard is fenced, however, a small portion at the edge of the landfill is accessible, but still within NWSE property.</p> <p>The site contains fill material which extends into a marsh located adjacent to the rail classification yards. Items reportedly buried at this site include cars, trucks, electronic equipment, clothing, and furniture.</p> <p>Scrap metals, forklift batteries, and PCB-containing transformers were also stored at this site. Transformers were stored in open rail cars before being transported to the controlled storage area. No leaks in the transformers were reported.</p> <p>Site-related activities included disassembling batteries for purposes of lead recovery. In addition, battery acid was drained onto the ground surface.</p>	<p>An Initial Assessment Study (IAS) was conducted in 1983 and the report did not recommend a follow-up confirmation study.</p> <p>During the 1993 SI soil, sediment, and surface water samples were collected from Site 13.</p> <p>During the 1995 Phase II RI additional soil, surface water, and sediment samples were collected. Additionally, five shallow ground water monitoring wells were installed and samples collected.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI.</p> <p>COCs include: <i>Soil:</i> Metals, PAHs, and pesticides. <i>Sediment:</i> PCBs - Aroclor 1254 <i>Groundwater:</i> Metals (arsenic, cadmium, chromium, and lead); VOCs (Vinyl chloride).</p>	<p>During summer of 1997, NWSE personnel performed a partial removal of surface debris.</p> <p>The Navy and USEPA signed a Record of Decision in July 2004. The selected remedy for Site 13 is an engineered low-permeability cover system that meets RCRA criteria for municipal solid waste landfills. Construction of cap was scheduled to begin in June 2005.</p>	<p>Access to Site 13 is restricted. Site 13 is just west of Hockhockson Brook, about 0.5 miles from the station boundary. Given the groundwater and surface water flow and proximity to the station boundary, contaminants from this site have a greater potential to migrate off site.</p> <p>Site-related contaminants were not detected at high levels and it is likely that by the time contaminated sediments and surface water migrate off site they will be greatly diluted and would not pose an exposure concern.</p> <p>Exposure Potential – Low/medium</p>

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<p>Site 14 Defense Property Disposal Office Warehouse</p> <p>[OU 4]</p>	<p>Site 14 is a 16,000 square foot storage building located off of Asbury Avenue in the north central portion of the Mainside station.</p> <p>In 1970, a mercury spill was reported to have occurred in the building. According to site reports, the quantity of mercury released was estimated to be between one and several ounces. On-site interviews confirmed that the spill was confined to inside the building and it was cleaned up.</p>	<p>The IAS concluded that the site posed a minimal impact since the mercury spill was confined to the interior of the building and no contamination was expected to migrate outside of the spill area. No samples were collected at this site.</p>	<p>The mercury spill was cleaned up and no further corrective actions were required.</p>	<p>Access to Site 14 is restricted.</p> <p>Exposure Potential – Low</p>
<p>Site 15 Sludge Disposal Site near Waterfront South Gate</p>	<p>Site 15 is located along the former railroad tracks at the main entrance to the Waterfront area. During the early 1970s the site was used for disposal of an oily sludge material from ships home ported at the station.</p> <p>The exact quantity of sludge released is not known, however, site reports estimated over 5,000 gallons may have been disposed. The precise location of the disposal area could not be identified during visual inspections.</p>	<p>An Initial Assessment Study (IAS) was conducted in 1983 and the report did not recommend a follow-up confirmation study.</p> <p>Environmental samples were collected during the 1993 SI study. Additional environmental samples were collected during the 1995 RI.</p> <p>COCs include: <i>Sediment:</i> PAHs (Benzo(a)pyrene) and metals (lead)</p>	<p>The proposed plan for Site 15 was finalized in September 2004. The selected remedy for this site includes institutional controls and long-term monitoring. Access restrictions will be placed to limit future uses that may result in direct contact with contaminated soil.</p>	<p>Access to Site 15 is restricted. Additional fencing was installed in 2003.</p> <p>Exposure Potential – Low</p>

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<p>Site 16 Fuel Line Connecting Buildings C-20 and C-50</p> <p>EPIC Site F (Roundhouse)</p>	<p>Site 16 and EPIC Site f are considered one site because of their close proximity to each other and because portions of Site 16 overlap EPIC Site F. These two areas comprise approximately 8 acres combined and are located in the north central portion of the Mainside station.</p> <p>The Site consists of a heavy equipment storage yard and two railroad car storage yards that have been active since the late 1940s. Two former diesel tanks were also located at Epic Site F near Building C-50.</p> <p>An underground fuel line was used to transport diesel fuel from storage tanks to a dispensing station approximately 100 feet north of Building C-50. In 1977, a leak in the fuel line was discovered and use of the pipeline was discontinued. The primary environmental concern at this site is the release of petroleum-related compounds into the adjacent soil, surface water and sediment, and especially the shallow groundwater.</p>	<p>An Initial Assessment Study (IAS) was conducted in 1983 and the report did not recommend a follow-up confirmation study.</p> <p>Environmental sampling and a geophysical survey was conducted during the 1992 SI</p> <p>As part of the Phase II RI, soil gas sampling was conducted in June 1995 at three locations (Sites 3,16, and 26); where soil gas samples were collected and analyzed at Site 16 for BTEX (benzene, toluene, ethylbenzene, and xylene m-p and xylene-o), TCE, and PCE). Additional soil (surface and subsurface), sediment, and groundwater samples were collected and analyzed.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI.</p> <p>COCs include: <i>Surface Soil:</i> Metals (Lead) and TPH. <i>Sediment:</i> TPH. <i>Groundwater:</i> Organics (Benzene), TPH. <i>Soil gas:</i> Organics (total BTEX, TCE, PCE).</p>	<p>In 1989, the ditch on the side of Building C-50 was excavated and the materials were disposed at a licensed hazardous disposal facility.</p> <p>A pilot scale "bioslurper" system was installed in 1996 to determine whether the free-product fuel could be recovered. After some initial modifications to the pilot system, a large-scale system was designed in 1997 and was operated from February 1998 through May 1999. Approximately 5,000 gallons of diesel fuel has been recovered using the bioslurper process.</p> <p>Additional wells have been added to the site for additional recovery where building was demolished. Other wells that were not producing have been abandoned for additional sampling.</p> <p>Site 16/F is being remediated under the underground storage tank (UST) program in cooperation with the New Jersey Department of Environmental Protection (NJDEP).</p>	<p>Access to Site 16/EPIC Site F is restricted. Institutional controls are in place to prevent the use of groundwater as a drinking water source. There is a low potential for contaminants to migrate off-site via surface water and sediment transport since the source of contamination has been removed and shallow groundwater is the most significantly impacted media.</p> <p>Exposure Potential – Low</p>

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<p>Site 17 Disposal Area Behind Training Barge Waterfront Area [OU 9]</p>	<p>Site 17 is an active disposal area located in the northwest section of the Waterfront portion of the station.</p> <p>Materials reportedly disposed of at this site include forklift vehicles, empty paint cans, and construction debris (e.g., wood, concrete, asphalt).</p>	<p>An IAS was conducted in 1983 and the report did not recommend a follow-up confirmation study.</p> <p>During the 1993 SI surface, sediment, and groundwater samples were collected and analyzed for selected compounds.</p> <p>During the 1995 RI surface soil, sediment, groundwater, and surface water samples were collected and analyzed for selected compounds.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI.</p> <p>COCs include: <i>Sediment:</i> Metals (arsenic) and PAHs (benzo(a)pyrene) <i>Groundwater:</i> Metals (arsenic) <i>Surface water:</i> Metals (arsenic and lead).</p>	<p>No corrective actions have been conducted at Site 17 and there are none planned.</p>	<p>Access to Site 17 is restricted.</p> <p>Institutional controls are in place and long-term monitoring is planned to determine any ecological impact to adjacent marshes. The site does not pose a human health threat.</p> <p>Exposure Potential – Low</p>

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<p>Site 18 Demilitarization Furnace, Building 589</p>	<p>Site 18 includes Building 589, which housed a state-permitted furnace that was used to demilitarize small caliber (up to 40 mm) ammunition. The furnace operated between 1978 and 1989.</p> <p>Waste areas at this site include approximately 50 square feet of soil contaminated by metal fragments.</p>	<p>An IAS was conducted in 1983 and the report did not recommend a follow-up confirmation study.</p> <p>Other than confirmatory sampling in 1995, no additional site characterization has been conducted for Site 18. The confirmatory soil sampling was conducted in conjunction with the Resource Conservation and Recovery Act (RCRA) closure and furnace removal.</p>	<p>The furnace was removed under closure in accordance with the RCRA. Closure and soil sampling plans were submitted to NJDEP and were carried out in 1995.</p>	<p>Access to Site 18 is restricted.</p> <p>Exposure Potential – Low</p>
<p>Site 19 Paint Chip and Sludge Disposal Area Adjacent to Building S-34. [OU 2]</p>	<p>Site 19 consists of the former paint chip and sludge disposal area, located in the Mainside area portion of the station. The site is a 300-foot circular area; half is paved with asphalt and half is covered by gravel. Sludge and other materials were disposed in a trench approximately 50 feet in diameter, with a depth ranging from 5 to 10 feet.</p> <p>Paint chip and sludge disposal from a maintenance area occurred from the early 1940s until the early 1960s near Building S-34. Paint slurries and solvent residues were also discharged into an open drainage swale. The drainage swale runs from the depression to a small stream in the wetlands adjacent to the site. The paved portion of the site is currently used to train Navy forklift operators.</p>	<p>During the 1983 IAS document reviews and interviews with site personnel provided evidence of significant amounts of paint disposal at Site 19. However, the report did not recommend a follow-up confirmation study because it was believed that impacted soils were removed during the construction of new barricade facilities in the 1970s.</p> <p>Environmental samples (soil, sediment, groundwater, and surface water) were collected during the 1993 SI.</p> <p>During the 1992 RI/FS, additional soil, sediment, and groundwater samples were collected and analyzed for metals and VOCs.</p> <p>COCs include: <i>Surface Soil:</i> Metals (lead, cadmium, and chromium) <i>Surface water:</i> no site-related COCs found <i>Sediment:</i> Metals (arsenic) and PAHs. <i>Groundwater:</i> Metals (arsenic and lead).</p>	<p>The Record of Decision for remediation of this site was signed in August 1997.</p> <p>A Remedial Action consisting of soil excavation at the on-site surface depression and the drainage ditch leading away from it, backfilling with clean soil, and paving of the filled surface depression was completed in 1998.</p>	<p>Access to Site 19 is restricted.</p> <p>Exposure Potential – Low</p>

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<p>Site 20 Grit Blasting Disposal Area at Building 544</p> <p>[OU 4]</p>	<p>Site 20 is a small (15 by 100 feet) area behind Building 544 located in the center of the Mainside portion of the station. The site houses grit blasting operations for the removal of paint from ordnance.</p> <p>Activities at the site included the disposal of paint chips and spent grit from site operations. The spent grit was dumped in an open pile southwest of Building 544. A leaching field is present behind this building.</p>	<p>According to the 1983 IAS report, Site 20 was not recommended for a confirmation study because it was believed that the metal from paint chips would not leach into the environment.</p> <p>In 1986, additional soil samples were collected and analyzed for metals and TPH.</p> <p>During the 1993 RI/FS surface sediment samples were collected and analyzed for selected target compounds (e.g., metals, VOCs, pesticides, and PCBs).</p> <p>Twelve surface soil samples were collected and analyzed for metals and SVOCs as part of post excavation confirmatory sampling.</p> <p>COCs include: Soil: Metals and PAHs</p>	<p>A removal action was conducted in two stages; the first stage was conducted in December 1994 and the second in March 1995. The first removal action consisted of excavating approximately 300 cubic yards of contaminated soil. The second stage consisted of excavating additional soils that exceeded New Jersey Department of Environmental Protection (NJDEP) cleanup standards. Excavated soil was transported to a permitted off-site facility.</p>	<p>Access to Site 20 is restricted.</p> <p>Exposure Potential – Low</p>



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<p>Site 21 Baghouse and Cyclone Dust Storage Area Adjacent to Building S-589</p>	<p>Site 21 (referred to as "the DEMIL Storage Pad") is located in the east-central portion of the Mainside area. The site was used as a storage pad for dust recovered from the air pollution control equipment on the demilitarization furnace, which was, used from 1978-1989.</p> <p>Some containerized solid hazardous wastes were intermittently stored on this site until December 1998. Site 21 was included in NWS Earle's hazardous waste storage permit. A new hazardous waste storage facility has been constructed and is currently being used for the storage of hazardous wastes on NWS Earle.</p> <p>Site 21 is no longer used as a permitted hazardous waste storage area. Closure of this area is being performed in accordance with the conditions of the hazardous waste storage permit. The site was paved over shortly before the IAS was released.</p>	<p>An IAS was conducted in 1983 and the report did not recommend a follow-up confirmation study.</p> <p>An underground leach field was evaluated during the 1995 Remedial Investigation. Soil borings were taken in the area of the leach field and in nearby wetlands.</p> <p>No additional site characterization has been conducted.</p> <p>COCs include: <i>Soil:</i> Metals <i>Sediments:</i> Metals</p>	<p>An interim removal action was conducted in 1994 to remove the grit pile and visibly impacted soils. Confirmatory soil samples were taken in the excavated areas.</p>	<p>Access to Site 21 is restricted.</p> <p>Exposure Potential – Low</p>

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<p>Site 22 Paint Chip Disposal Area Adjacent to Building D-2 [OU 4]</p>	<p>Site 22 consists of approximately 50 square feet of partially vegetated land located south of Building D-2 near the center of the Mainside portion of the station. The site is bordered to the north by a railroad siding and to the east by a marshy area.</p> <p>This site was a former paint chip disposal area where waste sand blasting material and paint wastes were disposed. The soils is discolored from past grit blasting and painting operations.</p> <p>A shallow drainage depression, measuring approximately 275 feet in length runs the length of the site behind Building D-2, and discharges toward the southeast to the marshy area.</p>	<p>According to the 1983 IAS report, Site 20 was not recommended for a confirmation study.</p> <p>In 1986 a confirmation study was conducted to better characterize the nature and extent of contamination at Site 22. Soil samples were collected (between 0-3 feet bgs) from locations where stained soil was observed. The samples were analyzed for metals and TPH.</p> <p>During the 1992 RI/FS additional soil samples were collected at three locations at varying depths where stained soils were observed. These samples were analyzed for metals, VOCs, pesticides, and PCBs.</p> <p>COCs include: <i>Sediment:</i> PAHs (Benzo(a)pyrene)</p>	<p>A focused remedial action was conducted for Site 22 during 1996. The remedial action included removing approximately 250 tons of contaminated soil from; 1) an area approximately 38 by 50 feet up to one foot in depth and 2) an area approximately 16 by 4 feet up to 3 feet in depth, both located on the western side of building D-2. Excavated soil was transported to a permitted off-site facility.</p> <p>Confirmatory samples were collected after soil removal activities were completed. No further action is anticipated for this site.</p>	<p>Access to Site 22 is restricted.</p> <p>Exposure Potential – Low</p>

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 23 Paint Chip Disposal Area Adjacent to Building D-5</p> <p>[OU 4]</p>	<p>Site 23 comprises approximately 200 square feet located in the Mainside portion of the station, southwest of Building D-5. The site was used from about 1970 until 1993 for the disposal of paint chips and other paint wastes.</p> <p>The site is partially paved and surface water run-off primarily flows into three shallow drainage depressions and eventually into a marshy area northeast of the site.</p>	<p>An IAS was conducted in 1983 and the report did not recommend a follow-up confirmation study since site-related contamination was not expected to pose a hazard.</p> <p>During the 1993 SI, soil and sediment samples were collected and analyzed for metals and selected organic compounds.</p> <p>During the 1995 RI, additional soil and sediment samples as well as groundwater and surface water samples were collected and analyzed for metals and selected organic compounds.</p> <p>COCs include: <i>Soil:</i> Metals and PAHs (Indeno(1,2,3-CD) pyrene, dibenz(a,h)anthracene, benzo(b)fluoranthene, benzo(a)anthracene, and benzo(a)pyrene). <i>Groundwater:</i> Metals (arsenic, cadmium, lead, and vanadium).</p>	<p>A focused remedial action was conducted at Site 23 in 1996. The removal action included excavating approximately 86 tons of soil from an area covering 18 feet by 3 feet at a depth of 2.8 feet on the southwestern side of Building D-5. Excavated soil was transported to a permitted off-site facility. Confirmatory samples were collected after excavation activities were completed. The excavated areas were backfilled with clean fill and re-vegetated.</p>	<p>Access to Site 23 is restricted.</p> <p>Exposure Potential – Low</p>

Naval Weapons Station Earle (NWSE)

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 24/25 Closed Pistol Range [OU 4]</p>	<p>Sites 24 and 25 are closed areas previously used as small arms practice ranges. The sites are adjacent to each other in the north-central portion of the Mainside station.</p> <p>According to site documents, there are no wetlands in close proximity to the ranges.</p>	<p>An IAS was conducted in 1983 and the report did not recommend a follow-up confirmation study since lead was not expected to present at sufficient quantities to pose a hazard.</p> <p>During the 1993 SI, subsurface soil samples (3 feet bgs) were collected and analyzed for selected metals (i.e., lead, zinc, copper, chromium, and cadmium).</p> <p>In August 1995, addition subsurface soil samples were collected at the two ranges.</p> <p>Groundwater wells were not installed at sites 24 or 25.</p> <p>COCs include: Bullets and shells containing lead. No other COCs were identified at Sites 24 or 25.</p>	<p>A focused remedial action was performed at Sites 24 and 25 to remove bullets and shell casings from each site. As part of the remedial action, approximately 10 tons of bullets were recovered. No further remedial action is planned for sites 24 and 25.</p>	<p>Access to Site 24/25 is restricted.</p> <p>Exposure Potential – Low</p>

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 26 Explosive "D" Washout Area, Building GB-1</p> <p>[OU 3]</p>	<p>Site 26 is a 200 x 200 foot area located behind Building GB-1 near the center of the station at the intersection of Macassar and Midway Roads.</p> <p>Building GB-1 was reportedly used for the reconditioning of munitions casings/shells for a one-year period in the late 1960s; site-activities specifically include the removal and recovery of Explosive "D" and ammonium picrate, from 5-inch shells. It was reported that as much as 20,000 pounds of ammonium picrate might have been lost to surface water during the recovery process.</p> <p>A 30-foot wide x 10-foot deep percolation pit in the center of the site was used to collect overflow from a cooling/settling tank located in Building GB-1.</p> <p>Solvents were used in the reconditioning process and were discarded into an unidentified receptacle. Groundwater plumes containing TCE, 1,2-dichloroethylene (1,2-DCE), and PCE have been identified beneath this site.</p>	<p>The 1983 IAS did not recommend a confirmation study because the environmental impact was not expected to be significant. Upon further consideration, a SI study was conducted in 1986 and a Phase I RI was conducted in 1993. During these investigations soil and groundwater samples were collected and analyzed for selected explosives (e.g., picric acid), VOCs, pesticides, PCBs, and metals.</p> <p>As part of the Phase II RI, soil gas sampling was conducted in June 1995 at three locations (Sites 3, 16, and 26); where soil gas samples were collected and analyzed for BTEX (benzene, toluene, ethylbenzene, and xylene m-p and xylene-o), TCE, and PCE.</p> <p>Additional groundwater and soil samples were collected during Phase II RI activities. Confirmation sampling also was conducted during the 1996 RI Addendum.</p> <p>Additional environmental samples were collected as part of an RI Addendum for seven sites where data gaps were identified during the Phase II RI.</p> <p>COCs included: <i>Soil:</i> Metals (lead) <i>Groundwater:</i> VOCs (TCE, 1,2-DCE, and benzene). <i>Soil Gas:</i> VOCs (TCE)</p>	<p>A Proposed Plan was announced in December 1997 for remediation of the site using air sparging and soil vapor extraction. A removal action was conducted in February 1998 to remove the underground vault. The percolation pit and some associated clay drain pipes, located at the northwestern end of building GB-1, were not removed.</p> <p>A Record of Decision was issued in 1998, which documented the remedy for this site as air sparging/soil vapor extraction.</p> <p>In May 1999 a pilot process study was completed; the information obtained from the pilot system operation was used as the basis of design for the full scale, air sparging/soil vapor extraction system.</p> <p>The full-scale system design was completed in 1999 and the Air/Sparging System began operation in 2000. The system was taken off-line in 2004 for at least one year. Quarterly groundwater sampling continues to characterize the nature and extent of the TCE/PCE plume and evaluate the natural attenuation process.</p>	<p>Access to Site 26 is restricted. Although there is significant groundwater contamination at this site, people are not coming in direct contact with site related contaminants and groundwater beneath NWSE is not used for drinking.</p> <p>According to Navy personnel, the leading edge of the solvent (i.e., TCE and other organics) plume is thousands of feet from the closest NWSE boundary and would not be expected to migrate off site in the future.</p> <p>Exposure Potential – Low</p>

Naval Weapons Station Earle (NWSE)

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
<p>Site 27 Projectile Refurbishing Area</p> <p>[OU 4]</p>	<p>Site 27 is located in the southeast portion of the Mainside station. It contains Building E-14 and a small storage locker located off Oran Road.</p> <p>Projectiles are refurbished at the site by shot-blasting, repainting, and stenciling. Oil-contaminated rags, paint chips, and spent sandblasting shot were disposed behind the facility. Approximately 80 square feet of the surface near the southeast corner of Building E-14 was covered by red paint sludge.</p>	<p>The 1983 IAS did not recommend a confirmation study for Site 27.</p> <p>During the 1993 SI, soil and sediment samples were collected and analyzed for target compounds.</p> <p>During the 1995 RI, additional subsurface soil samples were collected.</p> <p>COCs include: <i>Soil:</i> Metals and SVOCs <i>Sediment:</i> Metals (Lead)</p>	<p>A focused remedial action was conducted at Site 27 to address soil contamination. The action included excavating approximately 54 tons of contaminated soil up to 1 foot in depth. The excavated soil was transported to an off site permitted disposal facility. Confirmatory samples were collected after excavation activities were completed.</p>	<p>Access to Site 27 is restricted.</p> <p>Exposure Potential – Low</p>
<p>Site 28 Waste Oil Tank</p>	<p>Site 28 is located in the north-central portion of the Mainside area. It consisted of an underground waste oil tank behind Building C-14, which has been closed in accordance with underground storage tank requirements.</p>	<p>No environmental investigations for Site 28 have been identified.</p>	<p>Other than the removal of the tank, no corrective actions have been conducted for Site 28</p>	<p>Access to Site 28 is restricted.</p> <p>Exposure Potential – Low</p>
<p>Site 29 PCB Spill Site, Building C-16</p> <p>[OU 4]</p>	<p>Site 29 is located in the storage yard north of Building C-16, which is in the north central portion of the Mainside station.</p> <p>In 1981, a PCB spill reportedly occurred when a transformer was vandalized.</p> <p>According to the 1996 RI, a plan to construct a hazardous waste storage facility at the site was in place.</p>	<p>The IAS did not recommend a confirmation study for Site 29 because the environmental impact was not expected to be significant.</p> <p>During the 1992 SI field investigation soil (0.5 – 1.5 below ground surface [bgs]) and groundwater samples were collected and analyzed for PCBs, selected pesticides, and TPH.</p> <p><i>Soil:</i> TPH and low levels of PCBs <i>Groundwater:</i> very low level VOCs (Benzene and 1,2-DCE)</p>	<p>More than 20 cubic feet of contaminated soil was excavated and transported off-site to a disposal facility within a week of the PCB spill occurring.</p> <p>No further remedial action is planned for site 29.</p>	<p>Access to Site 29 is restricted.</p> <p>Exposure Potential – Low</p>

Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
Site 47 Closed pesticide Shop Building S-86	<p>Site 47 is located in the north-central portion of the Mainside area.</p> <p>The Pesticide Shop was used basically as storage and mixing facility through the 1980s. Pesticides were mixed and applied by contractor personnel.</p>	<p>Soil and groundwater sampling of soils in the vicinity of the pesticide shop building was conducted. A Final Preliminary Assessment/Site Investigation Report for Site 47 was completed in January 2004.</p> <p>COCs included: Soil: Pesticides (chlordane and 4,4' DDT). Groundwater: Pesticides (Endosulfan I).</p> <p>Sludge in the septic tank, which had previously serviced the building, has been found to contain chlordane.</p>	<p>In 1991, all residual pesticide/herbicide product containers were removed from Building S-86 and properly disposed of as hazardous waste.</p> <p>The removal of contaminated soils, the septic tank, and the demolition of Bldg. S-86 were completed in December 1999. Confirmatory sampling of soil and groundwater was conducted to determine the effectiveness of the removal action.</p> <p>No further action is necessary at this site.</p>	<p>Access to Site 47 is restricted.</p> <p>Exposure Potential – Low</p>
Site 48 Mine Battery Site at West Pond area	<p>Site 48 is a 3-4 acre site located north and west of Building S-35, west of Highway 34, and adjacent to West Pond.</p> <p>The mine batteries were discovered in wetland areas adjacent to and within West Pond. The impacted area has been evaluated as the mines were determined to be inert.</p>	<p>An environmental evaluation of this site was conducted in Fall 1999. A Final Preliminary Assessment/Site Investigation Report for Site 48 was completed in January 2004.</p> <p>COCs include: Sediments: Metals Surface water: Metals</p>	<p>The Navy conducted a sweep of the wetland area and West Pond and removed mine batteries lying on the ground and in the pond.</p>	<p>Access to Site 48 is restricted.</p> <p>Exposure Potential – Low</p>

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Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
Other Sources of Contamination				
Epic Site L MSC Van Parking Area	<p>Epic Site L is a 15.7-acre site located near Asbury Avenue and Pine Brook Road in the northeastern portion of the Mainside station.</p> <p>Approximately one-third of the site was used for approximately 30 years to store utility poles, railroad ballast stone, and other wood, plastic, and metal scrap materials.</p> <p>A stained area near a treated utility pole storage area was observed during a review of aerial photos.</p>	<p>A Preliminary Assessment Addendum consisting of interviews and a review of aerial photos was conducted in 1992.</p> <p>During RI activities in December 1995, surface (0-0.5 feet bgs) soil samples were collected and analyzed for VOCs, metals, pesticides, PCBs, and TPH.</p> <p>COCs include: <i>Surface Soil:</i> PAHs.</p>	No corrective actions have been performed and none are planned for this site.	<p>Access to Epic Site L is restricted.</p> <p>Exposure Potential – Low</p>
Epic Site Q Fire Fighting School	<p>This site comprises 5.5-acres in the southwestern portion of the Mainside station.</p> <p>Fire fighting activities began in 1975 and the site continues to be used by a variety of state and county groups for fire fighting exercises.</p> <p>Fire fighting training takes place on a concrete pad surrounded by a bermed, paved area. All water used for training is contained and collected for treatment. An on-site water treatment plant is permitted and inspected by the New Jersey Department of Environmental Protection (NJDEP).</p>	<p>In December 1995, as part of the RI investigation, a small number of soil, sediment, and groundwater samples were collected.</p> <p>No COCs were identified at Epic Site Q.</p>	No corrective actions are planned for this site. Discharge monitoring of the water treatment plant will continue in accordance with the state permit.	<p>Access to Epic Site Q is restricted.</p> <p>Exposure Potential – Low</p>



Appendix A: IRP Site Summaries and Exposure Potential of Source Areas of Contamination at Naval Weapons Station Earle (NWSE)				
Sites	Site Description/ Waste Disposal History	Investigations and Significant Findings	Corrective Actions	Site Access and Exposure Potential
Wayside	This is a 440-acre site located in the far northeast corner of the Mainside Station. The U. S. Army used this area to conduct training activities and communications research and development between 1947 and 1992. The site included a number of buildings and structures, an underground network of electrical and telephone cables, potable water wells, and other communications equipment.	In 1992, the Navy contracted with Halliburton NUS to conduct an environmental assessment of the area. In 1999, NWSE, the U.S. Army, and Fort Monmouth representatives began plans for decommissioning the Army components from the site. Additional investigations are planned to assess any impacts to groundwater of Wayside Area activities. The U. S. Army, in conjunction with Navy collaboration and oversight, will take action to remove all buildings and structural assets from this site.	Following the 1992 environmental investigation, the U.S. Army removed several transformers containing PCB-dielectric fluid and underground heating oil tanks.	Access is restricted. Exposure potential - Low.
<p>Sources:</p> <p>Brown & Root. 1996. Remedial Investigation Report for NWSE. July 1996.</p> <p>Brown & Root. 1997a. Remedial Investigation Addendum Report for NWSE, Colts Neck, New Jersey. Volume I and II. February 1997.</p> <p>Brown & Root. 1997b. Record of Decision (ROD) Operable Unit (OU)-1. Sites 4 and 5, for NWSE, Colts Neck, New Jersey. August 1997.</p> <p>Brown & Root. 1997c. ROD OU-2. Site 19, NWSE. August 1997.</p> <p>Brown & Root. 1998a. ROD OU-3. Site 26, NWSE. August 1998.</p> <p>Brown & Root. 1998b. ROD OU-4. Sites 14, 20, 22, 23, 24, 25, 27, and 29, NWSE. December 1998.</p> <p>Brown & Root. 1998c. RI Addendum Report for NWSE. January 1998.</p> <p>Brown & Root. 2004a. ROD Defense Property Disposal Office Yard Landfill. Site 13 (OU 5), NWSE. July 2004.</p> <p>Brown & Root. 2004b. ROD Sites 1 and 11 OU 8, NWSE. September 2004.</p> <p>Brown & Root. 2004c. ROD OU-6. Sites 3 and 10, NWSE. December 2004.</p> <p>Brown & Root. 2004d. ROD Site 26 PCE Plume OU 7, NWSE. December 2004.</p> <p>Engineering Field Activity Northeast (EFAN). 2006. Phase I Groundwater and Soil Data Open Burning/Open Detonation Unit. January 2006.</p> <p>Hart Associates, Inc. 1983. Initial Assessment Study NWSE. February 1983.</p> <p>Roy F. Weston, Inc. 1993. Installation Restoration Program Remedial Investigation/Feasibility Study for 11 Sites at NWSE. September 1993.</p> <p>Roy F. Weston, Inc. 1994. Installation Restoration Program Site Investigation for 16 Sites at NWSE: Final SI Report. January 1994.</p> <p>Tetra Tech NUS, Inc. 1998. [ROD OU 4].</p> <p>U.S. Navy. 2003. First Five-Year Review Report, NWSE. February 2003.</p> <p>U.S. Navy. 2005. NWSE Installation Restoration Program Site Summary. January 2005.</p>				

Appendix B. List of Comparison Values Used by ATSDR

Comparison Values

ATSDR comparison values are media-specific concentrations that are considered to be safe under default conditions of exposure. They are used as screening values in the preliminary identification of site-specific “contaminants of concern.” The latter term should not be misinterpreted as an implication of “hazard.” As ATSDR uses the phrase, a “contaminant of concern” is a chemical substance detected at the site in question and selected by the health assessor for further evaluation of potential health effects. Generally, a chemical is selected as a “contaminant of concern” because its maximum concentration in air, water, or soil at the site exceeds one of ATSDR's comparison values.

Nevertheless, it must be emphasized that comparison values are not thresholds of toxicity. Although concentrations at or below the relevant comparison values could reasonably be considered safe, it does not automatically follow that any environmental concentration that exceeds a comparison value would be expected to produce adverse health effects. The principal purpose behind conservative, health-based standards and guidelines is to enable health professionals to recognize and resolve potential public health hazards before they become actual public health consequences. Thus comparison values are designed to be preventive—rather than predictive—of adverse health effects. The probability that such effects will actually occur does not depend on environmental concentrations alone, but on a unique combination of site-specific conditions and individual lifestyle and genetic factors that affect the route, magnitude, and duration of actual exposure.

Listed and described below are the various comparison values that ATSDR uses to select chemicals for further evaluation, as well as other non-ATSDR values that are sometimes used to put environmental concentrations into perspective.

CREG	=	Cancer Risk Evaluation Guides
MRL	=	Minimal Risk Level
EMEG	=	Environmental Media Evaluation Guides
IEMEG	=	Intermediate Environmental Media Evaluation Guide
RMEG	=	Reference Dose Media Evaluation Guide
RfD	=	Reference Dose
RfC	=	Reference Dose Concentration
RBC	=	Risk-Based Concentration
MCL	=	Maximum Contaminant Level

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations expected to cause no more than one excess cancer in a million persons exposed over a lifetime. CREGs are calculated from EPA's cancer slope factors, or cancer potency factors, using default values for exposure rates. That said, however, neither CREGs nor cancer slope factors can be used to make realistic predictions of cancer risk. The true risk is always unknown and could be as low as zero.

Minimal Risk Levels (MRL) are estimates of daily human exposure to a chemical (doses expressed in mg/kg/day) that are unlikely to be associated with any appreciable risk of deleterious non-cancer effects over a specified duration of exposure. MRLs are calculated using data from human and animal studies and are reported for acute (≤ 14 days), intermediate (15-364 days), and chronic (≥ 365 days) exposures. MRLs for specific chemicals are published in ATSDR toxicological profiles.

Environmental Media Evaluation Guides (EMEGs) are concentrations that are calculated from ATSDR minimal risk levels by factoring in default body weights and ingestion rates.

They factor in body weight and ingestion rates for acute exposures (Acute EMEGs — those occurring for 14 days or less), for intermediate exposures (Intermediate EMEGs — those occurring for more than 14 days and less than 1 year), and for chronic exposures (Chronic EMEGs — those occurring for one year [365 days] or greater).

Reference Dose Media Evaluation Guides (RMEGs) represent the concentration of a contaminant in air, water, or soil that corresponds to EPA's RfD for that contaminant when default values for body weight and intake rates are taken into account.

Reference Dose (RfD) is an estimate of the daily exposure to a contaminant unlikely to cause noncarcinogenic adverse health effects. Like ATSDR's MRL, EPA's RfD is a dose expressed in mg/kg/day.

Reference Concentrations (RfC) is a concentration of a substance in air that EPA considers unlikely to cause noncancer adverse health effects over a lifetime of chronic exposure.

Risk-Based Concentrations (RBC) are media-specific concentrations derived by Region III of the Environmental Protection Agency from RfD's, RfC's, or EPA's cancer slope factors. They represent concentrations of a contaminant in tap water, ambient air, fish, or soil (industrial or residential) that are considered unlikely to cause adverse health effects over a lifetime of chronic exposure. RBCs are based either on cancer or non-cancer effects.

Maximum Contaminant Levels (MCLs) represent contaminant concentrations in drinking water that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at an exposure rate of 2 liters of water per day.

More information about the ATSDR evaluation process can be found in ATSDR's Public Health Assessment Guidance Manual at <http://www.atsdr.cdc.gov/HAC/HAGM/>. A hard copy can be obtained by contacting the ATSDR information line toll-free at (888) 422-8737.

Appendix C. ATSDR's Methods

Contaminant Data Evaluation

In public health assessments, ATSDR addresses the likelihood that exposure to contaminants, using the maximum or average concentrations detected, would result in adverse health effects. While the relative toxicity of a chemical is important, the response of the human body to a chemical exposure is determined by several additional factors, including the concentration (how much), the duration of exposure (how long), and the route of exposure (breathing, eating, drinking, or skin contact). Lifestyle factors (i.e., occupation and personal habits) also have a major impact on the likelihood, magnitude, and duration of exposure. Individual characteristics such as age, sex, nutritional status, overall health, and genetic constitution affect how a human body absorbs, distributes, metabolizes, and eliminates a contaminant. A unique combination of all these factors will determine the individual's physiologic response to a chemical contaminant and any adverse health effects the individual could suffer as a result of the chemical exposure.

ATSDR has determined levels of chemicals that can reasonably (and conservatively) be regarded as harmless, based on the scientific data the agency has collected in its toxicological profiles. The resulting comparison values and health guidelines, which include ample safety factors to ensure protection of sensitive populations, are used to screen contaminant concentrations at a site and to select substances ("chemicals of concern") that agency environmental health scientists and toxicologists scrutinize more closely.

It is a point of key importance that ATSDR's (as well as state and federal regulatory agency) comparison values, screening numbers and health guidelines define very conservative and protective levels of environmental contamination and are not thresholds of toxicity. This means that although concentrations at or below a comparison value could reasonably be considered safe, it does not automatically follow that any concentration above a comparison value will necessarily produce toxic effects. To the contrary, ATSDR's comparison values are intentionally designed to be much lower, usually by at least two or three orders of magnitude, than the corresponding no-effect levels (or lowest-effect levels) determined from scientific studies. ATSDR uses comparison values (regardless of source) solely for the purpose of screening individual contaminants. In this highly conservative procedure, ATSDR may decide that a compound warrants further evaluation if the highest single recorded concentration of that contaminant in the medium in question exceeds that compound's lowest available comparison value (e.g., cancer risk evaluation guides or other chronic exposure values) for the most sensitive, potentially exposed individuals (e.g., children or pica children). This conservative process results in the selection of many contaminants as "chemicals of concern" that will not, upon closer scrutiny, be judged to pose any hazard to human health. Still, ATSDR judges it prudent to use a screen that "lets through" many harmless contaminants rather than one that overlooks even a single potential hazard to public health. Even those contaminants of concern that are ultimately labeled in the toxicologic evaluation as potential public health hazards are so identified solely on the basis of the maximum concentration detected. The reader should keep in mind the protective nature of this approach when considering the potential health implications of ATSDR's evaluations.

Because a contaminant must first enter the body before it can produce any effect on the body, adverse or otherwise, the toxicologic discussion in public health assessments focuses primarily on completed pathways of exposure, i.e., contaminants in media to which people are known to have been, or are reasonably expected to have been, exposed. Examples are water that could be used for drinking, and air in the breathing zone.

To determine whether people were, or continue to be, exposed to contaminants originating from a site, ATSDR evaluates the factors that lead to human exposure. These factors or elements include (1) a source of contamination, (2) transport through an environmental medium, (3) a point of exposure, (4) a route of human exposure, and (5) an exposed population. Exposure pathways fall into one of three categories:

- *Completed Exposure Pathway.* ATSDR calls a pathway “complete” if it is certain that people are exposed to contaminated media. Completed pathways require that the five elements exist and indicate that exposure to the contaminant has occurred, is occurring, or will occur.
- *Potential Exposure Pathway.* Potential pathways are those in which at least one of the five elements is missing but could exist. Potential pathways indicate that exposure to a contaminant could have occurred, could be occurring, or could occur in the future. Potential exposure pathways refer to those pathways where (1) exposure is documented, but there is not enough information available to determine whether the environmental medium is contaminated, or (2) an environmental medium has been documented as contaminated, but it is unknown whether people have been, or could be, exposed to the medium.
- *Eliminated Exposure Pathway.* In an eliminated exposure pathway, at least one of the five elements is missing and will never be present. From a human health perspective, pathways can be eliminated from further consideration if ATSDR is able to show that (1) an environmental medium is not contaminated, or (2) no one is exposed to contaminated media.

ATSDR’s evaluation of potential human exposures at NWSE did not identify any completed exposure pathways to site-specific contaminants. Most IRP Sites are not accessible to non-authorized military personnel and do not pose an exposure concern under present land use restrictions.

Appendix D. Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency in Atlanta, Georgia, with 10 regional offices in the United States. ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases from toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. For additional questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

Absorption

The process of taking in. For a person or an animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

Acute

Occurring over a short time [compare with chronic].

Acute exposure

Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Additive effect

A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].

Adverse health effect

A change in body function or cell structure that might lead to disease or health problems

Aerobic

Requiring oxygen [compare with anaerobic].

Ambient

Surrounding (for example, ambient air).

Anaerobic

Requiring the absence of oxygen [compare with aerobic].

Analyte

A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Analytic epidemiologic study

A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

Antagonistic effect

A biologic response to exposure to multiple substances that is less than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].

Background level

An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Bioavailability

The degree to which chemicals can be taken up by organisms

Biodegradation

Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biologic indicators of exposure study

A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

Biologic monitoring

Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

Biologic uptake

The transfer of substances from the environment to plants, animals, and humans.

Biomedical testing

Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

Biota

Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

Body burden

The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

CAP [see Community Assistance Panel.]

Cancer

Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

Cancer risk

A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Carcinogen

A substance that causes cancer.

Case study

A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

Case-control study

A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

CAS registry number

A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.

Central nervous system

The part of the nervous system that consists of the brain and the spinal cord.

CERCLA [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980]

Chronic

Occurring over a long time [compare with acute].

Chronic exposure

Contact with a substance that occurs over a long time (more than 1 year) [compare with acute exposure and intermediate duration exposure]

Cluster investigation

A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

Community Assistance Panel (CAP)

A group of people from a community and from health and environmental agencies who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

Comparison value (CV)

Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Completed exposure pathway [see exposure pathway].

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

CERCLA, also known as Superfund, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances. The Superfund Amendments and Reauthorization Act (SARA) later amended this law.

Concentration

The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant

A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

Delayed health effect

A disease or an injury that happens as a result of exposures that might have occurred in the past.

Dermal

Referring to the skin. For example, dermal absorption means passing through the skin.

Dermal contact

Contact with (touching) the skin [see route of exposure].

Descriptive epidemiology

The study of the amount and distribution of a disease in a specified population by person, place, and time.

Detection limit

The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

Disease prevention

Measures used to prevent a disease or reduce its severity.

Disease registry

A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

DOD

United States Department of Defense.

DOE

United States Department of Energy.

Dose (for chemicals that are not radioactive)

The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An “exposure dose” is how much of a substance is encountered in the environment. An “absorbed dose” is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)

The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship

The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

Environmental media

Soil, water, air, biota (plants and animals), or any other parts of the environment that can contain contaminants.

Environmental media and transport mechanism

Environmental media include water, air, soil, and biota (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The environmental media and transport mechanism is the second part of an exposure pathway.

EPA

United States Environmental Protection Agency.

Epidemiologic surveillance [see Public health surveillance].

Epidemiology

The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure

Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

Exposure assessment

The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure-dose reconstruction

A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

Exposure investigation

The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

Exposure pathway

The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Exposure registry

A system of ongoing followup of people who have had documented environmental exposures.

Feasibility study

A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

Geographic information system (GIS)

A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

Grand rounds

Training sessions for physicians and other health care providers about health topics.

Groundwater

Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].

Half-life ($t^{1/2}$)

The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

Hazard

A source of potential harm from past, current, or future exposures.

Hazardous Substance Release and Health Effects Database (HazDat)

The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

Hazardous waste

Potentially harmful substances that have been released or discarded into the environment.

Health consultation

A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with public health assessment].

Health education

Programs designed with a community to help it know about health risks and how to reduce these risks.

Health investigation

The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to evaluate the possible association between the occurrence and exposure to hazardous substances.

Health promotion

The process of enabling people to increase control over, and to improve, their health.

Health statistics review

The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.

Indeterminate public health hazard

The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

Incidence

The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

Ingestion

The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].

Inhalation

The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Intermediate duration exposure

Contact with a substance that occurs for more than 14 days and less than a year [compare with acute exposure and chronic exposure].

In vitro

In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].

In vivo

Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with in vitro].

Lowest-observed-adverse-effect level (LOAEL)

The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

Medical monitoring

A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Metabolism

The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite

Any product of metabolism.

mg/kg

Milligram per kilogram.

mg/cm²

Milligram per square centimeter (of a surface).

mg/m³

Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration

Moving from one location to another.

Minimal risk level (MRL)

An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects.

MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see reference dose].

Morbidity

State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.

Mortality

Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

Mutagen

A substance that causes mutations (genetic damage).

Mutation

A change (damage) to the DNA, genes, or chromosomes of living organisms.

National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)

EPA's list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

National Toxicology Program (NTP)

Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

No apparent public health hazard

A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

No-observed-adverse-effect level (NOAEL)

The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

No public health hazard

A category used in ATSDR's public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]

Physiologically based pharmacokinetic model (PBPK model)

A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Pica

A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume

A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

Point of exposure

The place where someone can come into contact with a substance present in the environment [see exposure pathway].

Population

A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

Potentially responsible party (PRP)

A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

ppb

Parts per billion.

ppm

Parts per million.

Prevalence

The number of existing disease cases in a defined population during a specific time period [contrast with incidence].

Prevalence survey

The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.

Prevention

Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public availability session

An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public comment period

An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public health action

A list of steps to protect public health.

Public health advisory

A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human health.

Public health assessment (PHA)

An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with health consultation].

Public health hazard

A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or radionuclides that could result in harmful health effects.

Public health hazard categories

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are no public health hazard, no apparent public health hazard, indeterminate public health hazard, public health hazard, and urgent public health hazard.

Public health statement

The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public health surveillance

The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

Public meeting

A public forum with community members for communication about a site.

Radioisotope

An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide

Any radioactive isotope (form) of any element.

RCRA [see Resource Conservation and Recovery Act (1976, 1984)]

Receptor population

People who could come into contact with hazardous substances [see exposure pathway].

Reference dose (RfD)

An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

Registry

A systematic collection of information on persons exposed to a specific substance or having specific diseases [see exposure registry and disease registry].

Remedial investigation

The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA)

This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

RFA

RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD [see reference dose]

Risk

The probability that something will cause injury or harm.

Risk reduction

Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

Risk communication

The exchange of information to increase understanding of health risks.

Route of exposure

The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].

Safety factor [see uncertainty factor]

SARA [see Superfund Amendments and Reauthorization Act]

Sample

A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Sample size

The number of units chosen from a population or an environment.

Solvent

A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

Source of contamination

The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an exposure pathway.

Special populations

People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Stakeholder

A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics

A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance

A chemical.

Substance-specific applied research

A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's toxicological profiles. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)]

Superfund Amendments and Reauthorization Act (SARA)

In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

Surface water

Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Surveillance [see public health surveillance]

Survey

A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see prevalence survey].

Synergistic effect

A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].

Teratogen

A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent

Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.

Toxicological profile

An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology

The study of the harmful effects of substances on humans or animals.

Tumor

An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor

Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

Urgent public health hazard

A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

Volatile organic compounds (VOCs)

Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

Other glossaries and dictionaries:

Environmental Protection Agency (<http://www.epa.gov/OCEPAterms/>)

National Center for Environmental Health (CDC)
(<http://www.cdc.gov/nceh/dls/report/glossary.htm>)

National Library of Medicine (NIH)
(<http://www.nlm.nih.gov/medlineplus/mplusdictionary.html>)

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