

NAPLES

Public Health Evaluation



Summary of Study Findings: Phases I & II

The Naples Public Health Evaluation has been completed. The Navy has fulfilled the study's purpose to evaluate health concerns and take health protective actions where necessary. Although the study has ended, enduring processes are in place to ensure the health of our military and civilian families continues to be protected.

What is the Naples Public Health Evaluation?

The Naples Public Health Evaluation was a comprehensive study of the health risks associated with potential exposure to chemicals in the environment resulting from the area's waste disposal practices. The Campania region of Italy has experienced numerous challenges associated with trash collection, open burning of uncollected trash and illegal waste disposal practices. In response to health concerns expressed by U.S. Navy personnel in 2007, the Commander, Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA) contacted the Navy and Marine Corps Public Health Center (NMCPHC) to conduct a comprehensive public health evaluation to assess the potential health risks for U.S. personnel living in the Naples area.

The Public Health Evaluation began in January 2008 and was completed in June 2011. The study involved the collection of tap water, irrigation water, soil, soil gas and air samples. NMCPHC also conducted epidemiological studies – focusing on birth defects, cancer and asthma – and a food study. The food study focused on vegetables and poultry grown near the Campania region and sold at the Navy commissary at the Support Site in Gricignano. The Navy also conducted an extensive review of Italian scientific literature and media reports.

The U.S. Navy is committed to ensuring our families are safe while serving our country at home or overseas. The Naples Public Health Evaluation has been an extensive Navy effort to learn more about the potential environmental health risks present in the Campania region of Italy.

For the Naples Public Health Evaluation, attempts were made to answer the following questions:

- What chemicals have been released to the environment?
- How much of the chemicals are present and at what locations?
- How might people come into contact with chemicals in the environment?
- How might exposure to these chemicals affect people's health?
- What actions are needed to protect public health?

To answer these questions, the Public Health Evaluation evaluated:

- Historical information and reports documenting chemical contamination that were developed by the Government of Italy, European Union and non-governmental organizations.
- Environmental data collected by the Navy – such as levels of chemicals and bacteria in water, soil, soil gas, air and food.
- Exposure data – how people could come into contact with chemicals and bacteria.
- Toxicity data – what adverse health effects might be expected due to exposure to chemicals and bacteria.

- Epidemiological health outcome data – including information on community-wide rates of illness, disease and death.
- Community health concerns – such as reports from Navy personnel on illness.
- Actions that could eliminate or mitigate human health risks, where practicable.

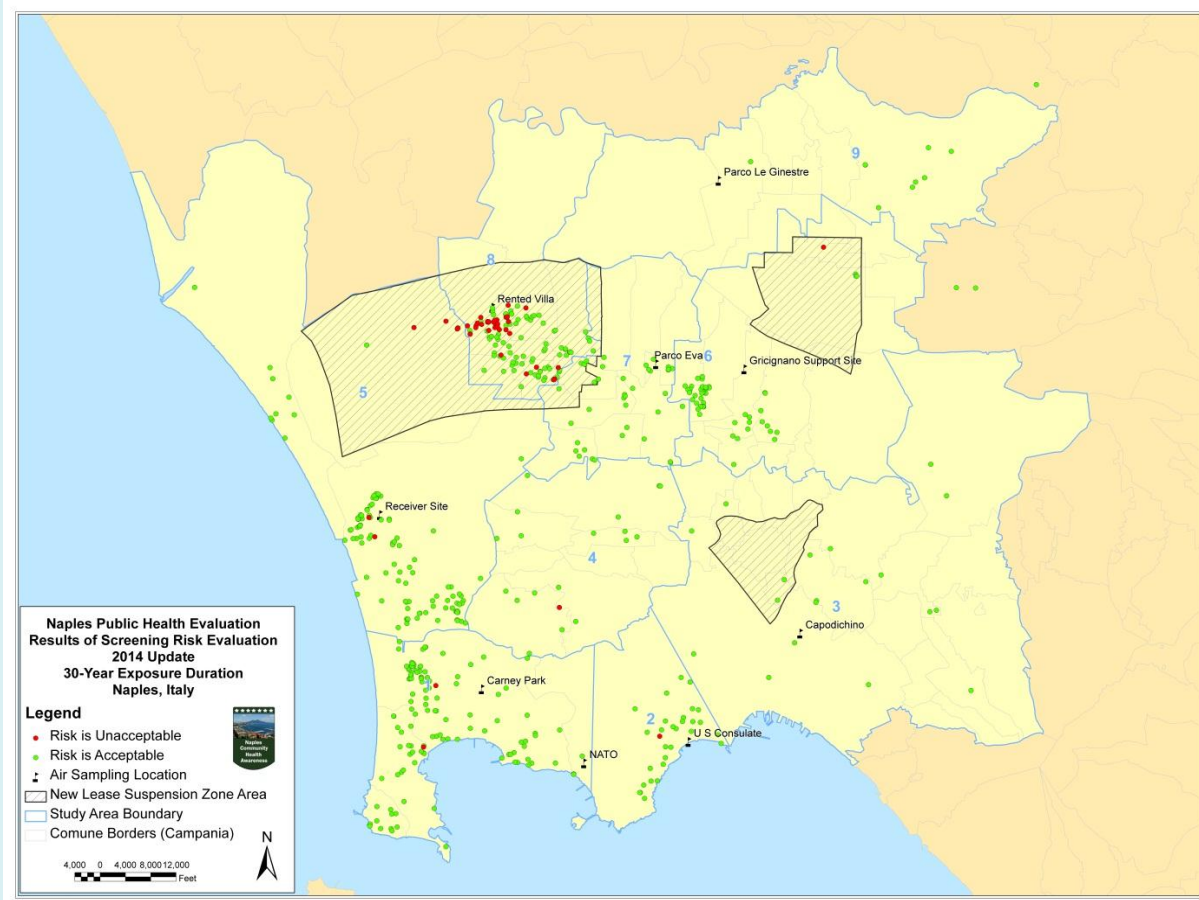
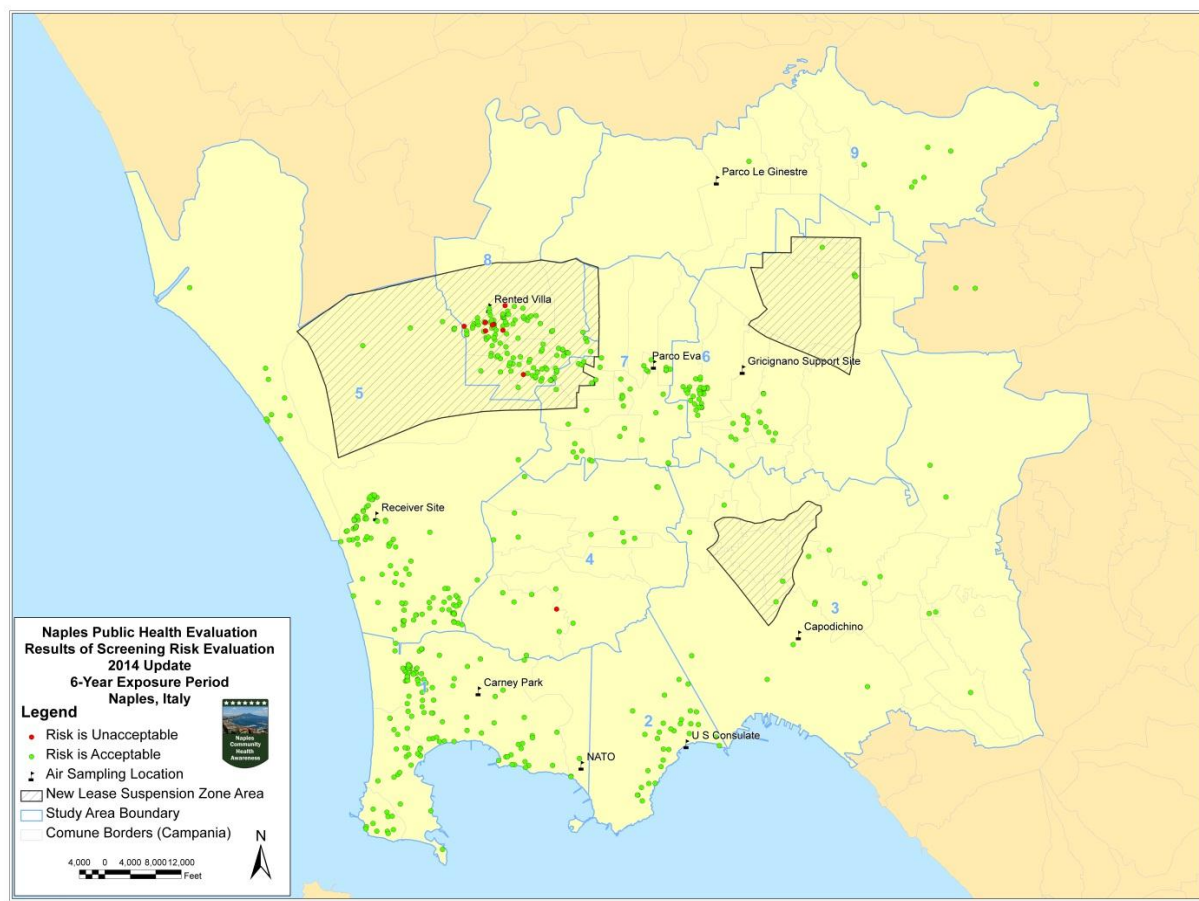


Figure I. Public Health Evaluation study areas, sampling locations and risk assessment results for those working and living in Naples for 6 years and 30 years. The results also assume that residents follow the Navy's Bottled Water Advisory. The results have been updated to reflect changes to toxicity factors made by the U.S. Environmental Protection Agency and the additional sampling of residences.

What did the Navy learn?

Through the Public Health Evaluation, the Navy has been able to identify and address public health risks for U.S. personnel living in the Campania region. The Navy established new health protective policies and took immediate actions to protect the health of U.S. personnel and their families. Many of these health protective policies are in place to ensure continued health protection beyond the life of the study.

The following section provides general information about the sampling results, the Navy's protective actions, and steps U.S. personnel can take to minimize their risk.

For details specific to where you live, please consult the Phase II report, available at <http://www.cnic.navy.mil/Naples/About/HealthAwareness>, or contact the U.S. Naval Hospital Naples, Public Health at DSN 629-6457 or Commercial at +39 081-811-6457.

Tap Water

What we learned:

Contamination from bacteria (fecal coliform/total coliform), nitrate and tetrachloroethene (a volatile organic compound, also known as perchloroethylene or PCE) was found in the tap water (primarily well water) of many homes. Lead was found in a limited number of homes, and arsenic was widespread. Arsenic is naturally occurring and is common in volcanic areas such as Naples. Although arsenic is a natural part of the Naples environment, residents should avoid exposure to the chemical by following the bottled water advisory. Tap water from municipal suppliers was typically safe.

The source of contamination for bacteria was likely from the water holding tank and/or indoor plumbing system of the home. Improper maintenance and disinfection of domestic water holding tanks can be a source of contamination. Other contributing factors to tap water contamination include:

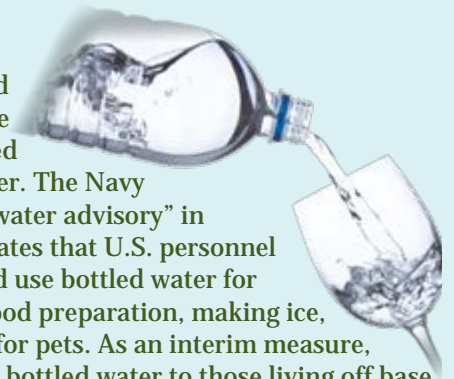
- “Blended” water coming out of the tap (contaminated well water mixed with city water).
- Lack of code enforcement for well installation and plumbing.
- Low pressure in the public drinking water system in Campania.

Volatile organic compounds ([VOCs] – chemicals that readily evaporate at room temperature) were also detected in the tap water of some homes. Primary VOCs detected included PCE and chloroform. The majority of these homes were connected to non-permitted, private wells, which were drawing water from potentially contaminated groundwater sources.

In some instances, homes that were connected to the city water supply were also contaminated with VOCs, likely from neighboring homes improperly connected to both a well and the city water supply.

What we did:

Most risks associated with tap water can be reduced or eliminated by using bottled water. The Navy issued the “bottled water advisory” in July 2008, which states that U.S. personnel living off base should use bottled water for drinking, cooking, food preparation, making ice, brushing teeth, and for pets. As an interim measure, the Navy distributed bottled water to those living off base. A permanent Water Distribution Point at Capodichio was then installed to provide free drinking water to U.S. personnel living off base.



Further, the Navy improved all new off-base rental leases by requiring landlords to:

- Provide bottled water service from a Navy-approved vendor.
- Clean and disinfect the home's water holding tank and associated plumbing twice a year and prior to the occupancy of a new tenant.
- Connect the home's plumbing system to the city water supply and disconnect from non-permitted wells.

In addition, the Navy defined areas where leases were discontinued (New Lease Suspension Zones) based on Navy and/or Italian data. As a protective measure, the Navy suspended all new leases in those areas.

Of note, potential exposure to VOCs in tap water also can occur by breathing the chemicals when they evaporate from tap water that is being used for showering, washing clothes and other household uses for which bottled water is not typically used. However, during the Public Health Evaluation, the concentrations of VOCs in tap water were generally not high enough for inhalation of the chemicals to pose a health risk. In the few instances where potential health risks were identified (residences located in Study Area 8 – Casal di Principe – that obtained their tap water from non-permitted, private wells), the Navy relocated the residents to other homes.

What you can do:

U.S. personnel living off base should continue to follow the bottled water advisory to avoid exposure to harmful levels of bacteria and chemicals that may be in your tap water. Make sure your tap water supply is disconnected from non-permitted wells and connected only to the city water system. Also, make sure your landlord disinfects your water holding tank twice per year and provides approved containerized water as required by your lease. Do not exchange your bottled water service for other desirable residential perks. Also, ventilate your home, when practical, by opening windows to allow a higher air exchange rate.

Soil Gas

What we learned:

PCE and chloroform were the chemicals responsible for most of the potential health risks associated with soil gas. Soil gas is a term used to describe volatile chemicals that are present in the small spaces between particles of soil beneath the ground surface. Typically, the presence of chemicals in soil gas indicates that underlying soil or groundwater may be contaminated. If conditions are right, chemicals in soil gas can move upward through the soil and potentially make their way into the indoor air of overlying buildings. This process is called “vapor intrusion.” The highest incidences of soil gas contamination and potential vapor intrusion were in Study Area 8 – Casal di Principe – an area already identified as a New Lease Suspension Zone.

Since the Public Health Evaluation was published in 2010, the U.S. Environmental Protection Agency completed its extensive evaluation of the toxicity of PCE. The Agency concluded that PCE’s ability to cause cancer is less than initially believed. Therefore, risks in the 2010 Public Health Evaluation corresponding to PCE were overestimated. Many residences that had unacceptable risks may now be acceptable. The figures on page 2 show the most current results.

What we did:

Where soil gas results indicated a potential health risk, additional soil gas investigations were conducted for nearby homes. For residences with unacceptable soil gas concentrations that indicated the potential for vapor intrusion, the residents were relocated. Additionally, residences with soil gas values that exceeded the Naples Public Health Evaluation criteria were further examined to determine whether these homes would be eligible to lease in the future.

Of note, the Navy also conducted a vapor intrusion study at Capodichino and the Support Site to determine whether there were potential health risks from soil gas into the indoor air of buildings at these locations. Although some soil gas results were initially found to be unacceptable, follow-up indoor air sampling demonstrated that it is safe to live and work in buildings on base.

What you can do:

The following are actions you can take to help prevent the possibility of vapor intrusion into a home you select:

- The higher you live, the less risk you potentially have from vapor intrusion. Look for homes where the living space is higher than the ground floor. For example, a building with a ground floor parking garage that is well ventilated.
- Avoid living in basements.
- Ventilate the home by opening windows to encourage more air exchanges, when practical.

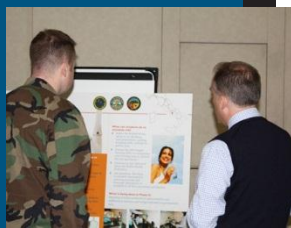
Results by Study Area Chemicals and bacteria in tap water and chemicals in soil gas were responsible for the majority of unacceptable risks. The ranges of risks were significantly different throughout the study areas. A number of areas throughout the Campania region were identified that appear to be impacted by releases of chemicals to the soil and/or groundwater, creating the potential for vapor intrusion (VI) into residences. The health risks attributable to VI cannot be accurately determined solely using the results of this study. Limited, site-specific soil gas samples are not reliable indicators of future subsurface conditions, as this surrogate to intrusive sampling presents spatial and temporal limitations. However, the potential health risks for living off-base can be mitigated by following Navy established risk management actions.

The greatest number of unacceptable risks was observed in Study Area 8 – Casal di Principe – where tap water was primarily obtained from non-permitted, private wells. Prior to commencement of the Public Health Evaluation, Italian maps and information regarding historical waste disposal practices in agricultural areas (such as Study Areas 5, 6, 7, 8 and 9) presented in the press and Italian scientific literature indicated that Study Area 8 could be one of the study areas with a large number of unacceptable risks. In addition, many of the residences in Study Area 8 obtained their tap water from private wells, which are more susceptible than the public water supply system.

Study Areas 2, 3, 4 and 9 had the lowest percentage of unacceptable risks but also had the fewest number of residences sampled. Therefore, it was not possible to reach any conclusion regarding the significance of these findings. For Study Area 1, a small number of properties sampled were found to have unacceptable risks. In general, it was expected that properties in this Study Area would largely be found to be acceptable because these areas are densely populated and do not have expansive agricultural areas or open space that could readily be used for illegal waste disposal activities. In addition, almost all of the residences in these study areas obtained their tap water from a public source.

Information Sharing

The Public Health Evaluation was detailed and complex. Throughout the course of the study, the Navy implemented a number of initiatives while sharing and explaining the study process and results to U.S. military and civilian personnel, Navy and U.S. Consulate leadership, designated Italian officials and Italian landlords.



- The Navy established the Environmental Health Information Center (EHIC) at U.S. Naval Hospital Naples to provide staff to answer health-related questions from the Navy community.
- The Navy hosted various information sessions to discuss the Public Health Evaluation and study findings and to address questions from the Navy community.
- The Navy provided detailed and individualized reports of findings to residents and landlords whose homes were sampled during the study.
- The Navy shared results of findings with select Italian officials.
- Information about the Public Health Evaluation and implementation of enduring processes was available through various sources, such as the NSA Naples Community Health Awareness website, weekly articles in the *Panorama*, All Hands e-mails, town hall meetings and AFN news.

Navy personnel that have health concerns about their home should contact the U.S. Naval Hospital Naples, Public Health.

Soil

What we learned:

Surface soil contamination was not found to present a health issue, with the exception of a few isolated instances that were addressed by the landlord. Chemicals found at concentrations typical of urban environments included polycyclic aromatic hydrocarbons and dioxins/furans. In addition, soil was found to contain arsenic in virtually all soil samples. The presence of naturally occurring arsenic is common in volcanic areas such as Naples.

What we did:

At those few locations where soil contamination was detected, the Navy required landlords to remove or cover the soil to prevent exposure. Because the health risks for soil in almost all cases were found to be acceptable, soil sampling was discontinued early in Phase II. To address arsenic in the soil, the Navy recommended actions residents could take to minimize their exposure to this chemical. Because arsenic is a natural part of the Naples environment, it cannot be removed from the soil.

What you can do:

Due to the presence of arsenic in soil, limit direct contact with soil. Be sure to wash after playing and working in the soil and limit the amount of soil tracked in from outdoors.

Air

What we learned:

The health risks did not vary significantly between the nine study areas. Many of the contaminants in Naples outdoor (ambient) air were likely associated with diesel or gasoline exhaust, industrial emissions, or agricultural burning. The chemicals 1,2-dibromo-3-chloropropane and acrolein were responsible for most of the potential health risks associated with outdoor air. Also, the risks associated with ambient air were not significantly greater on days when trash was burned than on days when trash was not burned. Aldehydes (e.g., formaldehyde) were the only chemicals with airborne concentrations that were slightly higher on days when trash was burned than on days when trash was not burned. While most of the contaminants were similar to those found in the U.S. when the Navy compared them to six major U.S. cities, they were not identical. Therefore, direct comparison of the risk between typical urban air quality in the U.S. and the air quality in Naples is not appropriate.

The Navy applied the results of the air study to the 2010 asthma epidemiological study and found that increased air pollution levels did not affect the number of asthma-related medical visits. However, as the levels of the air pollutant PM10 increased, people that had an asthma-related medical visit were more likely to be diagnosed with worse asthma symptoms.

What we did:

The Navy informed the Navy community and U.S. Naval Hospital medical providers about the results of the asthma study and provided recommendations that people with asthma could follow. Also, as a result of the 2010 asthma study, NMCPHC recommended that U.S. Naval Hospital Naples consider the impact of the air quality on those with documented respiratory problems, especially persistent asthma, before granting an overseas screening waiver. **Continued on pg.6**

What you can do:

Avoid lengthy periods outdoors when open burning is taking place and keep windows closed when air conditions are poor. If you suffer from asthma or other upper respiratory illnesses, consult your medical provider about actions you can take to help control your symptoms.

Irrigation Water

What we learned:

Capodichino, Carney Park, and the Support Site in Gricignano have wells that are used for irrigation purposes only. The Navy collected samples of irrigation water at these locations. The testing results showed that many of the wells on these sites contained nitrates, total and fecal coliform bacteria, and other chemicals that exceeded health-based standards. These findings reaffirmed that irrigation water is not suitable for drinking and should only be used for irrigation.

What we did:

To remind the Navy community that children and pets should not drink, wash or play in irrigation water; more than 30 bilingual signs were posted on pavilions and poles around Capodichino, the Support Site in Gricignano, and Carney Park.

What you can do:

Do not drink, wash or play in irrigation water. However, avoiding freshly irrigated areas (for example, wet grass) is not necessary.

How did the Navy conduct the study?

The Naples Public Health Evaluation was an extensive study for the Navy. A 395 square-mile regional area was divided into nine discrete study areas. Multiple sampling events took place, which are described below. Environmental samples were collected from April 2008 through October 2009. Samples were collected from 543 off-base private rental homes occupied by U.S. personnel and from 10 U.S. Government-related properties. Each sample was analyzed for approximately 240 chemicals and microorganisms in eight main categories:

- Volatile organic compounds
- Semi-volatile organic compounds
- Pesticides
- Polychlorinated biphenyls
- Dioxins and furans
- Metals
- Microorganisms (bacteria)
- Radionuclides



How did the Navy evaluate the data?

The Navy's priority is to be protective of the health of Navy personnel and families, so a conservative approach was used to evaluate data. For example, the risk evaluation was based on an assumption that a person would live in the Campania region for 30 years. In reality, tour lengths vary:

- *Average military tour length is 2.2 years.*
- *Average civilian tour length is 3.2 years.*
- *Overall population average tour length is 2.8 years.*
- *Over 94% of U.S. personnel reside in Naples less than six years.*

The Navy placed the risk evaluation results into one of two categories, "acceptable" risks or "unacceptable" risks. To determine the appropriate category, the Navy compared the results of each chemical analyzed to U.S. Environmental Protection Agency (USEPA) standards and guidance and to the criteria established by the Navy for this project.

The USEPA has various standards and guidance for comparison. In the Public Health Evaluation, tap water, irrigation water, soil, soil gas and air samples were compared to USEPA risk-based concentrations called Regional Screening Levels (RSLs). RSLs are for use in situations when there is known or suspected contamination and potential public health risks. Since the completion of the Public Health Evaluation in 2010, the RSL for PCE has changed. The figures on Page 2 reflect this change.

Tap water and irrigation water samples were also compared to another set of USEPA standards called Maximum Contaminant Levels (MCLs). Air samples were compared to USEPA National Ambient Air Quality Standards (NAAQS). MCLs and NAAQS are the basic regulatory standards and apply only to water and air, respectively, while RSLs can be applied to water, air, soil and soil gas.

Based on the categorization of acceptable or unacceptable, the Navy determined the appropriate course of action to ensure the safety of Navy personnel and their families.

Sampling Events

Pilot Study (April-June 2008):

This effort tested the process of collecting environmental samples in Italy. This was a critical step to ensure the integrity of all future testing efforts. Seven homes were included in the pilot study and all phases of the effort were evaluated – from environmental sampling and analysis to the process of sharing findings with residents.

Phase I (May-November 2008):

This phase included the collection of samples from 130 off-base private rental homes and 10 U.S. Government-related properties. The selection of sampling locations was based on proximity to known locations of unsegregated trash dump sites. The sampling results from off-base private rental homes led to two other sampling investigations:

Pre-Lease Sampling (September 2008-January 2009):

Phase I samples from off-base private rental homes showed a high incidence of tap water contamination from bacteria and volatile organic compounds (VOCs). As one of many actions, the Navy immediately instituted a policy that required each home's tap water be sampled before occupancy by U.S. personnel. During this period, 240 residences were sampled. Pre-lease sampling was discontinued after new housing lease clauses required that landlords connect to the city water system instead of non-permitted, private wells, and the incidence of contamination decreased as a result.

Step-Out Sampling (September 2008-August 2009):

Testing of some Phase I samples from off-base homes detected VOCs in soil gas. VOCs in soil gas pose potential health risks if the chemical vapors migrate to the indoor air of overlying buildings through a process called "vapor intrusion." The contaminated soil gas can also migrate underground through soil and groundwater. For this reason, the Navy expanded sampling activities to investigate homes near those that were originally found to have soil gas contamination. Thirty-six residences were sampled during this sampling event.

Naples Public Health Evaluation Sample Quantities

Event	Number of Locations Sampled for Water	Number of Locations Sampled for Soil	Number of Locations Sampled for Soil Gas	Number of Air Samples	Total Number of Analytical Results
Phase I					
Phase I Residences	130	112			
<i>Tap Water</i>	130				
<i>Irrigation Water</i>	0				
<i>Passive Soil Gas</i>			107		
U.S. Government-Related Properties*	82	79			
<i>Tap Water</i>	69				
<i>Irrigation Water</i>	13				
<i>Passive Soil Gas</i>			35		
Total Samples	212	191	142		
				Total Phase I Analyses for Water	52,286
				Total Phase I Analyses for Soil	40,196
				Total Phase I Analyses for Passive Soil Gas	5,680
* U.S. Government-related properties includes Capodichino, Support Site, JFC NATO, U.S. Consulate, Parcos, Carney Park and Flag Officer Quarters.					
Phase II					
Phase II Residences and Other Concurrent Investigations**	404	73			
<i>Tap Water</i>	395				
<i>Irrigation Water</i>	9				
<i>Active Soil Gas</i>			201		
U.S. Government-Related Properties	1	0			
<i>Tap Water</i>	1				
<i>Irrigation Water</i>	0				
<i>Active Soil Gas</i>			39		
Total Samples	405	73	240		
				Total Phase II Analyses for Water	85,824
				Total Phase II Analyses for Soil	15,246
				Total Phase II Analyses for Active Soil Gas	18,172
** Concurrent investigations denotes step-out and pre-lease sampling events.					
Phase I & II Combined					
Residences	534	185	308		
U.S. Government-Related Properties	83	79	74		
Total Samples	617	264	382		
				Total Phase I & II Analyses for Water	138,110
				Total Phase I & II Analyses for Soil	55,442
				Total Phase I & II Analyses for Passive & Active Soil Gas	23,852
Year-Long Regional Ambient Air Study					
Regional Air Station Samples				441	
Residential Ambient Air Samples				30	
				Total Air Analyses	126,178

Phase II (November 2008-October 2009):

This phase included the sampling of 209 residences (137 of which were new residences that had not been sampled before) and continued sampling at U.S. Government-related properties. In addition, an investigation of soil gas and indoor air was conducted for Capodichino and the Gricignano Support Site. While Phase I sampling locations were based on proximity to known unsegregated trash dump sites, Phase II sampling locations were spaced more evenly across the nine study areas.

Ambient Air Sampling (July 2008-July 2009):

A year-long ambient air sampling and monitoring evaluation was performed, spanning both Phase I and Phase II of the Public Health Evaluation. The purpose of the ambient air sampling event was to characterize air quality for the nine study areas. Sampling involved the construction and operation of nine fixed air sampling stations, a continuous air monitoring station and a meteorological monitoring tower. Over 92,000 individual analyses for 211 chemicals were performed during this one-year period. Tens of thousands of continuous monitoring measurements for criteria pollutants and meteorological parameters were also obtained and evaluated.

In total, 543 off-base residences and 10 U.S. Government-related sites were sampled, covering a period of two and a half years. Environmental samples were analyzed for approximately 240 different chemicals. Water samples were also tested for microorganisms.

What happens now that the study has ended?

The Navy is committed to sharing the results of the Public Health Evaluation with military and civilian personnel and their families, Department of Defense leadership, and the Italian government and landlords. In addition to sharing the findings, the Navy has taken appropriate actions to address the findings. The Navy's health-protective processes that have already been implemented will remain in place to ensure continued health protection beyond the life of this project.

New strategies included developing additional educational programs and providing more staff to ensure all personnel and families are fully and continually informed on how to protect their health while living in the Campania region. Health protective processes already implemented that will remain in place included:

- Bottled water advisory.
- Health-protective lease clauses for off-base rentals.
 - Landlords must provide containerized water service from a Navy-approved vendor.
 - Leased home must be supplied by city water or permitted wells. Landlords must disconnect all non-permitted wells and provide proof of connection to the city water system or that the well is permitted.
 - Landlords must clean and disinfect domestic water holding tanks every six weeks.
- New Lease Suspension Zones.
- Health information updates on the Naples Community Health Awareness website.
- Education and counseling at the U.S. Naval Hospital Naples, Public Health.
- Maintain the U.S. Naples PHE website and the U.S. Navy Regional Water Quality Board
- NSA Naples will continue the monitoring of Italian environmental and health-related information and make public health information available to U.S. personnel.

The Navy continues to share environmental data with designated Italian officials.



The Phase II report can be found on the NSA Naples Community Health Awareness website at

<http://www.cnic.navy.mil/Naples/About/HealthAwareness/>

Who should U.S. personnel contact if they have health-related questions?

U.S. personnel who have health-related questions should contact the U.S. Naval Hospital Naples, Public Health. The phone number is 629-6457 (DSN) or 39-081-811-6457 (commercial). Health professionals are available for one-on-one consultations to discuss personal health concerns.

Continue to stay informed about how to protect your health through the Naples Community Health Awareness website, Panorama, AFN Radio and Television, All Hands e-mails, chain of command and the U.S. Naval Hospital Naples, Public Health.

The Navy is interested in ensuring accurate and thorough information is available to all U.S. personnel and families. If you have questions or for more information, contact:

U.S. Naval Hospital
Public Health
PSC 817 Box 40
DSN: 629-6457
COMM: 39-081-811-6457

Naples Public Affairs Office
Naples
PSC 817 Box 40
DSN: 626-5907
COMM: 39-081-568-5907