

Naples Public Health Evaluation (PHE) Executive Summary

Introduction

In response to U.S. personnel concerns regarding potential health impacts associated with waste management practices in the Campania region, Commander Navy Region Europe, Africa, Southwest Asia (CNREURAFSWA) requested in late 2007 that the Navy and Marine Corps Public Health Center (NMCPHC) conduct a Public Health Evaluation (PHE). The purpose of the study was to determine if there are any potential public health hazards to U.S. personnel from exposure to air, tap water, soil, and soil gas while residing in the Naples and Caserta Provinces of Campania. The geographic area (i.e., 395 square miles; 1,023 square kilometers) investigated during Phase I and Phase II was segregated into nine study areas (see Figure 1).

The PHE found the potential health risks for living off-base can be mitigated by following the U.S. Department of the Navy (USN) established risk management actions. The PHE was completed in two phases, with the results reported in publicly accessible documents. Phase I environmental sampling was conducted between May and November 2008, consisting of two components: 1) a one-month regional ambient air monitoring program and 2) environmental testing of one hundred thirty (130) residences leased by U.S. personnel and 10 U.S. Government-related facilities. Phase II environmental sampling was conducted between November 2008 and October 2009 to expand the geographic distribution of the sampling locations in the study areas. For Phase I, the residential sampling locations were based on proximity to known or suspected waste sites, as designated by Agenzia Regionale per la Protezione Ambientale della Campania ([ARPAC], see Figure 2). During Phase II, two hundred and nine (209) residences leased by U.S. personnel were sampled and the duration of the regional ambient air monitoring program was extended for one full year (July 2008 to July 2009).

In total, 543 residences occupied by U.S. personnel were sampled during Phase I and Phase II. A variety of media, including air, tap water, soil and soil gas, were sampled and analyzed for 241 chemicals and microorganisms (e.g., fecal and total coliforms). Additionally, four (4) epidemiological studies and a limited, USN commissary food study were conducted, spanning both phases of the Naples PHE. The results of the epidemiological and food studies were published between October 2008 and June 2010.

Finally, a review of available European Commission and Italian environmental, epidemiological, and public health reports and studies for Italy and the Campania Region were reviewed for information that might be applicable to the conduct of the PHE and its conclusions and recommendations.

The Phase I report, publicly accessible since April 2009, is available on the Naples Naval Support Activity (NSA) Community Health Awareness website¹. The Phase II report, consisting of three volumes, will be available on this website June 2011. Additional information available on the website includes fact sheets addressing commonly asked questions and a detailed timeline of study components.

Risk Assessment Approach

Where practicable, the PHE was conducted in accordance with U.S. Environmental Protection Agency (USEPA) and USN Risk Assessment Guidance. Environmental testing results were compared to:

- USEPA Regional Screening Levels – for tap water, air, soil, and soil gas;
- USEPA Maximum Contaminant Levels – for tap water;
- USEPA National Ambient Air Quality Standards – for air.

During the risk assessment, mathematical calculations performed assumed U.S. personnel would live at a residence for 30 years. This is a conservative assumption, given the typical 2-5 year tour length of U.S. Military and civilian personnel in the Campania region.

Risk evaluation results for non-cancer and cancer risks for soil, soil gas and tap water were placed into one of two risk management categories: acceptable risk and unacceptable risk. In addition, risks for tap water were calculated two ways, assuming tap water was and was not used for normal household uses, such as drinking, cooking, making ice and brushing teeth.

In most cases, the risks reported in Phase I and Phase II were based on a single-sampling event at a specific residence. A single sample only provides a "snapshot" of concentrations present in tap water, soil, and soil gas and may or may not be representative of the long-term concentrations at that particular residence. Comparison of the conservative Phase I and Phase II risk evaluation results to risk-based and U.S. regulatory criteria determined whether risks were acceptable.

For Phase I and Phase II testing, individual sampling reports were made available to each tenant and landlord where samples were collected. Each report presented the analytical results for all samples that were collected at the residence, the potential health risks, and recommended actions to be taken by the tenants. The sampling reports summarized whether identified risks were acceptable or not, using the established conservative risk criteria. If applicable, the landlord's report also indicated any actions they should take to maintain eligibility for potential future renting to U.S. personnel.

¹ The NSA Community Health Awareness website is available at:
<http://www.cnmc.navy.mil/Naples/About/HealthAwareness>

PHE Phase II Findings

Regional Distribution of Risks

The key media of concern identified during Phase II of the PHE was soil gas. Contaminants in soil gas were the primary contributors to unacceptable risk. Thirty-two (32) of the 175 residences (18%) that were sampled for soil gas during Phase II had unacceptable risks based on chemicals detected in soil gas. Clusters of residences with unacceptable risks associated solely with chemicals detected in soil gas were observed primarily in Study Areas 1, 5, 6, and 8 (with Study Area 8 having the most unacceptable risks). Chloroform and tetrachloroethene were responsible for the majority of the unacceptable risks in soil gas.

Tap water from public source(s) was typically acceptable, whether it was ingested or used as a resource for general washing or bathing. However, low concentrations of chemicals (such as lead and tetrachloroethene) and microorganisms² were detected at residences that obtained their tap water samples from public sources.

Tap water from private wells was typically unacceptable. Tap water from residences with private wells resulted in unacceptable risks at all locations (13 residences sampled). If tap water was only used for washing or bathing, then the risks were unacceptable at all but one of the sampled residences. Microorganisms, nitrates, and tetrachloroethene were responsible for the majority of the unacceptable risks in tap water from private wells.

The 80 residences where soil samples were collected during Phase II of the PHE had acceptable chemical concentrations in soil. The concentrations of chemicals that were detected are consistent with background concentrations typically found in volcanically active areas.

Regional Ambient Air Study

The ambient air samples collected during the PHE reflect general ambient air quality impacted by emissions from point (e.g., factory) and non-point (e.g., automobile exhaust) sources. This ambient air study involved the construction and operation of a meteorological tower and nine air sampling stations located across the nine study areas. An average of 50 samples were collected from each study area. Each sample was analyzed for multiple chemical substances, including volatile and semi-volatile organic compounds, dioxins and furans, pesticides, polychlorinated biphenyls, particulate matter (PM₁₀), metals, mercury vapor, and aldehydes, resulting in acquiring and evaluating over 92,000 analytical results.

² Microorganisms (fecal and total coliforms) were included in the risk evaluation because they may be accidentally ingested in small quantities during bathing or showering.

In the U.S., ambient air quality is regulated via the Clean Air Act (CAA) and this framework was used to evaluate the ambient air results collected during Phase II. The risks from ambient air samples collected in the Campania Region were compared to the risks from ambient air samples collected from six U.S. cities as reported in the USEPA's 2007 Air Toxics Database (San Diego, California; Los Angeles, California; Seattle, Washington; Houston, Texas; Midlothian (Dallas), Texas; and Washington, D.C. [USEPA, 2007]).

For chemicals detected in Campania ambient air and listed in USEPA's 2007 Air Toxics Database, the cancer risks for the nine study areas were less than the typical urban air in the U.S. in all but one study area (i.e., Study Area 8). A pesticide (1,2 dibromo-3-chloropropane, the active ingredient in a nematicide used as a soil fumigant) was detected at low levels in 7 % of 441 samples, and is the topic of a forthcoming technical memorandum. The noncancer risks in all nine study areas were greater than the typical urban ambient air in the U.S., primarily because of higher acrolein concentrations in the Campania Region. The higher concentrations of acrolein in Naples may be associated with diesel exhaust, because diesel engines are more prevalent in Italy than in the U.S.

Epidemiological Studies and Limited Food Study

After reviewing available Italian epidemiological literature, USN public health experts identified three (3) issues that could be of concern in this region – cancer, birth defects, and asthma. Retrospective epidemiological studies were conducted to assess health risks for the USN population in the Campania area. Summarized below are the findings from the epidemiological studies that assessed exposure to environmental pollutants, primarily found in air and drinking water.

- The findings of the cancer study indicated that cancer rates for USN personnel were consistent with cancer rates in populations with an average age of less than 50 years old. The cancer study focused on non-melanoma skin cancer, malignant melanoma and acute myelogenous leukemia because they are the only cancers that met two study criteria: (1) cancer associated with chemicals detected in the USN's environmental samples; and (2) cancer had a short enough latency period that exposure and diagnosis could occur during the study period.
- The birth defect rate of USN personnel in Campania region was within expected limits as compared with birth defects in the U.S. population residing in the United States.
- Two asthma studies were conducted; one released February 2009, the second in June 2010. The second asthma study found a weak, positive association between increasing levels of fine particulates (PM₁₀) in ambient air and a person being categorized as a persistent asthmatic in the population serviced by U.S. Naval Hospital Naples. It also found an increased risk of being categorized as a persistent asthmatic in adults 20 years and older when compared to children under 20 years old among the U.S. Naval Hospital

Naples population. This study also observed a statistically significant linear trend in the proportion of persistent asthmatics since 2006, while similar trends were not observed in Rota, Spain, or Sigonella, Italy.

As part of the Naples PHE a Food Study was conducted in February 2008 evaluating certain foods available at the Naval Support Activity Naples Commissary (Commissary).

- The Food Study demonstrated that the fruits and vegetables grown in the Campania region and sold in the Commissary met the food safety criteria for consumption in the U.S. In addition, chicken products sold at the Commissary met food safety criteria for consumption. Tap water in the washing sink of the Commissary's produce department met the safety criteria for drinking as well as washing fruits and vegetables.

Conclusions

The following general conclusions about the potential health risks associated with living in the Campania region are based solely on the results of Phase II of the PHE.

- Drinking water contamination was detected in tap water from residences on non-permitted, private wells and, to a far lesser extent, for those using a public drinking water source. The contamination may be attributable to many factors including problems with the drinking water distribution system (such as low pressure in some areas); unpermitted private wells with ancillary interconnections to the public drinking water system resulting in blended water at the tap; inadequate maintenance and disinfection of domestic water holding tanks; lack of comprehensive use and maintenance of installed backflow prevention devices; and lack of compliance with well permitting laws.
- 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 USN established risk management actions.
- The data gathered on VI supports that health risks associated with living on-base at Gricignano and Capodichino are acceptable.

USN Risk Management Actions

The Phase I and Phase II risk assessments are finished and were used in developing the comprehensive risk management actions. Throughout this PHE, USN established health protective policies and took immediate actions, when necessary, to protect the health of U.S. personnel and their families. The risk management analysis determined that many of the health protective policies established during Phase I and Phase II will continue, as well as new policies implemented to ensure continued health protection.

The enduring health protection policies are as follows:

- Maintain the July 2008 Bottled Water Advisory for U.S. personnel living off-base.
- Maintain the New Lease Suspension Zone (NLSZ) areas, based on USN and/or Italian environmental sampling data, where USN personnel are not permitted to sign new rental home leases.
- Maintain the USN Naples PHE Website, the USN Environmental Health Information Center (EHIC), and the USN Regional Water Quality Board.
- Maintain the health protective USN lease clauses for private off-base rental homes:
 - Landlords must provide containerized water service from a Navy-approved vendor.
 - Leased homes 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 months.
- USN personnel residing in the Campania Region for more than 6 years will receive targeted public health education.
- USN will continue to share data with designated Italian public health officials.

The PHE is finished and the risk management actions described above will assist in ensuring continued health protection for US personnel residing in the Campania region.

Figure 1. Select Comuni of the Caserta and Naples Provinces and 3 New Lease Suspension Zone (NLSZ) Areas.

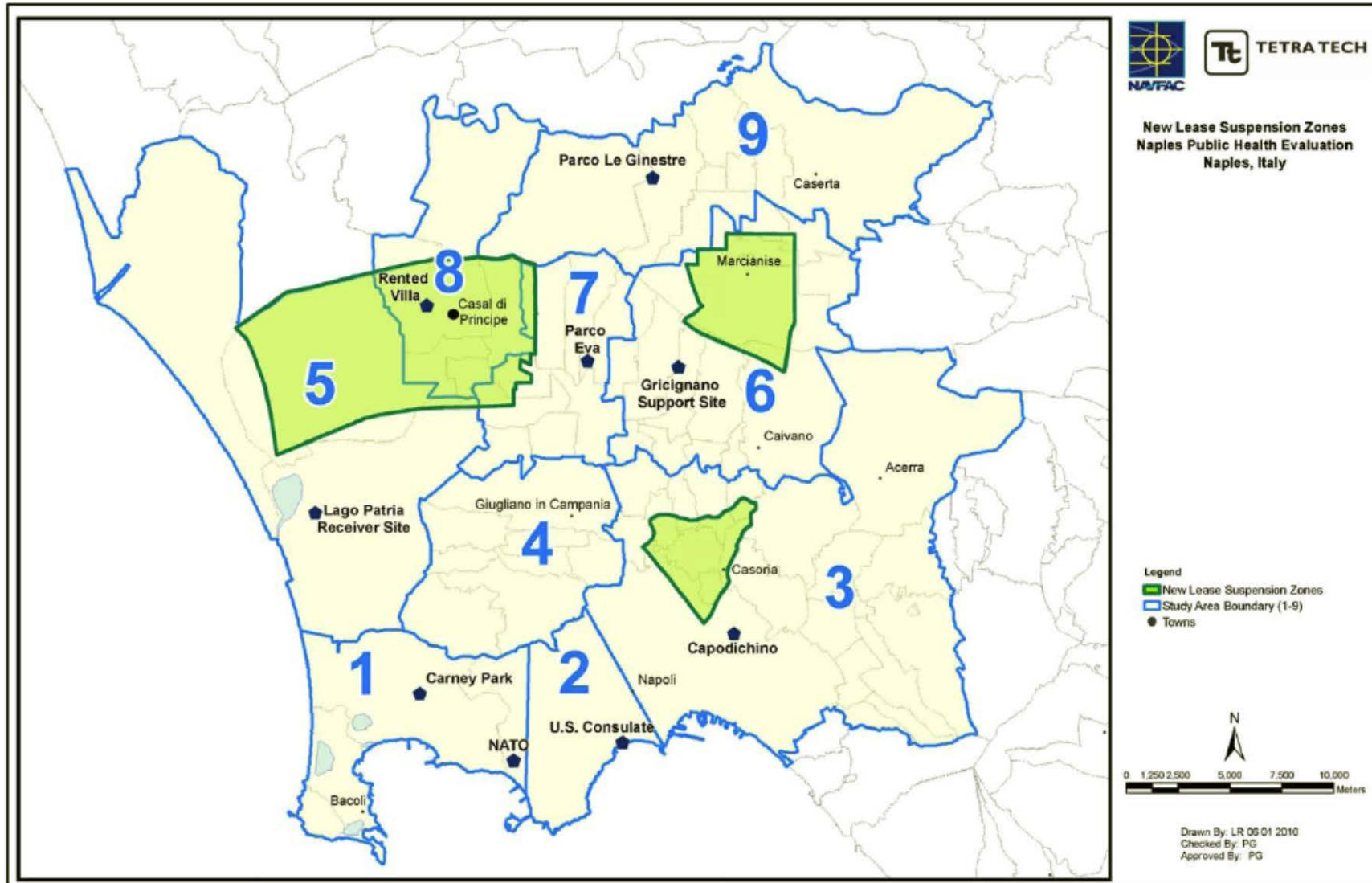


Figure 2. Sites of National Interest and Agenzia Regionale per la Protezione Ambientale della Campania (ARPAC) waste sites.

